INDICATORS OF ECONOMIC AND SOCIAL PROGRESS: AN ASSESSMENT AND AN ALTERNATIVE

By

RICCARDO NATOLI

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School of Applied Economics

Faculty of Business and Law

Victoria University

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In memory of my father

To my mother

With love and eternal appreciation

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VOLUME 1: RESEARCH REPORT

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Declaration

I, Riccardo Natoli, declare that the PhD thesis entitled “Indicators of Economic and Social Progress: An Assessment and an Alternative”, is no more than 100,000 words in length including quotes and exclusive of tables, figures, appendices, bibliography, references and footnotes. This thesis contains no material that has been submitted previously, in whole or in part, for the award of any other academic degree or diploma. Except where otherwise indicated, this thesis is my own work.

Riccardo Natoli Date

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Abstract

Measures of progress serve as a crucial link between the economy and the nation's policymaking establishment. Given that the idea of efficient allocation of resources is such a powerful influence in economics, a progress measure needs to account for most aspects of progress so it can serve as a basis for decisions to improve resource allocation. The use of the term *progress* encompasses notions of economic and social progress.

However, the conceptualisation of progress is fraught with difficulties, misconceptions and contradictions. Primarily, the contested nature of the concept leads to a general lack of agreement on a number of issues, such as adopting an appropriate conceptual framework and methodological approach. Over time, the term progress has adapted to reflect needs. So has its measurement.

Recently, the desirability of a narrowly defined economic growth as the panacea for achieving progress has been questioned. Despite containing conceptual limitations, GDP's use of money and production for its evaluation and demarcation purposes has given it an ease of comparability and desirability that many economists and policymakers yearn for. These limitations however have led researchers to develop alternative progress measures, which although are more difficult to build, possess greater intuitive appeal. Hence, a review is conducted here on the current main progress measurements.

The review sets out to identify aspects of income and non-income generating activity as well as to omit factors that generate income but do not contribute to the progress of a nation. Consequently, the relationship between market-based growth and progress is questioned in this thesis; a relationship, which the present research asserts, fails to consider a number of important costs. These costs incorporate social, economic and environmental aspects.

However, these costs can be included in progress measures through the abandonment of a single standardised system of accounts and the adoption of a comprehensive interdisciplinary approach. Subsequently, the present research proposes a framework

that integrates conceptually distinct theories comprising resources and capabilities, social and institutional arrangements, environmental systems and intellectual capital. This approach is appropriate for measuring multiple and different dimensions of progress. Additionally, the proposed progress index will incorporate the strengths while rectifying the limitations of the reviewed approaches.

The progress index is designed to not only incorporate empirical applications, but to detect the meaningful underlying dimensions contributing to national progress to provide guidance in articulating policies for optimal use of resources.

Furthermore, the measure is a non-monetary one. The use of market prices to capture aspects of progress tends to inaccurately reflect the real costs and benefits they provide, and ensures that the concerns in question (human, environmental, social, etc.) become part of a narrow debate where the economic bottom line is paramount, and where major impacts are omitted. Additionally, it has the capacity to ignore indirect costs that would lead to undesirable policy initiatives.

Challenges such as climate change, health and wellbeing have brought to the fore the growing chasm between the concerns of public policy and those of its citizens. Hence, a need arises for a progress measure to reflect society's core values. Consequently, the proposed non-monetary progress index employs a weighting technique based on public opinion. That is because market-based evaluations of progress components are inefficient since it is incapable of, amongst other things, accurately reflecting public concern. Hence, the use of a public opinion poll was justified.

The proposed index is assessed on two levels: from a single summary point of view and from a multiple dimension view. The aggregation method used to arrive at the single summary statistic is via the Condorcet method, while the dimensional assessment is evaluated via a z-score standardisation technique. Both approaches are appropriate and justifiable.

The progress index is applied to three countries that are representative of different clusters. They are Australia (mid-industrialised nation), Mexico (emerging economy), and the US (highly industrialised nation). These selected countries provide an opportunity to highlight any divergences that may exist in their perceived economic strength.

The results showed Australia as consistently having the highest levels of progress, closely followed by Mexico. Interestingly, the comparative results of the US and Mexico illustrated that it is possible to achieve high levels of progress without an excessive reliance on high levels of production and income. A sensitivity analysis was then conducted which exposed the progress index to a number of “what-if” scenarios. The main variables were selected under three different approaches: dynamic changes (coefficient of variation), empirical (literature review) and policy based. The sensitivity analysis resulted in altering some of the initial rankings.

Abbreviations

ABS	Australian Bureau of Statistics
CI	Composite Indicator
CKYL	Condorcet-Kemeny-Young-Levenglick
CPRN	Canadian Policy Research Network
CV	Coefficient of Variation
EDP	Environmentally Adjusted Net Domestic Product
EPU	Energy and Production Use
ESI	Environmental Sustainability Index
FAO	Food and Agricultural Organisation
FDI	Foreign Direct Investment
GDI	Gender-related Development Index
GDP	Gross Domestic Product
GNH	Gross National Happiness
GNP	Gross National Product
GPI	Genuine Progress Indicator
GS	Genuine Savings
HALE	Health Adjusted Life Expectancy
HC	Human Capital
HDI	Human Development Index
HDR	Human Development Report
HILDA	Household, Income and Labour Dynamics in Australia
HPI	Happy Planet Index
IC	Intellectual Capital
ICT	Information and Communication Technology
IEWB	Index of Economic Wellbeing
IPCC	International Panel on Climate Change
ITU	International Telecommunications Union
LAU	Land and Agricultural Use
MCMC	Markov Chain Monte Carlo
MDS	Multidimensional Scaling
MEW	Measure of Economic Welfare
NBER	National Bureau of Economic Research

NC	Natural Capital
OEC	OECD Environmental Data Compendium
OECD	Organisation for Economic Co-operation and Development
OSG	OECD Society at a Glance
PCA	Principal Component Analysis
PPP	Purchasing Power Parity
PQLI	Physical Quality of Life Index
RIE	Resource-Infrastructure-Environment
SA	Sensitivity Analysis
SC	Social Capital
SEEA	System of Integrated Environmental and Economic Accounts
SNA	System of National Accounts
UIS	UNESCO Institute for Statistics
UKONS	United Kingdom Office of National Statistics
UN	United Nations
UNCSD	United Nations Commission on Sustainable Development
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNICEF	United Nations Children's Fund
WB	World Bank
WCY	World Competitiveness Yearbook
WDI	World Development Indicators
WEF	World Economic Forum
WHO	World Health Organization
WRI	World Resources Institute
WRIE	World Resources Institute EarthTrends

Man does not inhabit a social vacuum; thus, failure to make some attempt to set those aspects of quality of life that we can measure in a wider framework will be a futile exercise. To discuss only the measurable components would be analogous to the old joke of the drunk looking for his lost keys under a lamp post, although he had dropped them elsewhere, because the light was better under the lamp! (Fallowfield, 1990, p. 18)

Chapter 1: Background and the Problem

1.1 Introduction

How does one measure the progress of a nation?

The composition of progress and its measurement are concerns that have long plagued economists. Over time, progress has adapted to reflect needs. So has its measurement.[1] The desirability of a narrowly defined economic growth, achieved through higher levels of gross domestic product (GDP), as the panacea for achieving progress has recently been questioned. Yet despite protestations to the contrary, the prevailing view amongst policymakers and traditional economists enables GDP to act as a *de facto* measure of progress (Waring, 1988). Although GDP contains conceptual limitations, its use of money and production for its evaluation and demarcation purposes has given it an ease of comparability and desirability that many economists and policymakers yearn for.

These limitations however have led researchers to develop alternative progress measures, which although they are more difficult to build, possess greater intuitive appeal. Some of the difficulties in developing measures of progress revolve around: How does one try to construct a measure determining whether societies are better off? What should be included? What should be excluded? Who sets the criteria? How does one incorporate societal values into a measure?

All these are legitimate concerns, which lead inevitably to one conclusion – no matter which way you look at it, *measuring progress is challenging*.[2]

[1] The term progress also implies wealth. In fact, the ABS (2006, p. 6) states that progress is one of a cluster of related concepts that include: wellbeing, welfare, quality of life and sustainable development. These terms are used interchangeably throughout the present research.

[2] The Organisation for Economic Co-operation and Development (OECD) 2007a, Second World Forum on Statistics, Knowledge and Policy, 'Measuring and Fostering the Progress of Societies', held in Istanbul, Turkey, on June 27-30, 2007, reflects this. The conference heard an array of opinions regarding progress measurement, where attendants signed a declaration affirming the need for improved progress measures that account for progress in all its dimensions.

The influence of GDP on policymaking decisions (it forms the basis from which government policy is derived and justified) is part of an established economic orthodoxy where the reification of economic data exists. This reification mirrors the crucial role mathematics and physics has played in economic analysis. This, Jevons asserted, comprised the mechanics of utility and self-interest. Economists, in an attempt to gain widespread legitimacy, adopted this technique. Yet they forgot one thing, economics (study of human behaviour) is not pure physics (study of matter) or physics in some other form (Georgescu-Roegen, 1971). This approach continues to this day, exemplified via the textbook representation of a circular diagram to illustrate the economic process as a pendulum movement between production and consumption within a completely closed system.[3] This adherence to mathematics and physics has had, on occasions, a negative influence on economics by detaching it from the real world, which is more subtle, rich and complicated.

Specifically for progress, this detachment had its roots in the writings of Alfred Marshall. It was Marshall who articulated neoclassical economics in the late 1870s, and shifted the discourse of economics from the cause to the mechanics of wealth creation. Consequently, the accounting of a national dividend changed from a stock to a flow.

> The money income, or inflow of wealth gives a measure of a nation's prosperity, which, untrustworthy as it is, is yet in some respects better than that afforded by the money value of its stock of wealth. For income consists chiefly of commodities in a form to give pleasure directly, while the greater part of national wealth consists of the means of production, which are of service to the nation only in so far as they contribute to producing commodities ready for consumption. (Marshall, 1920, p. 80)

The real economy according to this concept creates wealth by producing goods and services. Therefore, wealth is conferred by the flow of income and the stock, or capital, of material things and measured by utility. Subsequently, as Cobb, Halstead and Rowe (1995) argue, the economic value of a resource lies not in its nature but simply in its market price.[4]

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[3] For example, Mankiw's (2007a) textbook *Macroeconomics* and many others illustrate this circular flow model.

[4] Marshall was well aware of the limitations of a market centric approach being applied to the economy as a whole. For Marshall, this approach was only suitable for certain short-term exogenous shocks. However, as will be mentioned briefly in Chapter 3, his stance was misinterpreted.

This aim of measuring the value of production results in a measurement that concentrates mainly on market-based production. Consequently, exclusions occur. From an Australian viewpoint, the Australian Bureau of Statistics (ABS) excludes the following, amongst others, from its measurement (ABS, 2002, cat. no. 1370.0):

- consumer durables and motor vehicles that households use to produce services for themselves;
- native forests and other natural assets not used for economic production, but nevertheless contribute to its welfare;
- valuables held as stores of value such as monetary gold; and
- human capital (HC), defined as the stock of knowledge and skills embodied in the Australian population, and its development.[5]

Accordingly, progress is seen to reflect a market-based definition of production. While most of the inputs to the production of goods and services are an important repository of national progress, the present research asserts that it is what is excluded from this monetary approach that is important, and should be part of any progress measurement.

Thus, monetary measures of progress could be misleading as they can *underestimate* certain variables in the progress equation such as preventive health care. For example, Axnick, Shavell and Witte (1969) concluded that for every $1 spent on measles immunizations, it returned $4.92 in benefit, derived from savings in health care costs and averted economic losses. Yet these benefits are not accounted for. Additionally the contribution of childcare and household work, which is largely performed outside the market place, is severely underestimated by progress measures that solely utilise a monetary approach.

Conversely, monetary measures of progress also have the tendency to *overestimate* certain non-market inclusions such as expenditures on insurance, police and security.

[5] It must be noted that the categories of natural and human capital have, up until this stage, been included indirectly in mensuration via tourism and other related sectors. Additionally, there is certain production that is not exchanged in the market place, but for which a realistic value can be imputed using closely related market transactions that are included. These imputations however, are confined to a small number of cases where a reasonably satisfactory basis for the valuation of the implied transaction is available (ABS, 2000, cat. no. 5216.0).

These types of expenditures are known as 'defensive expenditures', understood to mean:

> … outlays with which the attempt is made to eliminate, mitigate, neutralize, or anticipate and avoid damages and deterioration that the economic process of industrialised societies has caused to living, working and environmental conditions. They serve only to restore, reapproach, or defend a status … that has been lost or compromised by negative impacts of the economic and social process. (Leipert, 1989, p. 844)

Hence, defensive expenditures are employed to help remedy negative externalities in society and do not necessarily represent an automatic and unquestioned increase in a country's progress. Economists such as Hamilton (1998) claim, and with some justification, that insurance does not actually add to the progress of a nation, rather it simply restores the activity in question to its original form. What one is left with therefore is a misleading and inaccurate determination of a nation's progress.

Other examples of *overestimation* in monetary measures like GDP occur where production results in negative externalities. For example, since the 1970s Indonesia was achieving economic growth rates of 7 per cent a year. However a study by the World Resources Institute (WRI) (reported in Cobb, Halstead and Rowe, 1995), found that Indonesia was selling off precious non-renewable minerals, clear cutting its forests and exchanging its topsoil with intensive farming. Yet these costs were omitted due to the assumption that the market price accurately measures what society values.[6]

As Cobb, Goodman and Wackernagel (1999) posit, if critical social and environmental assets are not incorporated into progress measures, they receive inadequate consideration in the policy arena despite their well-acknowledged contribution to progress. The present research claims that, along with human assets, a new progress measure is needed which will accurately account for these environmental components.

1.1.1 A More Neutral Measure?

Undoubtedly, economics must deal with issues of demarcation, abstraction and aggregation when attempting to understand the macroeconomy. Given the subjective nature of knowledge, what needs to be asked is the following: Is the way that

[6] Products with limited benefits such as 'junk food' also demonstrate this.

aggregations and abstractions are currently constructed, useful? And who benefits from the inherent bias of the measure?

Those who are in power have a vested interest in claiming their superiority and power over others. One way to ensure this occurs is to construct culturally value-based measures that lend support to their claim. Consider for example, how market-based measures, which place a greater value on material aspects of progress, are biased towards western economies.

Issues of culturally value-based measures producing bias are not new. This is best illustrated by the debate concerning the accuracy of western produced maps based on the Mercator projection versus the Peters projection. The traditional Mercator projection makes the west appear in the centre of the world and much larger than it really is. Here, European nations appear equal or larger than African and Asian territories when, in fact, they are substantially smaller (Vujakovic, 2002). For instance, the landmass of the southern hemisphere is exactly twice that of the northern hemisphere, yet the Mercator shows the north as comprising two-thirds of the map, with the south one-third (Hobson, 2004). Thus, under the Peters projection the size of a country is reflected in the *actual* measure of the land area.[7] All these distortions merely reinforce notions of legitimate power and a false connotation of European importance (MacEarchen, 1995).

What this demonstrates is how false ‘facts’ produced by biases can become part of our taken-for-granted knowledge of the world. This type of bias, this study claims, has also made its way into neoclassical economics, where the discourse is about control. Thus, even though progress measures such as extended national accounts intersect with other discourses in its discussion of household work and environment, the method used to achieve this creates a space only it can fill. The use of market prices, to capture these areas tends to inaccurately reflect the real costs and benefits they provide, as well as ignoring indirect costs, leading to undesirable policy initiatives. This is another reason why a more comprehensive approach is needed to measure progress.

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[7] The Peters projection is also known as the Gall-Peters projection. Although debate occurred between the two projections, no one questioned the claim of Peter’s improved accuracy compared to Mercator (Wood, 1992).

1.2 The Way Forward

Since progress measures serve as a crucial link between the economy and the nation's policy establishment, an approach is required that can ensure unquantifiable variables pertinent to progress will *not* be ignored. Accurate measurements of these types of variables are vital to the formulation of effective policies.

For many years the ownership of resources such as land, labor and capital determined a country's progress. Progress is now seen to comprise a variety of factors amongst the broad economic, environmental and social areas; areas that have expanded beyond the capacity of the current measurement domain. The World Bank (WB) reflects this with their recently expanded measure of wealth that explicitly includes HC and natural capital (NC) resources. Likewise, the United Nations (UN) through the addition of satellite accounts, include HC and NC to their system of national accounts (SNA).

Although the definitions of the resources that constitute progress have expanded, the present research argues that both the focus and the approach employed to measure progress have not. For instance, the emergence of HC and intellectual capital (IC) is now viewed as one of the most important determinants of a country's ability to produce and adopt technological innovations (Soubbotina, 2004). Yet knowledge, a part of IC, sits outside the measurement domain of conventional economics in the quantification of its value, cost and availability. As modern products use far fewer natural resources, they tend not to have the same prominence in the progress equation.

A desirable characteristic of a progress measure therefore is flexibility: its ability to accommodate changing situations. In response, numerous alternative multidimensional measures have been proposed in recent years (McGillivray and Shorrocks, 2005). These include: human development index (HDI) initiated by the UN (UNDP, 1990), genuine savings (GS) developed by the WB (WB, 1997) and the genuine progress indicator (GPI) initiated by Cobb and Cobb (1994). The aim of these measures is to adjust GDP to more accurately account for the differences in various countries. Although encouraging, the current study insists that these attempts to adjust GDP do not go far enough in accurately portraying progress.

Hence, as Giovannini (2007) states, initiatives to measure progress are growing due to the need for a measure to meaningfully account for the changes to the economic, environmental and social landscape, while also increasing political accountability.[8]

Furthermore, challenges such as climate change, health and wellbeing have highlighted the growing chasm between the concerns of public policy and those of its citizens. Hence, a need arises for a progress measure to reflect society's core values replicating what matters to its citizens in everyday life (Romanow, 2007). As Maxwell, Rosell and Forest (2003) assert: 'The legitimacy and sustainability of any major policy decision increasingly depends on how well it reflects the underlying values of the public' (p. 1032).

The ability to appropriately incorporate the concerns of citizens, the present research argues, is compromised when measures rely solely on market values. That is because market-based evaluations of progress components are inefficient since they are incapable of, amongst other things, accurately reflecting public concern.

In sum, the way forward should ensure that all the main components that comprise progress are included. This would involve a measure that incorporates HC, IC, NC and social capital (SC). Moreover, it would be less reliant on GDP, favour a non-monetary approach, and include non-market goods and services and externalities. It would also endeavour to accurately account for citizen concerns. In light of this, it is vital to articulate a meaningful definition of progress.

1.3 Defining Progress

It has been said that when social science borrows a word from ordinary language it takes time to settle on an agreed way of using it. A case in point is the use of the word *rent* in economics. Progress is no exception; its multidimensional nature makes establishing a universal criterion difficult, since the term means different things to different people (Gurria, 2007). For instance the Australian Unity Wellbeing Index, established in 2001 and principally authored by Robert Cummins, is designed to measure Australian's satisfaction with various aspects of life from an individual and

[8] This is supported by Gurria (2007) who declares that an explosion of initiatives to measure progress has occurred around the world.

national level (Cummins et al., 2003).[9] Although a valid interpretation, this standpoint does not reflect the intention of this current study. Additionally, in mainstream economics, progress has been defined as a term that involves an abundance of material possessions and resources possessing monetary or exchange value. The main focus of this definition was to collectively group income-generating assets. However, as will be demonstrated in the next chapter, the term has constantly evolved to a point where it now can also confer the property of welfare and wellbeing.

This move away from a market-centred definition to one that focuses on both social and economic progress (access to education and health care, innovation capacity, environmental health and social relations) needs to be reflected in measurement (Soubbotina, 2004).[10] In keeping with this, the current study defines progress as the process of making advancements, within the limits of mankind's knowledge, in the social, economic and environmental spheres. This is further elaborated below.

Hence, the present research's use of the term progress encompasses the more general concept of wellbeing, which echoes the sentiments of the HDI with its notions of social and economic progress. The present research divides progress into three key areas that can be drawn upon for its identification and determination:

1) *Resources*: comprises the machines, workers, money, land, raw materials and other things that a country can use to produce goods and services to make its economy grow (WB, 2005).

2) *Infrastructure*: involves the basic facilities, services and installations needed for the functioning of a community or society. It includes roads, railways, canals, ports, airports and communications, and is manifested by its network structure, for instance, the road or rail network (Banister and Berechman, 2000).

3) *Environment*: comprises the complex set of physical, geographic, biological, social, cultural and political conditions that surround an individual or organism and that ultimately determine the form and nature of its survival (WB, 2005).

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[9] The Australian Unity Wellbeing Index can potentially be used to complement the GDP as an indicator of progress. It is considered one of the preeminent measures of wellbeing in Australia.

[10] The importance of human, social and environmental factors was acknowledged by the aforementioned OECD (2007a) World Forum on Statistics, Knowledge and Policy, 'Measuring and Fostering the Progress of Societies', held in Istanbul, Turkey, June 27-30. This is also reflected in the ABS (2002, 2004a, 2006) attempts to measure progress, specifically, *Measuring Australia's Progress*, a biennial report first published in 2002, subsequently known as *Measures of Australia's Progress*.

The link between policy and progress measurement means that the need to design appropriate policies to foster progress requires the monitoring of the three key areas outlined above. These areas must then be converted into usable and understandable information necessary to evaluate alternative policy options. The current study asserts that this can best be achieved via a non-monetary approach.

1.4 A Non-monetary Approach to Progress Measurement

Value is an essential concept encompassing every aspect of economics. Currently market value, which asserts that no value exists apart from price, is the predominantly held viewpoint. A non-monetary approach provides a valid and justifiable alternative theory of value that moves away from the acquisition of goods as a measure of affluence, to a concept that is truly reflective of the production value of the society we live in. The popularity of non-monetary approaches is demonstrated in recent measures such as the happy planet index (HPI) developed by the new economics foundation (Marks et al., 2006) and the gross national happiness (GNH) initiated by the Centre for Bhutan Studies (2004).

Despite the increasing popularity of non-monetary measures, many national progress measures continue to use monetary measures. The lack of a readily useable price for convenient evaluations for human, environmental and social concerns leads to the omission of their major impacts[11] and restricts debates to the economic bottom line.

The potential folly of monetary measures of progress is best illustrated by the parable of the broken window. The parable tells the story of incomplete accounting for unintended consequences. In the story, a little boy breaks a shopkeeper's window. After initially sympathising with the shopkeeper the onlookers conclude that the little boy is a public benefactor due to the economic benefits created for everyone. For instance, the broken window makes work for the glazier who can buy bread benefiting the baker, who will then buy shoes benefiting the cobbler, etc.[12]

[11] An illustration of this can be seen in the work of Bilmes and Stiglitz (2006). Using standard economic and accounting frameworks, the authors assessed the *economic* costs of the Iraqi War. Even with such a narrow focus, their estimate was between US$1026bn to US$2239bn. This estimate occurs even *after* they omitted some of the most important costs of the Iraqi venture, as well as excluding costs borne by other countries, indirect costs such as the price of oil, and more importantly, the costs of the war to Iraq.
[12] It is an 1850 essay by Frederic Bastiat titled '*Ce qu'on voit et ce qu'on ne voit pas* (That Which Is Seen, and That Which Is Not Seen). The cost of repairing the window at the time was six francs.

However, the onlookers ignore the hidden costs. For example, the money the shopkeeper is forced to spend on the glazier cannot be spent elsewhere, for instance on a suit. Thus, the glazier's gain is the tailor's loss. Hence, instead of a window *and* suit, he has only a window. The onlookers therefore only see what is immediately visible to the eye. This fallacy is continually reaffirmed in traditional economic analysis. The parable of the broken window also serves to remind us that, as Hazlitt (1979) points out, in economics inevitable implications are not necessarily obvious implications.

There are, of course, differing interpretations of this parable. A relevant interpretation from this study's perspective involves those from a Keynesian standpoint. It was Keynes who stressed that when a country is experiencing a period of dramatic resource underutilisation, the economically sensible thing to do might be to build totally useless pyramids. This would stimulate the economy, increase aggregate demand and encourage full employment.[13] Hence, *exchange-value* production (demand) occurs at the expense of *use-value* (need).[14]

The pervasive nature of market value has led people to think in terms of money, where an increase means that they must be better off. As illustrated above, this is a flawed viewpoint. Furthermore, one also needs to consider the fact that monetary totals can rise yet people may not necessarily be better off. This, in part, is due to the peculiarity of the purchasing power parity (PPP).

To briefly illustrate, during the lengthy recovery from the depression, agricultural prices dropped sharply compared to industrial goods which experienced a minor drop. This factor, economists assumed, linked the prosperity of everyone to that of the farmer. Hence, a simple cure was identified. Restore the price of agricultural products to parity with industrial products. This parity existed from 1909-1914, an era where farmers were prosperous. This perpetual preservation of prices however does not exist elsewhere. For example, a Chevrolet in 1912 cost $2,150. An incomparably improved Chevrolet in

[13] A similar scenario involves 'building palaces in the desert'.
[14] The evolution of *exchange-value* and *use-value* for progress will be reviewed in the next chapter.

1942 cost $907. However, adjusted for parity it would have cost $3720 in 1942 (Hazlitt, 1979).[15]

Thus, what does this monetary measure tell us? Is society better off with a PPP? Can increases in monetary values automatically be associated with improvement? Why are improvements in the cost of production (lower costs) ignored? And why is it that when agricultural prices are above parity, they are not brought down to parity? The point here is to demonstrate that the use of monetary values is not necessarily an ideal approach, but rather is subject to flaws. This provides further justification for the use of a non-monetary approach to measuring progress.

On a related issue, empirical evidence on the relationship between income and subjective measures of wellbeing performed by the seminal work of Easterlin (1974, and more recently 1995, 2001) as well as Oswald (1997), Frey and Stutzer (2000) and Blanchflower and Oswald (2004), found that the positive effects of extra income on quality of life are relatively small. This finding adds credence to the present research's assertion that monetary measures (increased monetary outcomes) do not necessarily portray factors important to progress.

Similarly, McGillivray (2005) states that the ability of the HDI, the most prominent non-monetary progress measure, to identify countries that show superior outcomes in non-economic wellbeing to what their economic condition would suggest, is important if one accepts that there is more to wellbeing than what occurs in the economic sphere. Although a comprehensive non-monetary approach is preferred, to develop an all-encompassing approach is not the goal. This so-called 'theory of everything' will render the study meaningless. Hence limitations will be identified.

As the recent OECD (2007a) World Conference established, while it is not possible yet to truly construct an adequate progress measure, it is still possible to do a lot better than current measures. The current reliance by economists of equating progress in terms of a nation's GDP implicitly devalues the importance of factors such as NC, unpaid work,

[15] The estimate made by Hazlitt (1979) is based on his assertion that had the price relationship between agricultural and industrial products contained any logic, then the notion of perpetually preserving price relationships should be extended to every commodity at that time relative to every other. This is what he did.

knowledge and health (Cobb, Goodman and Wackernagel, 1999), as well as SC (Grootaert, 1998).[16] It also fails to distinguish economic activities that contribute to progress from those like crime and pollution that detract from it. The need for better measures is acknowledged.

With this in mind, this study sets out to develop a new measure that will more accurately reflect the state of a nation's progress and provide a foundation for an alternative approach to progress measurement. This will greatly increase the chance of an informed, balanced debate and lead to more optimal outcomes for progress. The proposed progress index will be applied to three countries. The countries selected are representative of different clusters. The three countries are Australia (mid-industrialised nation), Mexico (emerging economy) and the US (highly industrialised nation). The choice of Mexico was partly due to their association with the OECD, which would minimise data collection issues.

1.5 Objectives of the Thesis

The main contention of this study is that a more accurate portrayal of the critical factors contributing to progress can occur through the adoption of a comprehensive non-monetary approach. The present research therefore will employ this approach to build a basic model for progress measurement. This measure will contain an interdisciplinary approach in its construct, and a multidisciplinary approach in its application. In summary, the objectives for the present research are:

1. To review current approaches to progress measurement.
2. To identify aspects of income and non-income generating activity not yet included in progress measurements and conversely, to exclude factors generating income but not contributing to the progress of a nation.
3. To propose an alternative approach to progress measurement incorporating the strengths and rectifying the limitations of the reviewed approaches.
4. To detect the meaningful underlying dimensions contributing to national progress to provide guidance in articulating policies for optimal use of resources.

[16] This, of course, does not refer to all economists, for instance, sociologists or political scientists.

In achieving the above objectives the current study will make a contribution to progress measurement from a methodological standpoint.

1.6 Organisation of the Thesis

Chapter 1 briefly discussed the current state of progress measurement. It also reviewed the limitations of monetary measures of progress which opened the possibility to other avenues of measurement. The goal and the specific objectives of the present research were outlined in line with the identified problem.

Chapter 2 will review the evolving nature of wealth and its measurement. It also highlights how the nature of this knowledge production has formed crucial concepts. Chapter 3 provides an overview of some of the epistemological issues regarding economic analysis. It then critically reviews the main progress measurements. Chapter 4 assesses the main evaluative techniques employed to assess HC, NC and SC. It will also propose an approach, reflective of the present research's criteria, to incorporate into the conceptual framework and thus lay the foundations for an expanded progress measure specifically incorporating these aspects.

Chapter 5 identifies and justifies the most relevant theories for creating and maintaining progress, and then incorporates them into a cohesive and workable conceptual framework. Chapter 6 reviews the various methods which are available to link the theories with the objectives of the study, followed by the choice of methods used in this study. This chapter also justifies the selected variables chosen for analysis. Chapter 7 assesses the possible qualitative impacts amongst the proposed index's dimensions and themes. Chapter 8 examines the results and provides a discussion of the various analyses of the present research. A summary of the present research, its implications and suggestions for further studies are discussed in Chapter 9.

The alarming consequence of neglecting the lesson which philosophy teaches about the limits of human knowledge, the unattainable nature of certainty, and the value of constructive doubt, is that beliefs turn into dogmas and dogmatism leads to fanaticism. The dogmatic turn of mind is closed to new ideas and refuses to admit the possibility that what is presently regarded as knowledge might have to be revised.
(Hare, 2002, p. 500)

Chapter 2: The Evolution of the Wealth Concept and Approach to Measurement

2.1 Introduction

The study of economics has been a source of intrigue and inquiry dating from pre-Biblical times to the present day. Throughout this time, the main inquiry arising from economics has been the search for wealth and its accumulation.[17] Currently, this is portrayed by the satisfaction that is derived via the consumption of resources. However as this chapter will illustrate, this has not always been the case. In fact, the wealth concept has constantly adapted to reflect periodic needs, primarily centred on wealth accumulation. This, Skousen (2001) claims, has in the last 250 years led to the creation of economic models that best serve this need. The ability to directly influence outcomes via economic models meant that the economics discipline underwent a transformation from theory to application. This application of economic theory, this study argues, coincided with the recent phenomena of organising and utilising resources with the aim of satisfying individual consumption at the expense of societal outcomes.

In Chapter 1, the present research outlined how Marshall had shifted the economic discourse from the cause to the mechanics of wealth creation, with wealth being created only through market exchanges (see Section 1.1). Consequently, the market became the central concept in all economic matters. While this conception of wealth is highly contestable, this study is in agreement with Marshall's sentiment regarding the study of economics. Marshall claimed that before delving into economic inquiry it is important that:

[17] As mentioned in Chapter 1, the term progress also implies wealth. The confluence of the terms is reiterated by Cummins et al. (2003, pp. 159-160), who state that, 'the goodness of societies has been traditionally measured through wealth'.

> The economist should know something of the history of manners and customs and laws and of the principles of mental, moral, legal and political science. He [the economist] must avoid the error of regarding the present experience of mankind as of universal validity, mistaking temporary or local phases of human character for human nature itself. (Marshall, 1879, p. 5)

It is for this reason, the current research asserts, that an analysis of the evolution of wealth and its measurement is important. This chapter will briefly trace the main protagonists who have contributed to defining and measuring wealth, starting from the Stone Age up until the present day. The intent is to illustrate the changing nature of knowledge production in forming crucial concepts, where different economic theories utilised different definitions and measurements of wealth. By demonstrating the contestable nature of knowledge production it permits this study to approach wealth measurement from a standpoint other than neoclassical.

2.2 Prehistoric Times

The Stone Age economy was characterised by what Sahlins (1974) termed the domestic mode of production. This meant that families made what they used themselves and notions of wealth accumulation were viewed as a hindrance. In those times, freedom of movement was the ultimate value. Consequently, production occurred only for its *use-value*. Once needs were met, production stopped since there was no reason to produce a surplus.

However as Sahlins (1974) points out, it would be wrong to assume that wants were restricted, desires restrained, or even that the notion of wealth was limited. To assume this implies that the hunters and gatherers had curbed their materialistic impulses, rather than, as Sahlins argues, they simply never made an institution of them.

Marx reflected these differences in conception to the industrial age by declaring:

> How sublime seems the ancient conception that made man the objective of production, in comparison with a modern world where production is the objective of man – and wealth the objective of production. (Marx, cited in Sahlins, 1974, p. 84)

The Bronze Age distinguishes itself from the Stone Age with the onset of specialisation, involving the making of goods for trade or exchange (Earle, 2002). Here, wealth took the form of status-defining objects, which Earle described as prestige-goods exchange. It is important to note that most communities in this era were largely charcterised by an absence of exchange. Consequently, wealth remained scarce during these times as it was not valued very highly due to its low *use-value*.

2.3 The Ancient Hebrews

Although wealth analysis was not the central concern of the Old Testament, Wheeler (1995) nevertheless argues that four themes were identified regarding wealth. Firstly, wealth was associated with unfaithfulness to God. Secondly, wealth accumulation was viewed as the fruit of injustice. Thirdly, wealth was seen as the blessing on the faithful; and finally, wealth was seen as a reward of labour. In addition, Liebermann (1979) posits, Talmudic authorities recognised three functions of money: to facilitate exchange, accumulate wealth and to serve as a standardised unit of account.

The Old Testament therefore regarded wealth as a blessing but forbade its accumulation. These systems of philosophy from which such isolated economic statements formed part, Roll (1992) claims, shaped how wealth was to be studied. However not all of their teachings took hold. Despite passages in the Bible to the contrary, the development of private property continued. With it came trade, both domestic and international, and the possibilities of accumulating wealth were boundless.

2.4 Philosophers in Ancient Greece

Xenophon's book *Oeconomicus*, where the term economics was derived, contained an analysis of household management and the meaning of wealth during Ancient Greek times. The following passage taken from Xenophon's writings was part of a detailed interaction between Socrates and Kritobulus, concerning the merits of wealth:

> '… wealth was equivalent to those things that are of use to us.'
> 'You seem to imply, Sokrates, that even money is not wealth if the owner thereof is ignorant of its use.'
> 'Yes … wealth consists of those things from which a man can deride advantage … Suppose … use of his money … brought about deterioration alike of his body, his soul and his household … be regarded as a benefit to him?'
> 'Not in any way, ...' (Laistner, 1923, pp. 30-31)

In this passage the difference between *use-value* and *exchange-value* was introduced. It also made it clear that wealth was not equivalent to money. While Xenophon may have introduced *use-value* and *exchange-value* into the economic lexicon,[18] it was Aristotle who provided a more detailed analysis. Aristotle remarks in his writings:

> Each possession may be used in two ways, both of which belong to the thing itself but not in a similar way; for one of them is but the other is not appropriate to the thing's [nature]. For example, a shoe may be worn or it may be exchanged for something else, and both of these are uses of the shoe; … but this is not the appropriate use of the shoe, for the shoe was not [originally] made for the sake of exchange. (Aristotle, Politics Book A, part 9, translated by Apostle, 1986, p. 28) [square brackets in original]

Here Aristotle divided the economy into two parts, distinguishing between *use-value* as a natural phenomena and *exchange-value* as an unnatural one. The satisfaction of natural wants was deemed the correct use of goods as it served merely as an extension of household management. Conversely, goods exchanged for monetary gain went beyond the confines of the household and was deemed unnatural.

Subsequently, wealth was divided into two forms: *household management* and *retail trade*. The former was productive and natural, the latter, unnatural and destructive.[19] Aristotle viewed money as comprising only a medium of exchange; it had no useful value in itself and could not be considered wealth. It was however identified as a measure of wealth and as a measure of value in general. Of course, as Spiegel (1991) prudently adds, money and wealth must not be confused; after all, who is rich in coin may be in want of food.[20]

Not surprisingly, many economists such as Staley (1989) have criticised Aristotle's explanations regarding wealth due to its 'monumental vagueness'. While this argument has some merit, Aristotle nevertheless did examine the problems of *exchange-value*, and

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[18] Laistner (1923) points out that whether the views expressed in the passage are Xenophon's or Socrates is a subject of much controversy.

[19] Schumpeter (1976) critiques the destructive nature of resources due to production, adding that the process of 'creative destruction' is an essential fact of capitalism.

[20] This of course is not a new idea. The Old Testament also states that one cannot fill his stomach with silver and gold (Ezekiel, 7:19-20).

the function of money in its determination and wealth accumulation.[21] His views were to influence western society for a long period of time, however elsewhere another view emerged.

2.5 Dark Ages

With the western world experiencing a rather stagnant period, knowledge wise, an abundance of literature was being produced in the Islamic world concerning economics. According to the Qur'an, five major Islamic economic and financial instruments are identified: the abolition of usury, profit sharing under economic cooperation between labour and capital, joint ventures (principally though not wholly through equity participation), the institution of charity and the avoidance of wasteful use of resources (Choudhury, 1999).

The avoidance of wasteful use of resources, Naqvi (1994) claims, concurs with the Islamic principles of wealth sharing. It was decreed that any individual who holds landed property that he does not cultivate himself must make it available for others to make do so useful. This is referred to as Zakah (the obligatory charity in Islam), where a certain percentage of wealth must be distributed among the due beneficiaries. In fact, there is an uncompromising insistence in Islamic economics regarding distributive justice, which can be defined as 'a superior distribution of income and wealth, in accordance with the universally accepted norms of fairness' (Naqvi, 1994, p. 89).

The emphasis on human and social considerations regarding the concept of wealth, in particular the notion that all of society must share in it, is paramount. Consequently, both ethics and economics are intertwined in a way that surpasses both Ancient Greece and Old Testament teachings. Despite the progress made by Islamic scholars, the western world would have to wait until the thirteenth century before the concept of wealth was thoroughly re-examined to reflect the times.

[21] Gordon (1964, p. 119) contends that Aristotle recognised that both utility and labour cost (at least in the limited sense of labour skill) were relevant to the determination of *exchange-value*. However, he adds, it was not a very satisfactory synthesis of the two.

2.6 The Scholastics

The scholastics, which comprised of churchmen in medieval time, applied their philosophical and religious principles to the study of the economy. Of these scholars, Saint Thomas Aquinas (1225-1274) wrote the most complete and authoritative statement on wealth. His most important work was *Summa Theologica*. For St. Thomas, natural wealth satisfied the needs of life whereas unnatural wealth was aimed at earthly gain. In essence it was a synthesis of Christianity and Aristotle's doctrine. According to St. Thomas:

> It is right for a man to seek such wealth as is necessary for a livelihood in his station. To seek more is not enterprise, but avarice, and avarice is a deadly sin. (Tawney, 1938, p. 32)

The scholastics distinguished between labour, which it considered necessary and honourable; trade, which was necessary but perilous to the soul, and finance, which, if not immoral, was at best sordid and at worst disreputable. However despite such proclamations, according to Roll (1992), St Thomas regarded wealth alongside other imperfections of man's earthly life, which were inevitable. Consequently the moral antipathy to the unbounded accumulation of wealth, which occurred under Aristotle, continued. St Thomas did however believe that wealth should be made as good as nature would permit. That is, others must be allowed to share in it. This was otherwise known as the stewardship of wealth which mainly comprised of acts of charity.

The scholastic view of wealth began to fade away in the sixteenth century. Commercial trade grew so rapidly that Canon doctrines no longer reflected economic practice. The time was ripe for a new understanding of the economy and of wealth. In the seventeenth century, a loosely formed group known as the mercantilists did just that.

2.7 Use-value Loses its Grip

Mercantilist principles were regarded as an important break from the past. Specifically, two main ideas emerged: firstly, that money was the essence of wealth and not solely a medium of exchange, and secondly, that a positive balance of trade indicated a nation's strength. As Magnusson (1994) states, mercantilists argued on the basis of a material interpretation rather than moral, where man's selfishness would serve social goals.[22]

Thomas Mun's book *England's Treasure by Forraign Trade*, written in 1630 but published posthumously in 1664, is considered by many authors to represent the essence of mercantilism. The book discusses the significance of foreign trade for the national economy.

> The ordinary means therefore to encrease our wealth and treasure is by *Forraign Trade*, wherein wee must ever observe this rule; to sell more to strangers yearly than wee consume of theirs in value. (Mun, 1664, ch. ii, p. 5) [emphasis in original]

For Mun, the concept of stock was significant. Mun was convinced that foreign trade was the optimal way to increase stocks of gold and silver. Subsequently, as Heilbroner (1972) points out, the idea of a national economy and the hypnotic concept of the balance of trade became the norm in the seventeenth century.[23]

A fundamental shift in the concept of wealth had occurred. Mun's strong focus on trade, which was due to the fear of downward pressure on employment caused by an outflow of precious metals (Robbins, 1998), meant that the term wealth was no longer identified with goods possessing *use-value*, instead it was associated with goods characterised by *exchange-value*.[24] While production increasingly became the *raison d'être* of economics, the act of production and circulation of wealth became separated processes connected by money (Roll, 1992) and the interplay of supply and demand became the valuation technique (Magnusson, 1994).

William Petty's, *Treatise of Taxes and Contributions* published in 1662, placed great emphasis on labour as the source of wealth. In the book Petty mentions 'labour being

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[22] Langholm (1992, p. 564) points out that this view was not a new one. In fact, its origins occurred in the fifteenth century.

[23] This is not the first instance of national policy formulation and implementation becoming the norm. Roll (1992, p. 52) states that in Greece and Rome, it was a continual aim of policy to form a metallic hoard which would serve in case of need. Additionally, in the Middle Ages, the pursuit of wealth and power was bound up with the accumulation of treasure.

[24] Schumpeter (1954) opposed this view claiming that no assertion could be found which had mercantilists equating wealth with such an outlook. There was, however, little support for his view.

the father and active principle of wealth, and land being the mother'.[25] Although Petty identified land, labour and production as the sources of economic value, Spiegel (1991) asserts that, Petty's real intention was *not* to define and determine concepts of wealth and income; rather, income and wealth appear because they were relevant to his argument in favour of a widened tax base.

This of course reiterates the point regarding the motivation for measures (see Section 1.1.1 on Mercator versus Peters map projection). As Spiegel (1991) demonstrated by highlighting Petty's real intention, those in power construct measures that lend support to their need.[26]

According to Daly and Cobb (1994), Petty was instrumental in gradually denying a valuation role to land, since land was now seen as matter, which could not form itself. It was dependent on labour as its form for its significant actualisation, or improvement. This type of analysis, of course, derived from the notion in physics concerning matter and form. As a result, economic analysis became predicted on the assumption that all physical things comprised matter, which were arranged in production and disarranged in consumption. Thus, the economy became a closed flow from production to consumption, to production again. This circular flow model is still employed in today's textbooks (see Section 1.1, Footnote 3).

However, it was not until 1690 when William Petty published *Political Arithmetik*, that this different approach to economic inquiry was employed. Petty, by distinguishing another method and manner of arguing, instigated a change in analysis.

> … instead of using only comparative and superlative Words, and intellectual Arguments, I have taken the course … to express my self in Terms of *Number*, *Weight* or *Measure*; to use only Arguments of Sense, and to consider only such Causes, as have visible Foundations in Nature … (Petty, 1690, cited by Hull, 1899, vol. 1, p. 244) [emphasis in original]

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[25] Spiegel (1991, pp. 686-687) mentions how Petty's reference to 'land being the mother of wealth', may have been inspired by Benjamin Franklin who referred to how, 'infants derive their sustenance from their mother, so men desire it from the earth'.
[26] Another example is the Gold Standard. According to Davies (2002), the Gold Standard was adopted initially by Britain in 1816 after an official enquiry advocated the use of gold as the precious metal to support monetary convertibility. Later in the century, countries such as France, the US, Germany and Japan followed. It is no coincidence that these countries also had high stocks of gold.

Given this preference, it came as no surprise that both William Petty in England, and Pierre le Pesmt Sieur de Boisguilbert in France, initiated the first real formulations of national income.[27] In Boisguilbert's 1697 publication *Le Detail de la France*,[28] Boisguilbert claimed that consumption is the foundation of all wealth since all the riches of the world are useless if they are not consumable (Kendrick, 1970).

In measuring national income, Petty sought to use the measure as a comparison for nations regarding their economic status or welfare: 'That the Kings Subjects are not in so bad a condition, as discontented Men would make them' (Petty, 1690, cited by Hull, 1899, vol. 1, p. 313).

During this stage the notion of wealth expanded. Previously wealth could only increase via foreign trade, now wealth could increase via human labour applied to nature. Thus, a circular flow of wealth was produced by a surplus of agricultural product where farmers, landlords and country labourers were the key. According to Studenski (1958), Petty defined the income of the people as the sum of the annual value of the labour of the people, and the annual proceeds of the stock or wealth of a nation.

Furthermore, the mechanistic belief that many if not all things lent themselves to measurement, which was prevalent in the natural sciences, began to take hold.

2.8 Calculus Enters Economics

This was taken a step further when, in 1738, David Bernoulli produced one of the earliest graphs that displayed the utility of wealth or income. Bernoulli was also the first to apply calculus and analytical geometry to an economic problem even though it was not recognised at the time. It occurred when Bernoulli was working on solving the St. Petersburg paradox.[29] Bernoulli's work led to the introduction of the subjective element as the determinant of value. This meant that utility was dependent on the circumstances

[27] Studenski (1958) notes that work on national income estimates in England came to a stop for a while at the start of the eighteenth century due to a general sense of wellbeing and relaxation of international tension. It was revived towards the end of the century with the onset of the Industrial Revolution, the US Declaration of Independence and the French Revolution.

[28] Some confusion exists over the exact date of publication, with some authors citing 1695.

[29] The paradox was the discrepancy between the mathematical value of a chance, and the lower value that people ordinarily place on it.

that were faced by the estimators. A flow on effect of this was that the concept of marginal utility and the principle of diminishing marginal utility were introduced.[30]

As yet however, there was no real system of analysis in place. This all changed with Richard Cantillon's *Essai Sur la Nature du Commerce en General* published in 1734,[31] which Jevons insisted was 'a systematic and connected treatise, … *the first treatise on economics*' (Jevons, 1881, p. 67)[32] [emphasis in original].

2.9 From a Stock to a Flow

Richard Cantillon, Jevons (1881) claimed, foresaw that there would be a circular flow of income and expenditure between landlords and labourers. Cantillon reinforced the view of Petty about land being the source of all wealth and labour as the form that produced it. However, he differed from mercantilists by arguing that increases in wealth lay *only* in the realm of production. Thus, even though natural resources constituted wealth it was man's productive labour alone that could increase wealth via surplus profits to the resource owners. 'The Price and Intrinsic Value of a Thing in general is the measure of the Land and Labour which enter into its Production' (Cantillon, 1734, p. 27). Consequently, Cantillon's theory of value was transformed from a labour theory of value into a cost of production theory.

According to Bloomfield (1938) most of the physiocratic ideas were borrowed from other writers, most notably Cantillon, Boisguilbert and Hume. The physiocrats rejected Cantillon's preference for foreign trade, although they did adopt his concept of a circular flow of income. By introducing the concepts of isolation and abstraction, many consider the physiocrats the first 'school' of economists.

[30] Bernoulli's article, translated by Sommer in 1954, states that Gabriel Cramer, a Swiss mathematician, developed his identical theory several years before, in a letter sent to Nicholas Bernoulli (cousin of David) in 1728.

[31] Although the year 1734 makes it prior to Bernoulli's in 1738, the English translation: *Essays on the Nature of Commerce* was published circa 1755.

[32] This is, of course, contrary to the established view that Adam Smith is responsible for the first treatise on economics.

The physiocrats believed national income was produced solely by the interaction of farmers, landowners and artisans.[33] The farmer generated a surplus, or net revenue also known as *produit net* in excess of his cost of production (capital and labour). Land, via an agricultural surplus product, was the only means to produce wealth while manufacturers and merchants fulfilled a necessary yet inferior role. The composition of wealth then had a narrower focus, consisting of a nation's resources and its goods which were destined for consumption. This change in emphasis, Bloomfield (1938) asserts, where money was viewed solely as a medium of exchange drew a distinction between real wealth and pecuniary wealth.[34]

Adam Smith echoed the physiocratic ideas of self-interest and natural liberty; however he was at odds with the physiocrats' concept of national income. His book *An Inquiry into the Nature and Causes of the Wealth of Nations* published in 1776 proclaimed a new beginning.

2.10 The Birth of Classical Economics

Smith articulated a broader theory of national wealth by claiming that manufacturing, trade and transport could also add to the total output value and become productive. Yet Smith's concept also restricted production to material goods (vendible commodities). This maintained the division between productive and unproductive labour.

> THERE is one sort of labour which adds to the value of the subject upon which it is bestowed: there is another which has no such effect. The former, as it produces a value, may be called productive; the latter, unproductive labour. Thus the labour of the manufacturer adds, generally, to the value of the materials which he works upon, that of his own maintenance, and of his master's profit. The labour of a menial servant, on the contrary, adds to the value of nothing. … But the labour of the manufacturer fixes and realises itself in some particular subject or vendible commodity, which lasts for some time at least after that labour is past. … The labour of a menial servant, on the contrary, does not fix or realise itself in any particular subject or vendible commodity. His services generally perish in the very instant of their performance. (Smith, 1776, Book II, pp. 314-315)

[33] The relationship between the farmers, landowners and artisans during this time was outlined in Francois Quesnay's *Tableau Economique* published in 1758. This work was considered by many to be an early model of the circular flow of the national income, and also of its annual reproduction. It took from Cantillon the idea of a circular flow of income, but went beyond Cantillon by introducing the idea of cumulative effects.

[34] As Robbins (1998) asserts, although this was not an entirely new concept it still contributed to how wealth was analysed.

For Smith, any value that could be added to that product, either directly or indirectly, to make that commodity vendible was viewed as productive. Hence, Smith's theory was solely a concept of material production. However, as the above quote illustrates, professionals (entertainers, lawyers, etc.) who offered their direct services for personal consumption were unproductive since their work perished in the very instant of their performance (production). As Cobb, Halstead and Rowe (1995) point out, while that view is debatable, Smith was asking a more pertinent question, one they believe has disappeared from economic thought.

Is there a difference between mere monetary transactions that restore value, or even create value such as the production of amphetamines, and a genuine addition to a nation's wealth? Another such example is the insurance sector. This comprises of financial transactions, which at best, only restore a person or object to their initial state. It cannot however genuinely make a net contribution to these forms.

Smith again differentiated himself from previous economic belief by insisting that per capita national income was the criterion for economic wellbeing, rather than aggregating national income or national wealth. Furthermore, the wellbeing of an individual was ultimately a function of his command over consumer goods (Roll, 1992).

Thus, it is Smith who makes labour the sole source of value, and the quantity of labour employed in each commodity as the measure of that value. Thus value becomes price deterministic ensuring all commodities could, at all times and places, be estimated and compared (Roll, 1992).

By regarding both commodity production and the distributive trade as productive (Kendrick, 1996), Smith helped his generation rise above the misleading proposition that a nation's wealth consisted of its gold and silver. Although Smith, universally acknowledged as the founder of classical economics, contributed greatly to the analysis of wealth, there were aspects of his work, especially regarding the labour theory of value, that needed further refinement.

Interestingly it is this *need*, once again, which necessitates a change in the development of measuring wealth as it did with Mun who feared that the outflow of precious metals would place downward pressure on employment, and just like Petty whose desire it was to widen the tax base. The need for further refinement however, was to be left to another generation.

2.11 The Rise of Mathematical Economics and its Reaction

Jean-Baptise Say published his two-volume work, *A Treatise on Political Economy*, in 1803, which redefined economic analysis in an orderly structure. Economic science, Say insisted, was not the science of commerce, or exchanges or the theory of value; rather it was the science of the production, distribution and consumption of wealth. According to Skousen (2001), Say was adamant that economic models must always be tested by observation, which was due to Say's misgivings about mathematical and statistical economics, which he believed misled ideas in the political economy.[35] With respect to the concept of wealth:

> … wealth can only exist where there are things possessed of real and intrinsic value…to create objects which have any kind of utility, is to create wealth…Production is the creation not of matter, but of utility. (Say, 1803, pp. 61-62)

Hence for wealth to occur economically, the object in question should have a market value and be appropriated. This meant that Say repudiated Smith's labour theory of value by insisting that value could only reside in the thing itself. Thus, all value was founded in utility. Utility took the form of a subjective utility theory of value.[36] Say also rejected Smith's distinction between productive and unproductive labour and he ignored the distinction between labour that produced a surplus and labour that did not. This in effect introduced land, labour and capital as the three factors of production, a concept that was to become the norm in nineteenth century economic literature. Say, who applied the subjective utility theory of value on Smith's doctrines, did away with physiocracy forever.

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[35] Say's (1803, p. xxi) view is best summed up by the following quote: 'Nothing could be more idle than the opposition of theory to practice!'

[36] According to Roll (1992), Say's utility theory of value relied heavily on Condillac (1776), who produced one of the earliest statements on utility. Condillac viewed that utility as an economic concept, was no longer a physical quality of goods, and instead was the significance that an individual attached to a good for the purpose of satisfying a want. This meant that value depended on scarcity and utility.

As economic analysis increasingly adopted an individual mechanistic viewpoint, sounds of discontent were starting to be heard throughout Europe. In Germany, Adam Muller criticised Smith's notion that national wealth was simply an accumulation of private member wealth (Briefs, 1941).[37]

For Muller, wealth's real existence could only be recognised in its *use-value*, for wealth was made up of tangible and intangible things (Spiegel, 1991). Muller's universalistic approach recognised that spiritual or intellectual capital, accumulated in the form of cultural values and scientific experience, was a part of the national wealth. Consequently, wealth analysis had overlooked the connection between man and community since this could not be estimated in weight or number.

Many economists have condemned Muller's writings for being far too vague. Interestingly however, the same economists rarely attribute this criticism to the principles of mathematical economics. Mathematical economics has the same capacity to be as vague or as deceptive as Muller supposedly is. For instance, although the conclusions in mathematics seem to be very clear, it is actually only deceptively clear, given the assumptions that are used in the derivation. This, to some extent, also impacts on the usefulness of the results for policy formulation.

David Ricardo had no such ideological problems with Smith, or mathematics for that matter. In his book *The Principles of Political Economy and Taxation*, published in 1817, the employment of mathematics in economics was taken a step further as economics lost the empirical bent that had been so characteristic of Adam Smith's approach. Instead, it became austere and abstract.

For example, Ricardo employed pure deductive reasoning and high mathematical formulas without reference to history, sociology, philosophy or the institutional framework. He did however develop Smith's labour theory of value, claiming that value arose from quantity of labour employed as well as the commodity's scarcity (Skousen, 2001).

[37] As Briefs (1941) points out, Muller was writing at a time when war had shaken the static, absolutist and mechanical conception of the state.

Augustin Cournot followed in the tradition of Ricardo. Cournot's theory of wealth focused on *exchange-value*, regarding it as the sole foundation of wealth in the economic sense of the term. This concept, he added, could doubtless only have an abstract existence. Being a mathematician, Cournot perceived economic concepts as functions of one another. Cournot differed to Say by insisting that any need to continually test via observation was superfluous.

As a result, not only does economics lose touch with philosophy, but it also now becomes subject to its own laws and inner logic. This apparent hijacking of economics by mathematics, with its tendency to produce conclusions that did not necessarily represent reality, caused a backlash in some quarters. John Stuart Mill best sums up these views.

In 1844, John Stuart Mill published his book, *Essays on Some Unsettled Questions of Political Economy*. This book set out to redefine the scope of abstract economics, insisting that the political economy:

> … does not treat of the whole of man's nature as modified by the social state, nor of the whole conduct in society. It is concerned with him solely as a being who desires to possess wealth, … It makes entire abstraction of every other human passion or motive; … (Mill, 1844, Essay V, p. 137)

Here, Mill was describing an early version of economic man, characterised by his desire to possess wealth (which was almost identical to self-interest) and his aversion to labour.[38] For Mill however, this focus was misplaced since man was motivated by a myriad of desires with the possession of wealth merely one of them. Therefore, any analysis that contained some version of economic man was inaccurate and misleading.

Not surprisingly, Mill favoured an eclectic approach. For economics to be truly useful to society, Mills asserted, any analysis must include a concern for both human welfare and tolerance. Despite Mill's cautionary tone, from this time onwards a consensus of

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[38] According to Spiegel (1991) this idea was dealt with in more detail in 1848 when Mill published *Principles of Political Economy*, with the aim to apply economics to social philosophy. In it, Mill argued that economics abstracted only three non-economic principles. They were: man's aversion to labour; his desire of the present enjoyment of costly indulgences; and the principle of population.

sorts emerged as to the make up of wealth. It was seen as a stock of useful things. However, what was still in dispute was an appropriate economic valuation technique. An alternative method of evaluation emerged with the writings of Karl Marx.

2.12 Ownership and Distribution

According to Marx, any determination of whether labour was productive stemmed from the social relations of production. This insistence, which requires an understanding of social structures, took Marx's analysis beyond Smith's individualistic standpoint.

> The determinate material form of the labour, and therefore of its product, in itself has nothing to do with the distinction between productive and unproductive labour. For example, the cooks and waiters in a public hotel are productive labourers, in so far as their labour is transformed into capital for the proprietor of the hotel. (Marx, 1863, translated by E Burns, 1963, vol. 1, p. 154)

Therefore, every commodity in capitalist production possessed a double character: *use-value* and *exchange-value*. Specifically for Marx though, workers that merely changed the form of a product's value from *use-value* to *exchange-value* were deemed unproductive (unlike Smith who recognised their indirect contribution to production). Instead, productive workers were those who added new value, or usefulness (Kushnirsky and Stull, 1989). Consequently, productive labour was not solely about profit but about producing value. Here, Marx was defining production and the economy in terms of his labour theory of value.

Marx's definition of production excluded material goods that did not contribute to the surplus value. Any non-material production was not considered productive due to Marx's preoccupation on the capitalist mode of production. While Marx did recognise that socially essential goods or effects occurred in the home and elsewhere such as nature (*use-value*), they were omitted since they did not possess *exchange-value*.

Another point of difference occurs with the role of services. In practice, services were for the most part excluded, however Marx did acknowledge that services could be productive. For instance, Marx considered the transportation of goods as a direct input to the production of material goods. For Marx, it was vital to service production that:

> The production cannot be separated from the act of producing, as is the case with all performing artists, orators, actors, teachers, physicians, priests, etc. Here too the capitalist mode of production is met with only to a small extent, and from the nature of the case can only be applied in a few spheres. (Marx, 1863, translated by E Burns, 1963, vol. 1, p. 398)

Thus Marx believed that the essence of services tended to exclude capitalist production. In fact, in situations where such services produced a surplus value Marx indicated that this type of non-material production, when compared to the totality of production, was so small that it should be omitted from the accounts (O'Connor, 1975).

From a usefulness perspective, Marx's impact in evaluating income and wealth has been mixed. The material product system that operated in the Soviet Union could be attributed to Marx, however Studenski (1958) claims that the Material Product System was, at best, a makeshift reproduction of Marx's work. Kushnirsky and Stull (1989), on the other hand, argue that Smith's vendible commodity formula was more influential in the construction than the writings of Marx. Apart from the material product system there have been, Shaikh and Tonak (1994) estimate, twenty-odd attempts in measuring the economy using Marxist theory. However, none have produced any consensus regarding the make up of production and hence wealth.

From a wealth measurement perspective, the Marxist theory of labour value that governs prices and production in capitalism has proved to be quite problematic. As Cutler et al. (1977) illustrate, Bohm-Bawerk argued successfully that the laws of supply and demand were sufficient, rendering price formation explained by labour value as superfluous. Even if supply and demand was not sufficient, Bohm-Bawerk added, labour value was still an inappropriate measurement technique that was superseded by neoclassical utility.[39] The problem of how one turned value into prices came to be known as the transformation problem.[40]

[39] Spengler (1955) examines the extent to which Aristotle anticipated Bohm-Bawerk's views on subjective value, and principle of diminishing utility.

[40] Resnick and Wolff (2004) argue that Bohm-Bawerk's critique is invalid when one theorises value as overdetermined. Under this approach, successive determinants of value are explored and integrated into its meaning/definition yielding a developed notion of value that dissolves Bohm-Bawerk's old price-value critique. It does so by simultaneously transforming value into prices of production and prices of production into value.

During this period, Ricardo and Mill continued to apply Smith's concept of national income to a nation experiencing substantial change, a change that produced a significant shift in the economy's centre of gravity away from manufacturing, to trade and finance. Smith's views on national wealth were now seen as being quite constrictive.

An alternative was needed.

2.13 Marginalist Revolution

This alternative came in the form of the marginalist revolution, which introduced the development of the marginal analysis of neoclassical economics. Its most famous proponents were Leon Walras, William Stanley Jevons and Carl Menger in the 1870s, followed later by Alfred Marshall.[41]

Prior to the marginalist revolution classical economics had for the most part, Meek (1973) points out, believed that to comprehend the complexities of the market place, one needed to adopt an analysis that penetrated *below* the surface of the market. This technique enabled most classical analysis to be interwoven with an historical view of society. This however all changed with Walras' book, *Elements of Pure Economics*.

> Everyone competent in the field [of economics] knows that the theory of exchange based on the proportionality of prices to *intensities of the last wants satisfied* … constitutes the very foundation of the whole edifice of economics … (Walras, 1874, translated by W Jaffe, 1954, p. 44) [content in parenthesis added, emphasis in original]

Meek (1973) asserts that this theory of exchange provided neoclassical economics its structure and legitimacy. Walras had introduced the concept of strong usefulness, where the nature of the need was not of concern. This standpoint enabled Walras to distance himself from the likes of Smith, Ricardo, Mill and Marx who adopted a weak usefulness approach where the nature of the need for a commodity was instrumental in determining its usefulness (Mamalakis, 1996).

Consequently, economic analysis had a new approach. The diminishing marginal utility concept allowed economists to link utility with price, legitimising an individualistic

[41] Niehans (1993) disputes the term marginalist revolution, instead insisting that Jevons, Menger and Walras simply added to or refined economic opinion of that time.

methodology (Mulberg, 1995). The economy was made up of only what existed in the market, and production comprised of any activity that resulted in a marketable good or service. The need to penetrate *below* the surface of the market was deemed unnecessary.

From this, a new concept of wealth arose that was best represented by Alfred Marshall.[42] 'Everything that is produced in the course of a year, every service rendered, every fresh utility brought about is a part of the national income' (Studenski, 1958, p. 20).

Alfred Marshall also went on to declare that:

> POLITICAL ECONOMY or ECONOMICS is a study of mankind in the ordinary business of life; it examines that part of individual and social action which is most closely connected with the attainment and with the use of the material requisites of wellbeing. Thus it is on the one side a study of wealth; and on the other, and more important side, a part of the study of man. (Marshall, 1920, Book I, p. 1)

This comprehensive definition of wealth and production also reflects Mill's concern of including the study of man and human welfare, rather than just money. However Marshall's definition, with its focus on 'material requisites of wellbeing' excluded non-material aspects of production since it could not be valued by the measuring-rod of money (Mulberg, 1995). Whatever Marshall's intent, his valuation procedure (which had its roots with the theory of exchange) replaced the restricted material product definition of Adam Smith and constituted a return to a comprehensive concept of production/valuation. As a result, Smith's distinction between durable and non-durable utilities regarding the make up of production and wealth were dismissed.

The popularity of the marginalists meant that as the nineteenth century was coming to an end, widespread agreement amongst key national accounting identities had occurred regarding the concept of wealth and production (Studenski, 1958). From this consensus, national income estimates emerged.

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[42] Marshall, it must be said, saw mathematics as an auxiliary tool in economics. In a letter written to Edgeworth on August 28, 1902, Marshall declared that there is no more calamitous notion than that abstract, or general, or 'theoretical' economics was economics 'proper'. It comprised a very small, albeit essential, part of economic inquiry (Marshall, 1902, p. 393).

For example, in 1884 Mulhall published his own national income estimates titled *Dictionary of Statistics*. Mulhall applied net/gross ratios to available statistics on gross value of output for eighteen countries. The estimates, although crude, were expressed in a per capita common currency. Additionally, Australia's Timothy Coghlan produced income estimates for New South Wales in 1886-1887. It was an official estimate, appearing in a government statistical yearbook initiated by Coghlan in 1887. It employed Marshall's comprehensive concept which included all services except those of government property. In 1890, Coghlan produced estimates for the seven Australasian colonies (Kendrick, 1970).

Up until Coghlan's work, estimations in economics were risky propositions undertaken by individuals. Governments did not want any part of a measure whose concepts and principles could not be clearly established. Coghlan's breakthrough however helped change all this.

The main motivation behind these attempts at estimating national income are perhaps best reflected in the National Bureau of Economic Research's first study of *Income in the United States* published in 1920. Its stated desire was to:

> … learn whether the national income is adequate to provide a decent living for all persons, whether this income is increasing as rapidly as the population, and whether its distribution among individuals is growing more or less unequal … (cited in Patinkin, 1976, p. 1106)

Whilst the majority of economists around the world praised the marginalist revolution for its contribution to economic analysis, others were quite unimpressed with the economic analysis of the time and sought to develop an alternative approach. Although holding opposing viewpoints, both the American institutionalists led by Thorstein Veblen, and the rationalists represented by Max Weber (a sociologist) were keen to promote change.

2.14 The Institutionalists and the Rationalists

Although the American institutionalist school developed in the late 1880s, it was not until the early 1900s that the school, mainly through the works of Thorstein Veblen, John Commons and Wesley Mitchell, rose in prominence.[43] Condemning the universalist tendencies of the classical and marginalist economists, the institutionalists endeavoured to incorporate the social and cultural effects that impact on human behaviour into economic analysis.

According to Mulberg (1995), Veblen argues that a marginalist economic analysis meant that even if a notion of maximum satisfaction (utility) could be achieved, it could not reflect a social optimum since these wants were artificially created. Although short-lived,[44] the institutionalist legacy was that no economic explanation could occur unless it incorporated social and political factors. This means that the economy could not be studied in isolation.

In contrast to the American institutionalists, Max Weber asserted that the models employed in modern economic analysis relied too heavily on ideal types. Ideal types had the tendency to exaggerate some features of reality and disregard others, while purporting to represent reality.

> We have in abstract economic theory an illustration of those synthetic constraints which have been designated as “ideas” of historical phenomena … Its relationship to the empirical data consists solely in the fact that where market conditioned relationships of the type referred to by the abstract construct are discovered or suspected to exist in reality to some extent … by reference to an ideal type. (Weber, 1922, pp. 89-90)

This ideal type referred to the individual. The understanding of the individual, otherwise known as *economic* or *rational man*, became the ultimate unit of explanation. This attachment to western positivistic thought was, according to Gerth and Wright Mills (1991), shown in Weber’s scorn for any philosophical or metaphysical elements that entered the social sciences. Weber stated that economists and social scientists in general should observe the distinction between what is and what ought to be. Social scientists therefore, should desist from presenting their personal preferences as representing a

[43] Thorstein Veblen has been viewed as a supplement to Marx sans materialism and determinism (Gruchy, 1972). He did though reject Marx’s problematic labour theory of value. Wesley Mitchell later founded the National Bureau of Economic Research (NBER).
[44] The American institutionalist school had lost its prominence by the 1920s due to the Keynesian influence.

scientific proposition. This fact-value distinction finally freed economics from its philosophical tendencies.[45]

Thus, economic analysis was replaced with matter-of-fact thought, similar to the natural sciences, which made the study of economics even more systematic. Such a conception went hand in hand with quantification, an approach that still persists. Weber saw this as a way to strengthen the formal quality of theoretical results.

This constituted Weber's greatest contribution to economic analysis. Some, such as Roll (1992), have argued that this distinction has made economists very reluctant to delve too deeply into the more philosophical aspects and, as a consequence, very hesitant to take up the challenge of new ideas.

Although this era demonstrates no dramatic change in the wealth concept, a noticeable shift towards the economy as a whole was to occur. It comprised a change in focus from an industrial origin to macroeconomic aggregates during and after the Second World War.

2.15 The Idea of Macroeconomic Management

For economists, the problems raised by the Second World War centred on how to direct resources for a possible long war effort while controlling inflation. This led John Maynard Keynes and Richard Stone to release their famous 1940 pamphlet, 'The National Income and Expenditure of the United Kingdom, and How to Pay for the War'.

It recommended the widening of the tax base as the best measure to finance the war effort.[46] To determine the necessary levels of taxation an estimate of national income was required. Since the British Treasury could not produce such statistics, Keynes, in collaboration with Erwin Rothbarth and working on estimates previously published by

[45] According to Mulberg (1995), initially the utilitarian philosophy claimed that a social ethic could arise from positive methodological individualism since ethics could be measured scientifically. However, once it became obvious this could not occur, the only way to maintain both a positivist analysis and a value-free science was to avoid considering ethics.

[46] Although for different reasons, interestingly the need for a widened tax base takes us back to what inspired Petty to attempt to develop estimates almost 350 years ago.

Colin Clark, produced his own estimates. An altered version of Keynes' tax proposal was passed in the 1941 budget which, Moggeridge (1995) claims, signalled a revolution in public finance by shifting the criteria for balance from the public accounts to the economy as a whole.

Keynes was not alone in working on aspects of national income. Earlier, the American economist Simon Kuznets had written a short article in 1933, where he set out possible definitions and classifications of the various items entering the national accounts. This resulted in the release in 1941 of the *National Income and its Composition 1919–1938*. In addition, Milton Gilbert, chief of the National Income Division of the Department of Commerce, also released an article titled *Measuring National Income as Affected by the War* in 1942, which measured gross national product (GNP) using the Keynesian model.

Gilbert's paper demonstrated that under the Keynesian model, unlike the results of existing national income figures, it was possible to raise the necessary money for war. Hence, the case for GNP-style accounting won out (Waring, 1988).

The need for nations to adopt national income estimates was internationally recognised. This was reflected by the League of Nations desire to investigate international comparability problems. A standardisation of data was actively pursued after the UN formed. For this task, the UN turned to Richard Stone.

Richard Stone, who initially assisted Keynes' work on national accounts at the Central Statistical Office, contributed significantly in the development of the standardised SNA that was subsequently adopted by the UN. In fact, he was awarded the Nobel Memorial Prize in Economic Science in 1984 for his fundamental contributions to development of national accounts.

In 1947, Stone's report to the League of Nations on national income statistics titled, 'Definition and Measurement of National Income and Related Totals' (Stone, 1947) was published as the Appendix to the UN publication. It provided the basic framework for the SNA. It was a standardisation of methods based on American and British accounts which was to be adopted by most countries. Only the Soviet bloc countries maintained a separate material product system.

As Pesaran and Harcourt (2000) explain, Stone's work on national income accounts synthesised three types of study, which were currently studied in isolation: the discovery and preparation of data, the theoretical appraisal of problems such as the framing of hypotheses suitable for quantitative testing, and the development of appropriate statistical methods, which Stone labelled a 'systematic synthesis'.

Stone argued that the main aim of economics was to increase human welfare by the investigation and analysis of real world problems. The economy, he added, was a system of interlocking transactions of appropriate national aggregates. Stone's aim was:

> … to develop a system of social accounts that was flexible enough to be of relevance to different countries at different stages of their economic development, while at the same time … have the proper logical structure for use in empirical analysis. (Pesaran and Harcourt, 2000, p. F152)

Stone fulfilled his aim when the UN statistical office became the main source for a nation's wealth and progress, producing the SNA in 1953. From this came the GDP. The SNA has since been revised in 1968 and in 1993.[47]

However, both Kuznets (1962) and Stone (1986) were quite aware of the measure's shortcomings regarding its use as an indicator of wealth. In fact, Cobb, Halstead and Rowe (1995) argue that as early as 1934, Kuznets warned the US Congress that the welfare of a nation could scarcely be inferred from this type of measurement.

The national accounts of this era reflected six strategic factors identified by Keynesian theory[48] which could be employed to assist in shaping the size and structure of the economy: volume of consumption, volume of investment, quantity of money, interest rates, government spending and tax collections (Studenski, 1958). Hence, measurement undergoes another transformation. No longer are national income factor shares

[47] The SNA is to undergo revision once again. The revision process, which will focus on incorporating the role of information and communication technologies in production and the growing role of intangible assets, is expected to be complete by March 2008 (OECD, 2007b).
[48] The Keynesian nature of the national accounts has been questioned. An overview of this debate can be found in Patinkin (1976), Tomlinson (1991) and Miller (1986).

employed, rather macroeconomic aggregates are preferred which leaves the national income indicators subject to government policy.[49]

The Keynesian influence remained strong until Paul Samuelson led the push to integrate Keynesian macroeconomics with mainstream microeconomics.

2.16 Cost/Benefit Analysis

This fusion of macroeconomics and microeconomics (neoclassical synthesis) resulted in the concept of value-added. This formed the core of social cost/benefit analysis. According to Jackson and Roberts (2000), the social cost/benefit concept provided an analytical framework that allowed microeconomic (individual) measurements of welfare changes to be directly related to macroeconomic (social) measurements of national output. One advantage of this type of analysis, Jackson and Roberts add, is that it could demonstrate a potential Pareto improvement, which occurs when the present value of aggregate benefits to society exceeds the present value of aggregate costs to society.

Hence economic analysis was a combination of formulating theories in mathematical terms and the use of statistical techniques to test these theories against observations (Spiegel, 1991). This strict adherence to numerical measurement became the hallmark of economics.

For example, Samuelson argued that two rules applied for every economic problem. The first was to reduce the number of variables while maintaining some simple economic relations, and the second was to, if possible, rewrite the problem as an optimisation problem (Samuelson, 1947). These steps incorporated a positive and normative dichotomy.

The theoretical rigour and abstract nature of the cost/benefit approach was criticised for its simplistic reductionist approach. For example, from a microeconomic standpoint, non-direct costs and benefits were ignored due to the difficulties with quantification while from the macroeconomic standpoint the SNA overlooked aspects of social utility

[49] Dowrick and Quiggin (1998, p. 94) suggest that national accounting began in the 1930s, the time of the ‘Keynesian revolution’. However, this overlooks the crucial role history has had in forming the concepts discussed above.

when selecting its output categories (Jackson and Roberts, 2000). This led many economists to question the relevance of economic measurement today.

One of the most vocal critics of abstractive analysis was Schumacher who argued that:

> To press non-economic values into the framework of the economic calculus, economists use the method of cost/benefit analysis … it is a procedure by which the higher is reduced to the level of the lower and the priceless is given a price … in other words, that money is the highest of all values. (Schumacher, 1974, pp. 43-44)

Although the basic structure of the national accounts remained, the cost/benefit approach constituted a substantial shift in measurement. With the national accounts solidified, the GDP became the measure and definition of wealth. Thus, despite Schumacher's protestations regarding the ills of monetary valuation, the cost/benefit approach meant that crucial economic functions such as the environment and HC, which both contribute to the wealth of a nation, went completely unnoticed, until the oil crisis of the 1970s.

2.17 Rise of Comprehensive Indicators

The growing disquiet regarding the employment of cost/benefit analysis, combined with the oil crisis of the 1970s, led to the abandonment of Keynesian economics and to the rejection of what Jackson and Roberts (1997) termed 'tonnage ideology'. This ideology linked wealth with an increase in material goods regardless of the consequences. Subsequently, alternative measures emerged seeking to disassociate quality of life with obtainment of material goods.[50] One of the earliest measures to embrace this notion was the physical quality of life index (PQLI), which adopted a non-monetary approach.

The PQLI was introduced in mid-1970s due to the failure of alternative measures to the GDP to take hold because of their excessive complexity (Morris, 1979). Consequently, Morris developed a simple measure which identified only certain conditions that had to be satisfied. Employing an index ranging from 0 to 100 based on equal weights, the

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[50] The alternative measures very briefly outlined in this section: the PQLI, the HDI, the GS and the GPI are all examined further in the next chapter.

variables: infant mortality, life expectancy at age one and basic literacy were measured. This helped direct policy towards helping the less fortunate.

Another alternative measurement is the human development indicator (HDI), which was introduced in 1990 to help overcome the fixation of equating economic growth to human development. Although it still uses GDP per capita for income levels, this is supplemented by measures for health via life expectancy and for education via literacy rate and enrolment ratios. The HDI also employs a non-monetary approach.

More recently, criticisms of progress measures were directed at their inability to reflect the economy that actually exists. Current changes in the configuration of the economy such as IC have made existing measurements seem outmoded. Hence, measures such as the genuine savings (GS) and the genuine progress indicator (GPI) explicitly expanded the measurement domain of progress. Once again, this was due to the failure of the GDP to incorporate NC, HC and other social externalities in their measurement.

The rise of these alternative measurements demonstrates the growing concern amongst economists that the current analysis (GDP) employed by mainstream neoclassical economics is not accurately conveying the real world situation.[51] Despite the proliferation of these alternative measures, neoclassical analysis via the GDP continues to reign supreme.

Table 2.1 below, summarises the evolution of wealth presented in this chapter. In this table the valuation of wealth falls under three distinct banners. They are: *use-value*, which is linked to what use a commodity could be put to for society; *labour-theory value*, which is measured in terms of the labour-time used reflecting the cost of production; and *exchange-value*, where the forces of supply and demand is the sole determinant of valuation. The table also highlights the recent increase in alternative wealth measurements, which reflects the debate that currently exists within economics regarding the idea and relationship of the whole and the part. This will be examined in the next chapter.

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[51] As mentioned in Chapter 1 (see Section 1.1 Footnote 2); the OECD (2007a) conference: 'Measuring and Fostering the Progress of Societies' reflects this. Here, attendants acknowledged the pressing need for improved progress measurement.

Table 2.1 Tabular flow of evolution of wealth and its measurement

Stage	Timeline	Summary
Pre-Historic (use-value)	10,000 BC - 500 BC	Wealth must possess use-value. Wealth accumulation not practical. Limited exchange of goods. Limited measurement.
Old Testament (use-value)	2900 BC - 350 BC	Wealth equals spiritual and practical wisdom. Wealth derived from land. Accumulation forbidden.
Ancient Greece (use-value)	330 BC	Natural wealth (use-value) and unnatural wealth (exchange-value) introduced. Money as a measure of wealth and value in general.
Dark Ages (use-value)	7th Century	Wealth must be shared. Avoidance of wasteful use of resources. Human and social considerations paramount. Accumulation forbidden.
Scholastics (use-value)	1274	Synthesis of Aristotle and Christianity. Unnatural wealth sinful. Moral antipathy to accumulation continues.
Mercantilists (exchange-value)	17th Century	Fundamental shift in wealth concept. Use-value replaced by exchange-value. Material interpretation. Accumulation no longer unnatural.
Mun (exchange-value)	1664	Wealth is money. Concept of stock supreme. Origin of wealth equals foreign trade. Used as an index of national welfare.
Petty (labour theory)	1692	Labour equals wealth. Wealth expands to stock of consumable goods and means of production. Analysis via commerce. Numbers replace words.
Boisguilbert (labour theory)	1697	Wealth is wellbeing of all subjects arising merely from production. Consumption is foundation of all wealth.
Bernoulli (labour theory)	1738	Introduces calculus to economics. Earliest graph on utility of wealth. Principle of diminishing marginal utility introduced.
Cantillon (exchange-value)	1755	Wealth equals flow. Analysis shifts from sphere of exchange to production. Labour theory of value dropped. Wealth increases only in production.
Physiocrats (exchange-value)	18th Century	Introduced isolation and abstraction to analysis. Wealth narrow focus, only agriculture.
Adam Smith (labour theory)	1776	Natural wealth equals accumulation of private wealth. Labour sole source of value. Per capita income criteria for economic wellbeing.
J-B. Say (exchange-value)	1803	All value found in utility. Production equals creation of wealth. Land, labour and capital equal 3 factors of production.
Muller (use-value)	19th Century	Wealth exists only in use. Universalistic approach. Measures must include intangibles. Riches do not equate to wealth.
Ricardo (labour theory)	1817	Labour and scarcity determines value. Analysis loses its empirical bent. Use of high mathematical formulas.
Cournot (exchange-value)	1838	Value of exchange sole foundation of wealth. Economic laws formulated in mathematical language.
J.S.Mill (labour theory)	1844	Favoured eclectic approach to analysis. Must include both human welfare and tolerance.
Karl Marx (labour theory)	1863	Analysis must include social relations of production. Focused on ownership and distribution of wealth.

Table 2.1 Tabular flow of evolution of wealth and its measurement (continued)

Stage	Timeline	Summary
Marginalist's (exchange-value)	1874	Market interactions generate wealth not natural resources. Comprehensive definition of wealth, rooted in theory of exchange.
Institutionalists (use/exchange-value)	Early 20th Century	Move away from universalist principles, instead favours incorporating historical, social and institutional factors.
Rationalists (exchange-value)	1922	Normative/positive distinction. Individual becomes unit of explanation. Scorn for any philosophical or metaphysical analysis.
Aggregation (exchange-value)	1940s	Wealth measurement transformed, analysis incorporates macroeconomic aggregates.
Cost/benefit (exchange-value)	1950s	Strict adherence to mathematical economics. Synthesis of macro and microeconomics. Formulate theories in mathematical terms.
Comprehensive indicators (use/exchange-value)	1970s - current	Concept and measurement of wealth expands to incorporate non-market aspects. Human, natural and social aspects seen as comprising national wealth.

Note: The timelines are approximates only.

2.18 Conclusion

The purpose of this chapter is not to provide a detailed history of the evolution of wealth and its measurement, but rather highlight how the nature of this knowledge production has formed crucial concepts. The chapter illustrated that different economic theories utilised varying definitions and measurements of production and wealth.

The focus on the varying economic theories related to production and wealth meant that certain human endeavours to progress were omitted. Although such significant contributions to society are well acknowledged such as: the great pyramid of Egypt; the intellectual achievements of the Vedas of ancient India, the Iliad of Homer; the architecture and sculptures in ancient Greece; the artists of the Renaissance in Tuscany, the Enlightenment era, etc. the difficulty of being able to incorporate such human endeavours into meaningful polices led to their exclusion.

The chapter demonstrated that different economic theories not only define economies but also highlight a more important issue.

> Let us start by speaking of the mathematical theory of individual choice as 'the mathematical theory of individual choice' instead of as 'economic theory,' of the choice-theoretic approach as 'the choice-theoretic approach' instead of as 'the economic approach'. (Nelson, 1993, p. 34)

By acknowledging this, one recognises that the neoclassical concept of wealth (progress) that exists today is not an incontestable concept reflective of the present day economy but a theoretical proposition that can be subject to change and alternative formulation. This continues to this very day with the onset of the knowledge revolution, and issues of environmental sustainability and social development. These all form an important part of progress creation yet, traditional economic theory, the present research asserts, cannot be applied to it.

This limitation needs to be set against the pattern exhibited throughout this chapter, namely, that wealth measurements were transformed *in response to a need*, to make them more appropriate to the actual facts of a changing, complex economic situation. It is, this study argues, no different now. The awareness of this factor is what makes an historical narrative of wealth and its measurement so important.

Thus, all the main components that comprise progress accumulation should be included into a cohesive framework, which can serve as a basis for decisions to improve resource allocation. Given the ever-changing nature of conceptual approaches, the first part of the following chapter will provide a very brief overview of some of the epistemological issues regarding economic analysis. This will then be followed by a critical review of the main progress indicators.

Epistemology without contact with science becomes an empty scheme. Science without epistemology is - insofar as it is thinkable at all - primitive and muddled. (Einstein, cited in Schilpp, 1949, pp. 683-684)

Chapter 3: Economic Epistemology and the Main Progress Measures Reviewed

3.1 Introduction

The review conducted in Chapter 2 highlighted how the nature of knowledge production formed crucial concepts in the definition and approach to progress measurement. Moreover, it illustrated how approaches to progress measurement were transformed to adapt to the ever-changing perception of progress. This ever-changing concept reflects the fact that no discipline, especially economics, is free from epistemological claims on knowledge and truth; in fact epistemology is the matter that lies at the heart of economics (Katzner, 2003). For instance: what do economists know? How do they know it? How do they know what they know is true? All these queries affect the main endeavour of the present research, which is to develop an alternative measurement of progress.

The development of such a measure, however, raises its own queries. For example: Does progress measurement pertain only to the exchange of goods and services as they enter the market place? Or is it found in the complex conceptual models of welfare economics? Or, as has been the recent trend, is a more comprehensive view of progress needed, one which necessitates a broader view of economics and society?

This chapter will provide an overview of some of the epistemological issues regarding economic analysis, before critically reviewing the main progress measurements. In doing so, the first objective of the research is completed.

3.2 Conceptualisation in Economics

Economic analysis on a societal level requires the acceptance of an economic theory. All theories share three common elements such as their ability to select factors to theorise about, defining these factors and establishing logical linkages among the factors (Wolff and Resnick, 1987). These linkages explain not only how the selected factors interact with each other, but more importantly, the direction in which they interact. For example, whether increases in education will positively or negatively affect a person's health?

As discussed above, since the acceptance of a particular theory impacts the type and directions of linkages between factors, the importance of choosing a theory becomes crucial (see Section 1.4). It literally serves to shape the way one analyses the world. The importance of theories illustrates the fact that any economic analysis cannot begin without the conceptual units of a belief system. And this belief system, in turn, reflects the nature of society as we understand it (Heilbroner, 1988). Adopting a belief system therefore, is necessary for any analysis that deals with themes that are as complex and interconnected as those attempted in this current research.

How then, does one go about choosing an appropriate theory to explain a given phenomenon?

3.2.1 The Economic Paradigm of Today

Since the Second World War, two approaches have dominated economic analysis and consequently the study of progress: neoclassical and Keynesian. Neoclassical economics rests on three assumptions: individuals have rational preferences; individuals maximise utility while firms maximise profits; and individuals act independently with full and relevant information. This doctrine of methodological individualism means that all economic phenomena can be explained by aggregating the behaviour of individuals (micro). Keynesianism, on the other hand, analyses economics from an overall (macro) point of view where general trends overcome individual behaviours. The Keynesian creed acknowledges that forces 'external' to the economy can affect economic decisions, with Keynesians urging governments to intervene and correct imbalances or inefficiencies. However, since the 1970s neoclassical economics has reigned supreme (Mankiw, 2004).

Both Keynesian and neoclassical theory work within their own prescribed rules and make epistemological claims to privileged knowledge, objectivity and scientific validity. But how did this come to be?

In 1938, Hutchison wrote *The Significance and Basic Postulates of Economic Theory*, which introduced economics to the ideas of logical positivists. However the major foundations for the current economic paradigm were laid just over a half-century ago by Milton Friedman's exemplary 1953 essay titled, *The Methodology of Positive Economics*. It was the most unambiguous statement of mainstream economics' scientific approach.[52] Basically Friedman postulated that, if the predictions of a theory proved correct, then any assumptions that were excluded from that theory would not have contributed greatly to explaining the event in question. Prediction therefore became the only test for economic theory, an assumption that was in line with the scientific method (Redman, 1991).

In 1954, Walras provided the first mathematical model of market equilibrium.[53] According to this model, markets groped their way towards equilibrium through the announcement of bid and ask prices in the market place. The study of economics entrenched itself further into mathematical abstraction with Debreu's *The Theory of Value* in 1959, which set the benchmark for the axiomatisation of the Walrasian General Equilibrium Model and ensured that all economic work would eventuate from it. Debreu declared that the elements of rigorous economic theory did not need any counterparts in the real world. This declaration 'liberated' economics from its dependence on real-world analogies (Davidson, 2003).[54]

The implication for economic analysis was that by developing logical structures that contain the essence of the real-world problem under study, economics could promote itself as being value-free. This newly found legitimacy for economic knowledge helped set it apart from the other social sciences (Redman, 1991). Therefore economic inquiry, which had traditionally been analysed as part of a greater social phenomenon that dealt with complex societal processes had, due to this scientific practice, abandoned the study of factors that lay beyond the scope of empirical inquiry. All that was deemed necessary for understanding society lay in mathematical analysis and measurement.

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[52] The notion of economics as a science goes back even further, as far back as Marx, who claimed a 'scientific socialism'. Regarding the term science, the present research adopts Immanuel Kant's description of science, which constitutes 'organised knowledge'.
[53] Although *Elements of Pure Economics* was published in 1874, it was not until William Jaffe translated his work into English in 1954 that it took hold in mainstream economics.
[54] Weintraub (2002) claims that, in fact Debreu showed contempt for Arrow and Hahn's effort to forge explicit links between the Walrasian model and contemporary theoretical concerns in welfare theory.

This naturalised epistemology (emphasising the methodological practices of the sciences to study and assess knowledge) became the paradigm, with axiomatisation considered as the path to discover new scientific truths. Other disciplines such as metaphysics and philosophy, which had previously helped define epistemology, were ruled out as invalid. In addition to logic and mathematics, sense data, which referred to what could be experienced and measured in the real world, became the only 'valid' source of knowledge (Beed, 1991). The rules of 'legitimate' economic inquiry came to mirror that of physics. The effect was that the best and brightest in the profession proceeded as if economics was the physics of society (Solow, 1985). This came to be known as mechanistic dogma.[55]

Alfred Marshall, whom many neoclassical economists consider the pioneer of the market-centric approach, was aware of the predicament facing economic analysis regarding mechanistic dogma.[56] To Marshall, this approach was only suitable for certain short-term exogenous shocks, and *not* for the economy as a whole. In fact, Marshall asserted that broader economic analysis had to incorporate social, historical and institutional features in partnership with the systematic application of economic principles (Zafirovski, 2005). Furthermore, he insisted that economists had a moral responsibility to fairly apply economic science while keeping social welfare in mind, with the end result being a more scientific approach to understanding economic coordination (Foster, 1993). Although Marshall was against economists who indiscriminately employed the physical sciences to economic analysis, this practice became a part of modern economic methodology.

3.2.2 The Modern Mantra

Modern economic methodology, of which neoclassical and Keynesian are a part, assumes that there is a given reality waiting to be known, a reality bereft of intrinsic value or subjectivity. This was reflected in the progress analyses produced by these approaches which are seen to function in absolute, universal and objective knowledge.

[55] Marshall's (1898) 'Mechanical and Biological Analogies in Economics', equated economics as a branch of ideology broadly interpreted. However as Hodgson (1993a, p. 406) states, Marshall's quote that 'the Mecca of the economist lies in economic biology rather than in economic dynamics' is always cited, yet Marshall's admission of the limitations of mechanical reasoning are conveniently forgotten.

[56] Foster (1993) claims that Samuelson in particular, misinterpreted Marshall's stance where mathematical formalism was consigned to his footnotes.

Not everyone however accepted this positivist paradigm. In fact, positivism drew heavy criticism in the 1960s and 1970s from the likes of Kuhn (1962), Lakatos (1970) and Feyerabend (1975), who were united in their criticism of science's role as the dominant philosophical approach to economic analysis.[57] Kuhn challenged the idea of a single objective reality, whereas Feyerabend dismissed the notion that science followed any methodological rules whatsoever. For Feyerabend, science was enriched by unscientific practices and methods, such as intuitions, serendipity, metaphysics, induction and falsification (Beed, 1991). Despite the detractors, modern economic methodology remained the most popular method of analysis.

A by-product of this preoccupation with modern theory is dualism, which became a concept that strongly influenced the western conception of the order of the world (Nelson, 1997). According to this concept, on one side of the dualism, values are perceived as utilitarian ends that are commensurable or not valued intrinsically. On the other side of the dualism however, values are *not* viewed as economic but rather as social, cultural or political. That is, the values are non-economic, normative and lacking robustness (Van Staveren, 2001). Some examples of dualism are reason versus emotion, choice versus coercion and objectivity versus subjectivity. In all the above cases, in economic discourse, the former rules over the latter.

This dualistic construction of economic theory privileges a notion of knowledge comprising of mathematical proof over broader notions of knowledge (Nelson, 1997). This has led many mainstream economists to the belief that the study of economics need not pay attention to personal values, and has led to the exclusion in economic discourse of 'unscientific' concepts. For many, this model dominates economic theory to the extent that it defines the subject (Hodgson, 1993b). The irony of this approach however, is that much of its economic explanation rests on the assumptions and concepts that arise from the value of freedom, for example, free choice, free exchange and free individuals (Van Staveren, 2001).

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[57] Beed (1991, pp. 465-466) states that the tradition of anti-positivist thought is much older than this. He cites Karl Popper's 1934 *Logic of Scientific Discovery*, which not only proposed the principle of falsification as opposed to verification, but also admitted the value of metaphysical knowledge. Popper's criticisms had only a minor impact on western economic thought, as his work was not translated into English until 1959.

One consequence of this modern mantra for progress measurement, where the assumption of maximising behaviour or individual rationality continues to be central, has been that any ethical inquiry regarding the determinants of individual and social wellbeing is, apart from a small reference to distributional aspects, omitted.

This modern tradition that has so dominated economic thinking creates a sharp delineation of the boundaries around concepts, theories and analysis as a whole (Katzner, 2003). So much so in fact, that Samuels argues that economists are 'antagonistic to analyses that are inconclusive and demand some form of closure, however premature or presumptuous that may be' (Samuels, 1990, p. 12).

While some form of delineation is needed the closure, that occurs around the definition and measurement of progress under a modern approach is denoted via exchangeability, measurability and the market. Hence, from a modern progress measurement perspective, if it is not in the market, it is not economic; and if it is not economic, it does not warrant measure. This modern mantra does not preclude non-market goods being measured in economics, rather that for the purposes of progress measurement, areas deemed to be outside the market are rarely measured. The current study considers this notion to be too restrictive. However this modern approach may be changing as was highlighted with the move towards non-monetary progress measures such as the HDI, GNH and the HPI (see Section 1.4).[58] Modern methods however, do provide useful and important tools.

The present research acknowledges that any explanation of the world via an analysis needs to incorporate some version of the 'four sins' of modern methodology theory (reductionism, functionalism, essentialism and universalism). Even for the best practitioners these concepts are a justifiable and an unavoidable part of the process (McLennan, 1996). Adherence to the 'four sins' prevents the study of economics becoming a 'theory of everything', which would result in an analysis that would be so unclear as to carry little analytical substance. What is needed then is the ability not only to identify limitations but also to employ some reductionism to particular causes or

[58] In essence, the signs have been there much longer. Gary Becker was a pioneer in introducing 'sociology' into economic analysis through racial discrimination, crime, etc. Psychologist Daniel Kahneman's Nobel laureate in Economics in 1992 demonstrated how human decisions may systematically depart from those predicted by standard economic theory. Additionally, Herbert Simon was awarded the Nobel laureate in Economics in 1978. He was responsible for a revolution in microeconomics with his work on organisational decision-making in terms of uncertainty.

explanations of certain phenomena. This however, is normally where the agreement ends.

3.2.3 Whose Paradigm?

The extent of disagreement regarding the modern approach highlights the questionable notion that somehow there exists only one universal correct approach to economic analysis. Samuels takes this premise a step further, and to its logical conclusion by arguing that it is not just economic analysis, but in fact, the economy itself which is a construction – a product of human action where:

> … theories less explain and more define and thereby help generate economic reality, such that the putative objects of study are themselves at least partly constituted by human belief. (Samuels, 1990, p. 10)

According to this, economic inquiry is not based on objectivity and scientific validity; instead it relies on epistemological, sociological and discursive claims, all of which take place through particular modes of discourse. Hence, much of what one thinks is knowledge is actually a matter of discourse (Samuels, 1991) and in economics this has usually taken the form of a market economic discourse. This view of 'economic analysis as rhetoric' indicates that any claims to 'truth' depend on the persuasiveness of the argument rather than on methods or facts (McCloskey, 1985).

Others however defend the current approach by declaring that economic 'science' is concerned with methodology and not epistemology, which rarely translates when applied to the methodology of economics (Caldwell, 1982). This belief perhaps best sums up mainstream economics' regard for epistemology which is seen as a flawed approach to policymaking.

As a result of the ongoing debate, an important implication for this present research lies in the fact that if, as the previous section illustrated, the neoclassical approach to economic analysis is considered the paradigm and the knowledge claims it makes deemed superior, how can another perspective be judged against it?

The discussions concerning this have led some to argue for a standpoint epistemology. Standpoint theories represent the world from a particular perspective that lays claim to privilege over others. A researcher in economics for instance, always employs a method that implicitly accepts an epistemological position on how to distinguish the knowable from the unknowable (Machlup, 1991).

While most epistemic privilege is commonplace and uncontroversial, claims of epistemic privilege over contested topics such as the definition and measurement of progress are clearly not. In economic analysis, standpoint theories claim to offer superior knowledge regarding the character, causes and consequences of social inequalities. A classic model for standpoint theory is provided by Marxian theory, which claims an epistemic privilege over the analysis of economics on behalf of the standpoint of the proletariat. This proletariat standpoint enabled Marx to criticise the bourgeois ideology (Wolff and Resnick, 1987). Another example is feminist economics, which claim an epistemic privilege on behalf of the standpoint of women. This feminist standpoint theory claims that by virtue of their social positioning, women have access to, or can achieve better knowledge of gendered social relations (New, 1998).[59]

From a Marxian standpoint, any attempt at a comprehensive social analysis is not achievable in principle, neither for Marxian or any other kind of theory. Marxists recognise that all social analyses, no matter which theoretical framework is used to produce them, are partial and never complete. Since different theories provide different partial analyses, due to the standpoint dependency existent in every theory, any claims to a privileged access to knowledge via the application of some universal framework are misguided. This is a sentiment which this current study supports and views as crucial in justifying an alternative approach to progress measurement.

This acknowledgement of partiality however, does not make undertaking progress measurement any less worthwhile, nor does it prevent neoclassical theorists, who derive their partiality from its three broad entry points: individual preferences, productive capabilities and initial endowments, from being socially influential (Wolff and Resnick, 1987).

[59] New (1998) also claimed other feminist standpoints exist that deal with various features of women's social situation.

The issues surrounding epistemology are not only extremely complex, but also *not* the main focus of the present research. However, by explicitly recognising the dilemma that the knowledge one seeks is not only standpoint dependent, but also partial and subjective, it logically follows that since no analysis (neoclassical, Marxist, feminist, etc.) can claim to have access to a privileged notion of knowledge, the way is open for an alternative approach to measure progress.

This recognition of knowledge as both partial and subjective raises another important issue. If different standpoints and assumptions allow a measure to see only certain things, then conversely these same standpoints and assumptions must hide other things. Specifically, this present research asks: Are the abstractions employed, as a necessary part of the four sins, useful? As Lao Tzu observed:

Thirty spokes share the wheel's hub;
It is the center hole that makes it useful.
Shape clay into a vessel;
It is the space within that makes it useful.
Cut doors and windows for a room;
It is the holes which make it useful.
Therefore benefit comes from what is there;
Usefulness from what is not there.
(Lao Tzu, 600 BC,[60] Chapter 11, translated by Feng, G and J English, 1974)

Thus, anyone undertaking a review of progress measurement should not only consider what the measure analyses, but more importantly, what it *fails* to analyse. It is this need (which the previous chapter demonstrated drives changes in measurement) to incorporate absent items important to progress creation into a cohesive framework, which helps define the intention of the present research. Thus, a more accurate depiction of progress can serve as a basis for improved resource allocation decision-making.

With this in mind the following section critically reviews some of the main progress measurements, starting with a review of the GDP.

[60] This is not an official date but rather a general consensus for the date of this writing.

3.3 Progress Indicators: A Review

Progress indicators have been employed in the study of economics to help simplify complex events. They provide the basis for judging the progress of nations, and act as a crucial guide for national policy decision-making. For instance, evidence of success or failure from these indicators helps determine future allocation of resources. If inaccurate, progress indicators will not only give a misleading picture of the state of an economy but will also lead to poor policy initiatives and sub-optimal resource allocation (Cobb, Halstead and Rowe, 1995).

Given their importance, any assessment of welfare must be aware that:[61]

> Welfare is a thing of two aspects. For a person's state of mind at any time depends partly on his own mental make-up and partly on his external environment … Anybody, therefore, concerned with welfare must look to both these aspects of it. To stimulate production of what one may call welfare-goods and pay no heed to people's capacity to use and enjoy them would be wasted effort. (Pigou, 1954, p. 2)

Despite this insistence, governments almost exclusively rely on market-centred frameworks for assessing national progress. Other assessments of course exist, with most of these alternative measurements following one of three approaches: firstly, to extend the national accounts to incorporate non-market goods and services, while eliminating detrimental components; secondly, to identify and evaluate social norms via a list of social indicators; and thirdly, to target mental states directly through survey data on wellbeing and by research on the dynamics of hedonic experience (Offer, 2000). The current study will critically review the main measures of progress, starting with the market-centred GDP measure.

3.4 Market-centred Conceptual Framework

Under this framework, the market provides the institutional link between resource owners, producers and consumers. Here what the consumer is willing to pay, via price mechanisms, is regarded as the most efficient way to allocate resources (Norton, 1984).

[61] This is an opportune time to remind the reader that, as stated in Chapter 1, progress is one of a cluster of related concepts that include: wealth, wellbeing, welfare, quality of life and sustainable development, which are used interchangeably throughout the present research.

3.4.1 Gross Domestic Product

When a country joins the UN, they have to subscribe to the SNA[62] (Kendrick, 1996). The UN Statistical Office headed by Richard Stone produced the SNA in 1953. The SNA is used to evaluate countries economic wellbeing, with the GDP per capita used as a summary measure of those trends. The GDP is based on Richard Stone's work, and is an aggregate measure of production that measures the total value in monetary terms of all the production of a country in one year. There are three ways of measuring GDP: firstly, by summing the value-added at each stage of production; secondly, by summing the incomes generated by production; and thirdly, by summing final expenditures on goods and services produced (ABS, 2001). All three methods should produce the same result.

It is the methodological insistence of focusing on value-added, this study asserts, that has led the GDP to be a misleading indicator of progress. For instance, notions of real progress can be the difference between GDP growing annually by 2 per cent and the Dow Jones Industrial Averages growing, or shrinking, by 15 per cent (Myers, 1996).

This restricted definition (focus on value-added) tells us nothing about the desirability, or usefulness, of production. For instance, what is the *use-value* of producing weapons that are stored away and then destroyed once they become obsolete? Given that government policy, which adopts orthodox economic theory, claims that production adds to individual welfare by creating utility and satisfying needs, this logically leads to the notion that increases in the production of goods and services via economic growth, increases progress. Consequently, government policy views economic growth as an indispensable obligation and the GDP, as a measure of that growth, becomes a de facto measure of progress.

Of course, economists are aware that the GDP is not a perfect progress measure. Even Kuznets (1962) and Stone (1986) were quite aware of the measure's shortcomings regarding its use as an indicator of progress (see Section 2.15). Other economists have correctly argued that GDP measure merely serves as an indicator of SNA-type economic welfare, and is not structured to serve as an indicator of total, or even

[62] Other programs that countries must subscribe to include: the UN General Assembly, the International Court of Justice (The Hague), Universal Declaration of Human Rights (not legally binding), and others.

economic, welfare (Mamalakis, 1996). However despite such acknowledgement, policies continue to be implemented on the proviso that growth necessarily implies increased progress.

> Economists often try to get around the difficulty by (implicitly) equating *welfare* with wealth, or income, or GDP per capita, even though they have long recognized (in principle) that ‘welfare’ is not the same thing as gross consumption, either at the individual or national level. (Ayres, 1996, p. 120) [parenthesis and emphasis in original]

The end result is that the GDP *is* used not only as a measure of overall success and wealth of an economy, but also the welfare derived from it (Cobb, Halstead and Rowe, 1995).

Although the continued use of GDP is justified via government policy, the present research asserts that the GDP is an incomplete progress measure because it neglects important inputs and outputs in a nation’s production function. Although no index of measurement could possibly attempt to factor all facets of society in its analysis, the GDP contains three quite significant omissions, which will be briefly examined. These omissions, which could potentially misrepresent national progress, comprise (Van Dieren, 1995, pp. 68-71):

(1) excluding practically all non-monetary production, including cooking, cleaning, childcare, volunteerism, substitutes for monetary goods, etc;
(2) failure to assess changes in human capital (both social and organisational); and
(3) the virtual omission of the environment.

While the GDP acknowledges non-market production as part of the economy, it continues to omit the value of most non-market production that significantly contributes to progress. The main reason for this is:

> If values are assigned to the outputs, values have also to be assigned to the incomes generated by their production and to the consumption of the output. It is clear that the economic significance of these flows is very different from that of monetary flows…The inclusion of large non-monetary flows of this kind in the accounts together with monetary flows can obscure what is happening on markets and reduce the analytic usefulness of the data. (UN, 1993, Paragraph 1.21, pp. 4-5)

This obstacle however, is not insurmountable. The basis for distinguishing productive activity from other non-economic activities practiced outside the market place was articulated by Margaret Reid's 1934 work, *The Economics of Household Production*, which introduced the 'third person' criteria. Here, if a third person could be paid to perform an unpaid activity then it may be deemed work, depending on whom enjoyed the benefit. For example, cooking was a productive activity because the person who pays for it gains benefits, however paying a third person to eat or read on your behalf is not considered work since the payee enjoys the benefits (Waring, 1988). Most studies that want to value non-market production use this third person criterion.

The majority of household production fits within the third person criterion, and also the SNA definition of production. Yet, the GDP excludes it from measurement because it is not exchanged in the market place. Curiously though, values are imputed for other non-market production such as rent.

For example, rent imputations are considered necessary by the Australian System of National Accounts because:

> … if a large number of rented houses were sold to their occupiers and if estimates of imputed rent were not calculated for owner-occupied dwellings, then there would be an apparent decrease in gross domestic product without any decrease in the provision of housing services. (ABS, 2004b, Cat. No. 5204.0, p. 114)

This justification, however, can also be made for cooking meals. For example, given an inefficient current allocation of resources, if more people choose to cook their own meals rather than eat out, the GDP would also decrease without a decrease in the provision of services. Why then, are household services excluded, while rent is included? The SNAs response for failing to impute values for household production is explained by a combination of factors, namely the:

> … relative isolation and independence of these activities from markets, the extreme difficulty of making economically meaningful estimates of their values, and the adverse effects it would have on the usefulness of the accounts for policy purposes and the analysis of markets and market disequilibria – the analysis of inflation, unemployment, etc. (UN, 1993, Paragraph 6.22, p. 125)

The SNA did acknowledge household production activities as being productive in the economic sense; however the 1993 SNA recommended that the definition of economic activity *not* be revised to include household production. Instead, it should be recorded in separate satellite accounts.

Thus, despite studies showing that unrecorded household production may amount to some 30 to 50 per cent of the measured GDP, its contribution is completely omitted (Goldschmidt-Clermont, 1990). Rather, it is *only* the activities that are transferred from the household to the market sector, that are recorded in the GDP. The end result is that we are left with a measure that undervalues a nation's progress.

According to the SNA approach, the nation would seem to be better off if we paid each other to look after each other's children rather than looking after our own. By denying the value of non-monetary work, it discourages and discriminates against those who do it, which are still mainly women (Cobb, Halstead and Rowe, 1995).

The next broad GDP omission deals with HC. Here, provisions such as health, education and social services are not included in the core capital boundary. The expenditure in these provisions must satisfy the following criteria. Firstly, it must be on commodities that generate a flow of services used in market production, that is, serve as a means of collective, semi-public or private commodity production. Secondly, provisions must comprise market-generated means of production, that is, require market-costed factor services for their own production. Finally, it must be used, but not used up in production, by possessing economic, use and time durability, that is, be indirectly useful to consumers through multiple uses in production over two or more accounting periods. Consequently, the aforementioned expenditures are excluded because of failing to satisfy the first and third criteria (Mamalakis, 1996).

Given these exclusions, which derive from the GDP's market-centric focus, the contributions to progress made in fields such as health and education are severely underestimated.

The third main omission from the GDP deals with the environment. When national accounts were being devised in the early 1940s, the environment was given a very low priority. Currently, the more a nation depletes its natural resources, the more the GDP increases (see the Indonesian example in Section 1.1).[63] In fact, under the GDP measure, pollution can be seen as a windfall. The most infamous example of this was the voyage of the Exxon Valdez. The spilling of oil that arose from the accident caused an ecological disaster, yet the costs of the clean up, insurance and associated legal machinations all contributed positively to GDP. Thus, no account of either the depletion or damage of natural resources used to produce goods and services took place (Cobb, Goodman and Wackernagel, 1999).

As demonstrated above, the GDP makes no distinction between activities that add to progress and those that subtract. It is a strictly short-term approach. If an activity creates a marketed service the GDP includes it, hence any recognition of the critical services NC provides, such as clean air and water, fertile soil, etc. are omitted. This inability to reflect external diseconomies or social costs, does not tell us anything about how income is distributed, the provision of basic needs, and access to clean water, basic medical care, education and other services (Tan, 1997). These omissions do not avoid value judgement; rather they make the enormous value judgement that such things count for nothing in the economic balance (Cobb, Halstead and Rowe, 1995).

The multidimensional factors that contribute to national progress mean that any single measure such as growth in per capita GDP, which measures only one dimension of economic development: aggregate output per head of population, is unlikely to be accurate (Gurria, 2007). A more accurate measure of progress therefore, must also account for the environment and defensive expenditures.

Defensive expenditures involve both crime-related costs, such as police, and security, and non-crime related costs, such as insurance and commuting to work (see Section 1.1 for definition). These expenditures do not represent an overall increase in progress, because they only prevent or repair social and environmental costs. For example, a study conducted by Leipert (1989), estimated that in Germany, increases in defensive

[63] Australia is currently experiencing this with the resource boom in Western Australia.

expenditures due to diseconomies accounted for greater than 20 per cent of productive growth. Its impact on economic growth, in this example, is quite pronounced.

More important though, is that the existence of defensive expenditures brings into question the neoclassical belief that anything exchanged in the market contributes to progress. It challenges the individualist standpoint of neoclassical economics, replacing it with a more collectivist (mixture of individual, social and ecological) approach.

Some traditional economists, such as Adler (1982), have challenged the whole notion of defensive expenditures, arguing that the measurement of economic welfare beyond the bounds of exchange, are concepts which a philosopher, rather than a statistician, should attempt to deal with. This rather narrow conceptualisation of economc welfare however, fails to reflect a broader view of society. Such a view acknowledges that although other factors which impact on progress may be beyond the bounds of objective measurement, these subjective components still need to be accounted for.

Despite the limitations of the measurement, per capita GDP is still widely used as a measure of progress. For many years now, economists have initiated policies that promote economic growth due to the belief that growth is necessary to address social and environmental problems. Consequently, increasing economic growth becomes a nation's top priority. However, there is a need to develop an alternative measurement due to the restrictions of the GDP.

> This linear model, with wealth going in one end of the pipeline of progress and welfare coming out of the other, is simplistic. It ignores the complexity of social, economic and ecological systems. Human, social and natural capital is as much a prerequisite of wealth as a consequence, quite apart from its contributions to non-material well-being and to sustainability. (Eckersley, 1998, p. 29)

Therefore, there is a *need* to develop an alternative measurement. Economics can play an important role in creating policies and strategies, if it is put back into its human and environmental context, something that the current GDP, with its emphasis on value-added, is incapable of (Anderson, 1991).

The Max-Neef threshold reinforces this need for change. Max-Neef, a development thinker from Chile, posits that although traditional economics equates the demand for material products to a satisfaction of needs, it can also be achieved via material and non-material satisfiers such as access to education, cultural events and community matters (Mont, 2004). In fact, Max-Neef (1995) suggests that policies aimed at improving the welfare and wellbeing of societies must consider his threshold. Here, economic growth brings improvement to the quality of life, but only up to a point – the threshold point – beyond which the costs associated with achieving economic growth begin to outweigh the associated benefits. This idea has given rise to an influx of new progress measures.

Hence, an economic theory that is predisposed to only measuring market oriented concepts, such as the GDP, may be an excellent measure of the size of the market-oriented growth, but it is a poor indicator of the broader concept of progress. It limits progress to what is in the market, resulting in the non-market (household work, childcare, etc.), the social economy (shapes attitudes and behaviours and regulates access to resources) and the environment (a critical contributor to wellbeing), being omitted (Prescott-Allen, 2001). In essence, market-centred measures of progress are a mere extension of a defective measurement system for depicting progress. An extension of that measurement still results in a defective measure.

The aforementioned third person criterion encapsulates this. This point is illustrated by Mulberg (1995) when, in his assessment of aggregate monetary measures, he pointed out that when an activity is withdrawn from the monetary sphere and instead performed by the homeowner, national income goes down even though the work is done. This, he adds, suggests that this aggregate measure is about activity and not value.

The GDP’s inability to reflect external diseconomies (negative impacts) or social costs, for instance medical expenditure to counter effects of air pollution and the previously mentioned Exxon Valdez disaster, further reinforce the inadequacies of the measure. By failing to recognise progress’ critical components, the GDP in effect assigns a zero value to their contribution towards national progress. The challenge therefore, is to develop values that are more reasonable than zero, and to stop ignoring totally that which is crucial to the nation’s economic and social health (Samuelson, cited in Cobb, Halstead and Rowe, 1995). This however, requires a new view of value and knowledge.

Hence, recognising the many limitations of the GDP, one alternative approach is to adjust GDP to account for activities that have been omitted yet also derive an income, such as, the depletion of natural resources, pollution, unpaid work, etc. Another approach is to articulate a fresh framework. The former approach has taken the guise of extended natural resource accounting. The following section reviews the more prominent attempts that focus on the economy and the environment.

3.5 Economy-Environment Interaction Conceptual Framework

The measure of economic welfare (MEW) developed by Nordaus and Tobin in 1972 was one of the first efforts to incorporate environmental issues as part of natural resource accounting. This was followed years later by the advent of green indicators, initiated by Pearce and Atkinson (1993) and Hamilton and Clemens (1999) who established the GS measure to estimate national wealth. It is a measure that is employed by the WB.

3.5.1 Measure of Economic Welfare

The MEW attempts to measure economic welfare by adding up the benefits, such as the consumption of goods and services, while subtracting associated costs such as pollution. The MEW attempts to go beyond the scope of the market and the national accounts in assessing economic welfare. It differs from GDP as it assumes that the market, labour, production and welfare are *not* the same thing. Although this recognition seems obvious it is still an important recognition since the nature of the GDP implied that these were all alternative manifestations of the level of welfare.

The MEW differs from the GDP by promoting a weak usefulness approach. That is, the nature of a need commodity is paramount in determining its usefulness, or its welfare-promoting capacity. This criterion justifies whether certain goods should be deducted. It differs from the GDPs strong usefulness criteria (utility approach to value) where the nature of the need is not of concern (Mamalakis, 1996).

The MEW's starting point, unlike the GDP, focuses on personal spending on consumer goods and services. It then makes a series of additions, subtractions and imputations. Examples of deductions are outlays for activities not considered to increase welfare but seen as "regrettable necessities", such as costs of commuting to work and road maintenance. That is, defensive expenditures incurred in producing welfare. Imputations, on the other hand, are made for government and household capital services, non-market work and leisure. The sustainability component of MEW is the difference between the change in the net MEW capital stock and the growth requirement. The MEW subtracts the amount of investment that would be necessary to satisfy growth requirement, with the net investment that is left making up sustainable MEW (Eisner, 1988).

The MEW capital stock is a measure of net public and private wealth, consisting of four components: (1) net reproducible capital, such as investment in machinery, equipment and structures; (2) non-reproducible capital consisting of the value of land and net foreign assets; (3) education capital, valued by spending invested in labour force; and (4) health, representing accumulated public and private spending on health, reduced by an annual exponential depreciation rate of 20 per cent (Nordhaus and Tobin, 1972).

The correlation of MEW to GNP growth was examined to determine whether GNP growth served as an adequate measure of economic welfare. The results of MEW, according to Nordhaus and Tobin, were so similar to that of GNP growth that a separate economic welfare measure was seen to be superfluous. However, Daly and Cobb (1994), dispute Nordhaus and Tobin's interpretation of the MEW results. They claim that movements in economic welfare were significantly different to GNP growth when considered over shorter time spans, rather than over the whole MEW time span (1929-1965).

Critics of the MEW point to the fact that MEW makes no adjustments for inequality in personal consumption, a component along with the ownership of capital, which is critical to defining a good society (Galbraith, 1998). Given its importance, the MEW needs to take into account the changes in welfare that occur due to this inequality.

Another criticism of the MEW capital stock is that it does not include renewable and non-renewable natural resources in its measurement. Instead, Nordhaus and Tobin assume that in the long run there is a substitution between reproducible and non-reproducible capital, meaning any potential shortfalls will be overcome by technology.

For a measure that is purporting to capture the economic welfare of a nation, this assumption of sustainability seems to be quite hazardous. In addition, no adjustment occurs for ozone depletion, smog, etc., although one must question just how aware society was of these issues back in 1972.

The way MEW measures HC has also been criticised. MEW does not add imputation for the services of education and health capital, even though it includes imputations for services of consumer durables. Education and health are purported to be intermediate in character, with their benefit already displayed in labour productivity and earnings (Eisner, 1988). In addition, the stock estimate of HC includes all spending on the elderly, even though they will not re-enter the labour market. Eisner, in his total income system of accounts, included only 50 per cent of health expenditure for the retired population.

The MEW's focus on HC is quite narrow, leading to an under-representation of the value of HC. As it stands, this measure cannot accurately account for how society benefits from HC. The MEW was important for challenging the status quo of the GDP, however, due to its limitations it falls short of capturing the main components impacting on the progress of a nation.

These limitations did not stop other economy-environment welfare measures from being constructed. Of those, the present chapter will review both the environmentally adjusted net domestic product (EDP), and the more renowned genuine savings (GS).

3.5.2 Environmentally Adjusted Net Domestic Product

The EDP is a progress measure based on work from the United Nations Statistical Office, which has developed the system of integrated environmental and economic accounts (SEEA) approach. Specifically, it is an extension of SNA-type systems. It was pioneered by two country studies (Mexico and Papua New Guinea) in 1993. The SEEA expands the national accounts to more accurately reflect the impact of the natural environment. Within SEEA, two measures are given that allow the calculation of EDP. The first is depletion of natural resources and the second is (imputed) environmental costs.

The framework of SEEA allows both monetary and non-monetary accounts of the flows of resources to be included. It includes detailed breakdowns of non-market activity and physical accounts, for example, stocks and flows expressed in weight. They are expected to enable a country to make adjustments to the GDP, arriving at an EDP.

The interim handbook of SEEA (or SEEA Version IV) proposes three different valuation methods: (1) market valuation; (2) maintenance costs; and (3) a combination of market valuation and willingness to pay (UN, 1993). There is a lack of confidence in the non-market methods of valuation, which suggests that the aim of SEEA is to provide a better measure of value-added, rather than progress measurement. For example, the SEEA tries to add environmental aspects to the SNA, which encourages the use of techniques that provide misleading estimates of environmental damage (Aaheim and Nyborg, 1995).

The EDP needs to emphasise other parts of the SEEA, and not just the monetary valuation. By not taking into account social costs, future costs and distributional issues, the SEEA does not set out to challenge the GDP position (Stockhammer et al., 1997). Consequently, it cannot adequately support more general economic policies. In addition, the SEEA is regarded as part of the satellite accounts, which by its own definition is separate and peripheral to the main accounts – the SNA. This prevents the core accounts from being corrupted by non-market values. In fact, the proposed measure is limited in its capacity to assess environmental ailments due to the SEEAs non-integration of the economy and the environment (El Serafy, 1997). Furthermore, EDP accounting omits consideration of many issues which are important to the command over resources of individuals (Osberg and Sharpe, 2005).

In conclusion, the EDP, under the auspices of SEEA, repeats the same failures of the GDP and therefore cannot serve as a proper indicator of a nation’s progress. A more recent development in this area is the adjusted net savings measure, also known as GS. It is the wealth (progress) measure promoted by the WB.

3.5.3 Genuine Savings

The GS is a national accounting aggregate, developed by the WB to measure the net change in assets that are important for development. It was designed to assess the links between social and environmental changes and macroeconomic performance. It seeks to provide a clear and relatively simple indicator of whether a nation's investment policies are sustainable. In fact, the GS has been estimated and published in the *World Development Indicators* (WDI) since 1999 (WB, 1999).[64] Building on their previous work, the WB (1997) incorporated into the GS measure, the three major capital components that are required for sustainable economic development and used to determine a nation's wealth. They are produced assets, NC and intangible capital, which comprises primarily HC, SC, governance and errors and omissions in estimating physical capital, and NC (WB, 2006a). Intangible capital will be referred to as HC, for reasons of consistency with other measures. Under the GS approach wealth is defined as the stock of capital that is the basis of wellbeing.

Recent WB studies showed that physical capital (or produced assets) was not the main, let alone the only, component of a country's wealth. According to WB statistics, intangible capital accounted for 80 per cent of the composition of national wealth in high-income OECD countries in 2000, compared to 59 and 68 per cent for medium and low-income countries respectively. Interestingly, NC accounts for just 2 per cent of aggregate wealth for high-income nations (WB, 2006a). However, small shares of NC in industrialised economies, Soubbotina (2004) asserts, are deceptive and do not imply that NC is insignificant.[65]

Prior to the GS, standard measures of wealth accumulation tended to:

> … ignore the depletion of, and damage to, **natural resources** such as forests and oil deposits, on the one hand, and investment in one of a nation's most valuable asset – its people – on the other. (Soubbotina, 2004, pp. 87-88) [emphasis in original]

The GS aims to change all this by denoting the rate at which national wealth, viewed as a launching pad to increased prosperity, is being created or destroyed. Thus, any estimation of factors that result in a loss of NC, such as pollution damage or resource depletion, will decrease the genuine savings of a nation. Conversely, any increase in the

[64] Although it began in 1999, GS calculations have been calculated for all countries, where data has been available, from 1970 (Bolt, Matete and Clemens, 2002).
[65] The NC figures for medium and low-income nations are 13 and 26 per cent respectively (WB, 2006a).

value of HC, derived mainly from investments in education and basic health services, will add to a nation's genuine savings (Everett and Wilks, 1999).

The GS departs from standard national accounting in several ways. In standard national accounting only the formation of a fixed produced capital can increase the value of the assets available to society, as it is regarded as investment. Likewise, only depreciation in the value of human-made capital can decrease that value (Bolt, Matete and Clemens, 2002). As mentioned earlier, the GS differs by adopting the view that HC and NC are critical to a nation's progress. Consequently, four adjustments are made to standard national accounting calculations to reveal whether overall wealth is being created or consumed.

First, estimates of capital consumption of produced assets are deducted to obtain net national savings. Second, current expenditures on education are viewed as an investment in HC and are added to net domestic savings. This differs from the traditional approach of treating current education expenditure as consumption. Third, estimates of the depletion of a variety of natural resources, which are unsustainably managed, are deducted to reflect the decline in asset values. Fourth, pollution damages, which may include lost welfare in the form of human sickness and health, are also deducted (Bolt, Matete and Clemens, 2002). The calculation method of the GS is displayed below followed by Table 3.1, which lists the components of the GS.

Thus, GS is calculated as:

$$GS = (GNS - D_h + CSE - \sum R_{n,i} - CD) / GNI$$

where: GS = genuine savings rate

GNS = gross national saving

D_h = depreciation of produced capital

CSE = current (non-fixed-capital) expenditure on education

$R_{n,i}$ = rent from depletion of natural capital i

CD = damages from carbon dioxide emissions

GNI = gross national income at market prices

Table 3.1 GS components

Components	Add/Subtract	Calculation
Gross national saving (GNS)	Initial figure	Calculated as difference between GNI and public and private consumption.
Consumption of fixed capital (D_h)	Subtract	Replacement value of capital used up in the process of production.
Current education expenditure (CSE)	Add	Current expenditures in education, including wages and salaries, but excluding capital investments in buildings and equipment.
Rent from the depletion of natural resources ($R_{n,i}$)	Subtract	Resource rent is difference between world prices and average unit of extraction or harvest costs (including a 'normal' return on capital).
Damages from carbon dioxide emissions (CD)	Subtract	Limited to including global damages from carbon dioxide emissions.

Sources: Bolt, Matete and Clemens (2002, pp. 5-6) and WB (2006a, pp. 36-37).

The GS provides a first-approximation numeric indicator that determines the degree to which a nation satisfies Hartwick's rule (or Hartwick-Solow rule), also known as weak sustainability. A weak sustainability approach is premised on perfect substitutability between different types of capital, including physical, natural and HC (Pillarisetti, 2005). This numeric indicator gives a single clear positive or negative figure. Here, persistent negative rates indicate that total wealth is in decline and that the nation is deemed to be pursuing an unsustainable path, which will lead to lower levels of progress in the long run. The production of a single figure, the current study claims, is not only over-simplistic but makes it extremely difficult to deal with broader questions about the nature of a nation's progress on the basis of a solitary indicator. A more accurate progress measure should include an assessment of the costs and benefits of certain activities within a country.

The GS's estimation of NC has come under a lot of criticism, even from within the WB itself. Natural capital, like any other asset, contributes a flow of services to the economy. These services can be direct contributions to economic activity via inputs, such as raw materials and energy, or goods and services for final consumption (Kunte, Hamilton, Dixon and Clemens, 1998). The term direct contribution to economic activity significantly constrains the nature of the NC dimension; this focus necessarily restricts the GS focus to include *only market-valued* non-renewable and renewable NC in its measure.

This has the effect of reinforcing the GDP notion that resources are viewed only as inputs to production. Not surprisingly, many other NC resources that impact on a nation's progress are excluded. For instance, there is no accounting for the impact of soil degradation and the depletion of fisheries and subsoil water. In addition, factors such as biodiversity and the ozone layer, which comprise NC resources critical in providing life-supporting functions, and for which substitutes do not exist, are also omitted (Everett and Wilks, 1999).

Hamilton (2001) responds to these criticisms by denoting that, although these omitted factors can be handled in principle, in practice it requires knowledge of marginal damage curves and national thresholds that are currently lacking. This implies however, that to explicitly incorporate any other type of assessment for the omitted variables would be inappropriate for this measure.

For those NC resources that are identified, the GS applies the concept of economic rent as a means of determining its value. Here, economic rent is:

> … the return on a commodity in excess of the minimum required to bring forth its services. Rental value is therefore the difference between market price and cost of production/extraction. (Kunte et al., 1998, p. 4)

The manner in which the GS applies resource rents, which has many Sub-Saharan countries, North Africa, Middle East, as well as some countries from other regions failing to pass the test of weak sustainability, is contentious. This outcome led Neumayer (2000) to recalculate the resource rents using the popular alternative El Serafy method,[66] for 14 countries in Sub-Saharan Africa, North Africa and the Middle East regions using a 4 per cent per annum discount rate. Neumayer concluded that:

[66] The El Serafy method does not depend on efficient resource pricing. It utilises a reserve data of resources instead. However this data is less reliable.

> Sub-Saharan Africa does not exhibit persistent negative rates of genuine saving anymore and the region of North Africa and Middle East turns out to be a strong genuine saver… either they do not fail to pass the test of weak sustainability anymore or their unsustainability can be explained with negative extended net saving rate alone, i.e., without taking recourse to resource depletion. (Neumayer, 2000, p. 272)

Neumayer's results demonstrate the sensitivity of the GS measure, where the determination of an 'appropriate' resource rent seems to heavily influence the net outcome of a nation. This is important given that policy outcomes are derived from their conclusions.

The weak sustainability approach employed by the GS values all the different capital stocks in monetary terms, and allows for their substitutability with physical capital. The WB decision to employ a weak sustainability approach is about sustaining income flows, and not necessarily about sustaining the environment (Martinez-Alier, 1995). Pillarisetti (2005) adds that basing the GS on weak sustainability makes the measure conceptually defective as recent scientific evidence shows that such an assumption is untenable. Hence, the assumption of substitutability and the view of the environment as an input to production, means that the GS approach lends itself to a greater likelihood for natural resources to deplete rapidly. This is evidenced in cases where the income gained in the immediate usage or other savings outweighs estimated future income.[67] All this results in the GS understating the true impact NC has on a nation's progress.

For instance, the WB admit that their NC valuation exhibits some shortcomings and would benefit by incorporating a wider range of environmental services, and values other than monetary, which were noticeably absent (Kunte et al., 1998).

This has led some from within the WB to suggest that the best way to track sustainability would be to select biophysical indicators, to act as a complement to the GS (Hamilton, 2001). Although still not ideal, the treatment of NC is more inclusive than the GDP's measure. This is also the case for HC.

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[67] For example, according to a study by Pearce and Atkinson (1993, p. 106), the Japanese economy is the most sustainable given a weak sustainability approach. The reason is that Japan's high savings rate more than compensates for the depreciation of human-made and natural capital.

Unlike standard national accounting, which considers HC to be a ‘return to education’, the GS offers a more inclusive assessment. It comprises education, raw labour and SC which is measured through returns to education and raw labour, with SC assessed by determining the value-added component of institutions and other social structures. Similar to all attempts at measuring progress, the GS recognises that estimating HC is a very difficult and contentious area (Kunte et al., 1998).

The focus on current education expenditure is a departure from standard national accounting, which only includes fixed capital education expenditure on HC in the accounts. Traditionally, this makes up less than 10 per cent of all education expenditure, since current expenditure, comprising money spent on teachers’ salaries, books, etc. is viewed as consumption.

Given the extent of natural wealth that is due to HC, the GS approach regards HC as a valuable asset, where expenditures on its formation are seen as an investment (Hamilton, 1994). The GS should, in theory, be adjusted by the change in value of HC to reflect this investment but there is not, as yet, consensus on how to carry out this valuation. As a first approximation, rates of GS can be adjusted upwards according to rates of current spending on education (Bolt, Matete and Clemens, 2002).

Interestingly, since countries with stronger economies generally tend also to invest more in education, and education investment is regarded as savings, the treatment of HC by the WB will favour countries with strong economies (Pillarisetti, 2005). In fact, the high rates of education investment in high-income OECD countries and the East Asia/Pacific region sharpened the contrast between the GS effort in these areas compared to the rest of the world (Hamilton and Clemens, 1999).

If the WB insists on only using investment as the major component for measuring HC, an assessment of the *impact* that expenditure has must be incorporated, such as the service outcomes HC delivers to a nation, which is currently ignored. Other estimate exclusions involve HC leakages (brain drain) and the extent to which the nation’s citizens are sharing knowledge.

While Soubbotina (2004) admits that, due to difficulties evaluating HC, the calculation of GS rates for different countries is extremely challenging, the potential importance of using correct indicators for informing and guiding policymaking, makes the effort worthwhile.

As stated earlier, all GS calculations begin with the GDP of each nation. From here, certain values are either added or subtracted to obtain the GS numeric indicator. Given that the GS is heavily GDP centric, GS findings will tend to justify increasing real GDP as the central measure of progress (Qu, 1999).

Not surprisingly therefore, it is high-income OECD countries that emerge with consistently strong positive GS results, while the Middle Eastern/North African countries, which are resource dependent, emerge with consistently negative results (Soubbotina, 2004).[68] In fact, when the GS results were estimated for 1994, of the 15 regions examined, the North American region had a total wealth figure of 326, and was judged the most sustainable region, followed by Pacific OECD on 302 and then Western Europe on 237. A further drop then occurs to the next region, the Middle East on 150.[69]

The implication of these results on the environment can scarcely be overstated. There is a growing consensus that the western world is a big contributor to climate degradation.[70] Yet these results, suggesting that the west is the most sustainable region implies that other regions should follow in its footsteps. Given this, the ramifications to the environment could be disastrous.

Finally, apart from the intrinsic bias in the measure, the GS also fails to properly account for the inequalities that exist within a society. For example, no effort is made to include a measure of distribution such as the Gini coefficient.

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[68] As mentioned earlier, the discrepancy between these results and Neumayer's (who recalculated GS using the El Serafy method) shows the sensitivity of the measure.
[69] In Kunte et al. (1998, p. 2) the figures are in US$ per capita ('000), using PPP exchange rates and a 4 per cent discount rate.
[70] The need for this group to modify its practices is already under way. The IPCC have introduced target emission rates that aim to reduce the ecological impact of major industrialised nations.

Despite the list of criticisms highlighted in the above review, the GS, by explicitly accounting for the different components of wealth, have at least brought to the fore the concept of an expanded measure of wealth that includes HC and NC. Unfortunately though, the GS falls into the same trap as the GDP by preferring quantification and aggregation at the exclusion of a multidisciplinary approach. By aligning itself to the market, the GS national wealth calculations devalue all that is excluded, whether it is household duties, HC or the environment (both physical and natural). The end result is that the GS is a measure that continues to neglect important factors critical to progress, thus justifying the continuation of unsustainable practices.

Hence, economy-environment frameworks adopting a market-centred measure lose their rigour once they are forced to measure areas where market measures are not appropriate. This results in outcomes that overwhelmingly favour (and thus prioritise) the economy over the environment. Consequently, as value-added rises, resources and the environment become less important despite their contribution to human wellbeing remaining the same (Prescott-Allen, 2001).

This failure to reflect human welfare is another major criticism of economy-environment progress measurements, since it has the capacity to send misleading signals about national progress. This shortcoming brought rise to alternative progress measures attempting to incorporate this aspect. The next section will review the two main measures in this field: the genuine progress indicator (GPI) and the human development index (HDI).

3.6 Human-Economy Interaction Conceptual Framework

The measures in this section explicitly incorporate human welfare into national progress measures. The two major revisions in this area will assess the GPI and the HDI.

3.6.1 Genuine Progress Indicator

A popular approach to adjust conventional national accounts has been the index of sustainable economic welfare devised by Daly, Cobb and Cobb in 1989 and forms part of the Appendix of their book, *For the Common Good* (Hamilton, 1999). Cobb and Cobb revised this in 1994 with the book *The Green National Product*, which formed the basis of the GPI.[71] For the sake of consistency, the term GPI will be used to denote findings in both measures.

Established by the civil group Redefining Progress, the objective of the GPI is to provide a fairer and more inclusive measure of the overall economy. From the GDP, it includes only those financial transactions that are relevant to progress, and then adjusts them for aspects of the economy that the GDP ignores (Cobb, Goodman and Wackernagel, 1999).

The GPI is different from the GDP in that it is not an established measure of production. Instead, and rather controversially, this index is constructed on the assumption that progress is based on consumption (Lawn, 2005). The GPI uses aggregate personal consumption expenditure, adjusted for income inequality using the Gini coefficient as its base. This is known as weighted personal consumption, and helps overcome a major limitation of the GDP which can overlook the inequality and distribution aspect in society.

From this expanded value for consumption, the GPI then adds or subtracts categories of spending judged to either enhance or detract from a nation's progress. Deductions comprise: defensive expenditures; social costs such as divorce, crime or loss of leisure time; and the depreciation of environmental assets and natural resources. Conversely, the following non-monetary benefits (ignored by the GDP) are included in the GPI: the value of time spent on household work, parenting and volunteer work; the value of services of consumer durables, such as cars and refrigerators; and also services of highways and streets (Cobb, Goodman and Wackernagel, 1999). Services provided by the government are, for the most part, not included since they comprise defensive expenditures. However, this varies a great deal between the countries that employ this measure.

These adjustments are then made to measure the sustainability of consumption. Sustainable consumption requires that the productive potential of the capital stocks that generates goods and services be maintained. While the GDP does not account for

[71] The index of sustainable welfare has also been labeled a sustainable net benefit index (Lawn, 2005).

changes in capital stocks, the GPI attempts to incorporate changes to built capital (buildings and assets), financial assets (investment in built capital, etc.) and NC (Hamilton, 1998).

The GPI serves a crucial function by offering a different conception of progress. For instance: it explicitly includes time accounting and non-market activity; it equates consumption, and not production, to progress; and it deducts certain production activities. Thus, the social philosophy equating GDP growth with increasing welfare is questioned (Stockhammer et al., 1997).

Although the GPI is produced for a number of countries,[72] not surprisingly, some differences in methodology do exist. For example, for most GPI indices' the initial personal consumption figure is multiplied by an index based on changes in income share of the poorest fifth of households. The Austrian GPI however, employs a different methodology and adjusts the whole GPI for distributional inequality (Stockhammer et al., 1997).

Furthermore the Australian GPI, produced by Clive Hamilton at the Australia Institute, omits the US GPI's social cost of family breakdown, but does include the original GPI imputation for post-secondary education and public health spending, which was omitted in the US GPI. With the concept of leisure, which is an important one in all GPI measures, the US GPI did not impute any values for it; rather it recorded only the change in leisure time relative to a base year. The Australian GPI, on the other hand, does not account for leisure; instead it includes an estimate of the costs of overwork,[73] which it adds to the costs of underemployment and unemployment (Hamilton, 1998).

Moreover, the Australian GPI breaks with tradition by assuming that each component of public spending adds to progress unless there is a legitimate reason to deduct it. This is in stark contrast to the US approach, which is suspicious of any US government public service expenditure (Hamilton, 1998). A list of the full components of the Australian GPI is provided in Table 3.2 below.

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[72] The countries are: England, Germany, Italy, Sweden, Chile, Austria, the Netherlands, Australia and the US.

[73] Hamilton (1998) uses the lowest average hours worked in the time period as the base. From here, all excess hours in the other years are estimated at average wages. The base period occurred in 1982.

Table 3.2 Components of the Australian GPI

Consumption	Welfare Enhancing Consumption	Welfare Diminishing Consumption
A Personal consumption	D Public consumption expenditure (non-defensive)	F Costs of unemployment
B Income distribution	E Value of household and community work	G Costs of underemployment
C Weighted personal consumption	J Services of public capital	H Costs of overwork
	Z Net capital growth	I Private defensive expenditure on health and education
		K Costs of commuting
		L Costs of noise pollution
		M Costs of transport accidents
		N Costs of industrial accidents
		O Costs of irrigation water use
		P Costs of urban water pollution
		Q Costs of air pollution
		R Costs of land degradation
		S Costs of loss of native forests
		T Costs of depletion of non-renewable energy resource
		U Costs of climate change
		V Costs of ozone depletion
		W Costs of crime
		X Costs of problem gambling
		Y Value of advertising
		AA Net foreign lending

Source: Hamilton and Denniss (2000).

The differences in the methodology of the GPI concerning omissions and the choice of proxy values clearly impact on the index. In fact, when Daly and Cobb (1989) released their final GPI figures, they released one that included deductions of the value of the depletion of natural resources, and one without. Hamilton and Dennis (2000) did likewise for income distribution in Australia.

While differences in methodology and assumptions are to be expected when values are assigned to non-market variables, these differences should not be justification in itself for rendering a measurement meaningless, for every measurement is biased by the measure. Nevertheless, the technique of applying values to non-market phenomena has its difficulties.

> Undeniably, it is awkward to want an economic statistics that is not defined by standard procedures applied to observable data: the ‘objectivity’ of statistics appears to be compromised. But there is no way out. Either one has a (relatively) meaningless figure, or one employs economic expertise and guesswork in the construction of the statistics. We should not have expected anything else. (Mirrlees, 1969, p. 10) [parenthesis in original]

Even though applying values to non-market phenomena must always be seen in this light, it is only one part of a viable alternative measurement. The other, as shown in Table 3.2, is to highlight areas effecting progress that are not captured by the GDP. For instance, since the 1970s the following issues have resulted in sub-optimal progress:

> … unsustainable levels of foreign debt; the growing costs of unemployment and overwork; the combined impact of a number of environmental problems; the escalating costs of energy resource depletion and greenhouse gas emissions; and a failure to maintain investments in the national capital stock. (Hamilton, 1998, pp. 88-89)

Aside from foreign debt, these other concerns have yet to really impact Australia’s economic policy agenda, where the focus remains on growth.

The results of the GPI clearly confront this dominant assumption that growth is good. For example, in the US the GPI index shows both GPI and GDP growth occurring in the 1950s and 1960s. However, this all changed in the late 1970s and early 1980s. During this time, the GDP growth rate continued its steady upward climb whereas the US GPI figures showed progress to be stagnant. The major reason for this decline was due to increased levels of inequality and the unsustainable use of natural resources (Daly and Cobb, 1994). Similarly, the figures for Australia show that since 1996 the economy has grown strongly with GDP per capita rising by 13.4 per cent, compared to the GPI, which has only increased by 3.6 per cent (Hamilton and Denniss, 2000).

This difference between GDP growth and the GPI figures challenges the notion that production equals progress and that current government policies are conducive to greater progress. The recognition of this is significant as it provides an opportunity for the construction of an alternative progress framework that employs a different standpoint to the GDP.

Like all attempts to measure progress, the GPI has attracted criticism regarding certain valuation techniques. Currently, the Australian GPI measures income distribution by the share of total income received by the bottom quintile of taxpayers (Hamilton, 1998). The current study believes that since most countries adopt a progressive personal income tax, which in effect already redistributes income, an after-tax measure would provide a more accurate indicator of inequality. Hence, the broad based Gini coefficient would have been a more appropriate measure. Furthermore, Harris (2007) criticises the use of the Fisherian income as used by the GPI, preferring a Hicksian version instead.

Another criticism of the GPI is the absence of any consideration of gender. The GPI ignores the fact that the lowest income earners in society are disproportionately women (Waring, 1988).[74] Of course, other progress measures have willingly incorporated a gender inequality approach with the most prominent being the gender-related development index (GDI), which has been a supplement to the HDI since 1995. Like the HDI, the GDI measures life expectancy, education and income, but adjusts it for inequality between men and women. The present research however, like the GPI, will exclude considerations of gender.[75]

The GPI's valuation of NC has also been criticised. In particular its valuation approach in using constant dollars. A constant price calculation of service production is always problematic, especially for a historical data series given that a constant prices approach:

> … has to bridge the gap from the other side by trying to construct statistics that may have the chosen conceptual interpretation, and this act is, of course, much more debatable than simply *observing* certain market data. (Sen, 1979, p. 2) [emphasis in original]

In addition, the GPI methodology assumes that for sustainable growth to occur, renewable energy resources must replace non-renewable energy resources. This assumption led the US GPI to attribute a replacement cost for oil at US$75 per barrel, which was five times the world market price. Established green accounting practices employ current value rather than a hypothetical future substitution price. The GPI

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[74] The one exception to this is the Austrian GPI. Details of their methodology can be found in Stockhammer et al. (1997). Ironically though, their preference was for the broad-based Gini coefficient (which would have excluded a gender analysis) since the Gini was a more elegant approach. This however, was not possible due to a lack of data on personal consumption.

[75] The reason for its exclusion is provided in Chapter 6 (see Section 6.3.1).

refuses to employ current prices because they argue that it fails to adequately reflect future scarcities. The author of the Australian GPI, Hamilton, does however admit that technological change has provided and will continue to provide, many substitutes to emerging scarcities especially with minerals (Hamilton, 1998, p. 86).[76] Furthermore, with long-term environmental damage, such as greenhouse gas emissions and ozone depletion, the GPI attaches an arbitrary price regarding their impact. Thus, some critics have questioned whether the various values included in the measures adequately or accurately represent the costs they purport to measure (Nelson, 1997) and whether a pluralist approach rather than a monism approach would be more appropriate for environmental valuation (Norton and Noonan, 2007).

Additionally, Clarke (2007) argues that the GPI should be more concerned with the ownership of the costs and benefits associated with economic growth rather than the location of those costs and benefits. Often, those who derive the most benefit from exploitation of the environment are not located there.

Regarding the treatment of HC, like the GDP before it, the GPI does not account for changes in HC because of the conceptual and measurement difficulties involved (Hamilton, 1999).

> … the appropriate way to treat spending on education (and perhaps some aspects of health) would be as an investment in the stock of human capital, reflected in increased earning ability. Accretions in the net stock of human capital would add to sustainable economic welfare, just as net capital growth does. (Hamilton, 1998, p. 74) [parenthesis in original]

In practice however, the Australian GPI considers half of the private spending on health and post-secondary education as defensive. Consequently, it deducts these amounts from the index since they are included in the personal consumption figure. Additionally, half of the public spending on health is deducted, as is most of the education spending since it is viewed as an investment in HC, while expenditure on research and development (R&D) is excluded.

[76] The Australian GPI took the middle road and attached a depletion cost of US$75 per barrel of oil equivalent in 1995 dollars to the consumption of petroleum, and natural gas, but not to coal.

This very restricted assessment of HC is a significant limitation, one that this study intends to improve upon through its conceptual framework, given the prominent role HC plays in progress creation.

Another criticism of the GPI is the individualist standpoint it adopts. It starts with personal consumption and ends with economic welfare per capita. Crucially, the present research argues, the absence of a collective analysis in the GPI leads to a lack of recognition of the changes in social structures and their impact on progress, resulting in the lack of accounting for HC and SC. A comprehensive approach to measuring progress needs to be ingrained in the existing context and institutions.

Furthermore, the technique of adopting market measures is also questioned here. Although it provides a bridge to mainstream economics, this present research takes the stance that such an approach reinforces the idea of market based progress measures (where progress is about the market). This standpoint limits a comprehensive analysis of progress, demonstrated by the partial HC assessment, which must by its very nature include analyses of social structures, values, etc.

Others, such as Trewin, declare that the GPI as a summary measure of the economy is difficult to interpret, but it has the benefit of capturing headlines and focusing attention on wellbeing (Trewin, 1998). Trewin, who is the former head statistician of the ABS, adds that the ABS is wary of placing too much importance on a single indicator, which is baffling given that Trewin accepts the GDP as a useful measure of national wealth and wellbeing.

Overall, the GPI has made an invaluable contribution to the measurement of progress. However, this improved measure that has led to accounting for changes in NC and household work does not go far enough. Another measure incorporating human welfare is the HDI.

3.6.2 Human Development Index

The HDI has become an important alternative to the traditional uni-dimensional measurement of development. The HDI's explicit purpose was to shift the focus from national income accounting and towards a people centred measure. It was developed in

1990 and relies on the notion of individual capabilities popularised by Sen.[77] Here, the notion of freedom is central to the capabilities approach, as it is the agent of change. Sen emphasises five freedoms: political freedom, economic facilities, social opportunities, transparency guarantees and protective security (Sen, 1999).

The HDI have used Sen's capability approach as the conceptual framework in their analyses of contemporary development challenges. The HDI is based on the assumption that economic growth does not necessarily equate to human development. Thus, human wellbeing and not national income, is its end goal.

The HDI measures the average achievement of a country in what it calls basic human capabilities. This is achieved by measuring the following values: life expectancy (to lead a long and healthy life), education via adult literacy and enrolment ratio (to acquire knowledge), and standard of living via GDP per capita purchasing power parity (as a measure of command over resources). All three components are assigned equal weighting, and for the education index itself, literacy is given two-thirds and enrolment one-third weighting.

The HDI has three important objectives. Firstly, it breaks the dominance of the GDP as the index of development. Secondly, it shows how far a country has to go to achieve the ideal situation, which equates to one, and finally, it allows for inter-country comparison (UNDP, 1999).

It is also critically important for the current study due to its non-monetary approach to progress measurement. As Robeyns (2005a) asserts, considerable disagreements arise from monetary assessments as to the actual size and particularly the trend of global income poverty and inequality. This, she adds, is in spite of the confident rhetoric emanating from WB press releases.

Mainstream progress measurements, Sen argues, focus exclusively on utilities, commodities, material resources or income. These types of utility-based evaluation of individual wellbeing however, have the tendency to hide important factors, such as

[77] It would be remiss of this present research not to mention the crucial role Martha Nussbaum played in developing the HDI.

freedoms, rights and human agency (Fukuda-Parr, 2003). For instance, resource-based theories only capture the means to enhance wellbeing; they do not acknowledge that people differ in their abilities to convert these resources into capabilities, due to personal, social or environmental factors (Robeyns, 2003).

The HDI's capability does not rule out exchange but it does displace it from the core of economics, instead the underlying motivation of the exercise needs to deal with social values (Sen, 1984). In this respect, the HDI differs from most other measures by explicitly acknowledging value judgements that inherently exist in progress measurements via the incorporation of economic, political, legal and other social arrangements into its analysis. Moreover, there is an acknowledgement that individuals and groups may have different values. This acknowledgement enables the HDI to approach progress measurement from both an individual (rational man) standpoint as well as a social (societal capabilities, role of social actors) standpoint (Lehtonen, 2004).

In the capability approach, an individual's characteristic corresponds to the *endowments*: the collective wealth of an individual at a point in time; *resources*: the collective wealth available in the economy; and *personal attributes*: the personal characteristics of that individual (Sen, 1999). These personal characteristics are determined by a person's mental and physical aspects, which affect a person's freedom to achieve wellbeing and agency. The social conversion factors consist of social institutions and norms, family, religion, culture, etc., while the environmental conversion factors are determined by the environment where a person lives, such as deforestation which has caused flooding, threatening shelter, etc. (Robeyns, 2005a).

Sen's capability approach is deliberately an open-ended, underspecified approach. For example, it does not specify which capabilities should be included; instead preferring an evaluative approach.[78] This standpoint reflects the notion that different countries (people) have a different set of variables affecting its capabilities. This has led some to debate the social merits of the HDI, where the concept of a choosing, reasonable individual, who is constrained by social systems, is paramount. Hence, the choice-utility-freedom framework, which the HDI operates under, has been called ethically

[78] Martha Nussbaum is one who believes that Sen should endorse a specific list of relevant capabilities (Robeyns, 2005b).

individualistic insofar as it assesses the state of affairs only with respect to the properties of individuals (Gore, 1997). From a SC viewpoint, it is social opportunities that matter. Others such as Robeyns deny this ethically individualistic charge, arguing that the capability approach is not ontologically individualistic, as it does not assume atomistic individuals, or that our capabilities are independent of others (Robeyns, 2005a).

Sen has conceded that the connection to other strands of social science, in particular sociology, could be better developed (Gasper, 2002). Varying degrees of individualism aside, the HDI's failure to adequately account for social determinants to progress, is a major limitation.

It is with great interest, given the undertaking of the current study, to note that the operationalising procedure of such a multidimensional approach like the HDI has come under attack. Even the Nobel Laureate Amartya Sen cannot escape it. '… the HDI is conceptually weak and empirically unsound, involving serious problems of non-comparability over time, space, measurement errors and biases' (Srinivasan, 1994, p. 241).

The above criticisms are a natural part of progress measurement, where operationalising procedures are always going to come under intense scrutiny. However to make the capability approach more useful, the operationalising procedure needs to move beyond the current narrow conception of economics (Alkire, 2002). This however, is anathema to most statisticians, who view the capability approach with scepticism. To help overcome this problem, any measure attempting this type of analysis needs to be transparent in all stages of its methodology.

The GDI adjusts the HDI for inequality between men and women. Of course, gender inequality is not the only structural inequality facing society. Alongside gender, a case could also be made for factoring class, community or location. The HDI views gender as an important starting point since gender bias can impact on social, economic and political aspects of countries (UNDP, 1995). Results from the *Human Development Report* (HDR) (UNDP, various years) found that the greater the gender inequality, the lower the country's GDI, which resulted in the HDI being adjusted downwards.

Although the HDI accepts that income is only a means, the HDI uses GDP per capita as a proxy for most other capabilities beyond survival, education and what those directly reflect. The command over economic resources, which is needed for a decent standard of living, is captured by the logarithm of GDP per capita increased in PPP terms. This implicitly makes the strong value judgement that economic inequality and insecurity do not matter. In fact, it:

> … (1) assumes that aggregate share of income devoted to accumulation 'genuine investment' is optimal; and (2) sets the weight of income distribution and economic insecurity to zero, by ignoring entirely their influence. (Osberg and Sharpe, 2005, p. 317)

As a result, the capability approach tends to conceal the enormous and still rising economic inequalities that a resource approach makes quite blatant. This supports the present research's assertions that a greater interdisciplinary approach, such as incorporating both resources and capabilities as a starting point, has the potential to more accurately reflect a nation's progress.

This weighty reliance on GDP per capita manifests itself via a high correlation between HDI and GDP per capita. For example, both the HDI and the GDI have come under similar criticisms. Dijkstra and Hanmer (2000) computed a scatter plot for 137 developing countries that demonstrated that the GDP and the GDI are closely correlated. Their issue with the GDI was that low levels of human development, even with high levels of gender equality, could not escape a low score on the GDI due to the strong influence of GDP.[79]

Additionally, McGillivray and White (1993) assert that even with a zero weight, as opposed to the one-third weight normally given to it, GDP per capita still strongly influences both the HDI and the GDI. In fact, the correlation coefficient between the 1991 HDI and GNP per capita was 0.832 for a full sample of 160 countries.[80] Cahill updated the studies by McGillivray and White, and the results also showed that the HDI is strongly correlated with GDP (Cahill, 2005). This suggests that the HDI's capability approach alone is not sufficient in capturing the progress concept, as most of the information about the HDI is captured in per capita GDP. This strong positive

[79] These findings led Dijkstra and Hanmer (2000) to construct a relative status of women index.

[80] The full sample comprises 63 low human development countries, 64 medium human development countries and 53 high human development countries (McGillivray and White, 1993, p. 188).

correlation outcome brings into question just how much additional information, the HDI measure, conveys regarding progress.

The HDI also suffers from its inadequate assessment of NC. There is a general failing of taking into account ecological considerations. Furthermore, their methodology of folding three component indices into one is of concern. This practice hides trade-offs that occur between the various dimensions; especially given that one dimension can make up the deficiency of another (Sagar and Najam, 1998). The release of a refined single measure to embody progress smacks of methodological reductionism (Nelson, 1997), and is contrary to the original spirit of the HDI (Fukuda-Parr, 2003, p. 305).[81]

Furthermore, both measures (HDI and GDI) are very sensitive to the life expectancy component, where a small change in the scaling and weighting procedures, which change from year to year and reflects the degree of arbitrariness involved, can have a country move from one level of development to another (Srinivasan, 1994). This raises the query regarding whether any changes in the HDI ranking are due to changes in methodology or advancement in human development?

The limitations outlined above shows that the HDI is, as Sen (2002) points out, inescapably a crude index. The HDI, narrowly limited to three capabilities, has led many to surmise that it is biased towards a basic needs approach. That is, where the people's most fundamental needs is met, irrespective of other factors (Estes, 1992). The basic needs approach argument is somewhat misconstrued however, and points more to a commodities approach rather than a capabilities approach in defining human progress.

Overall, the capability approach is a major improvement over standard progress approaches. It opens up other avenues to measure progress, revealing the interconnected determinants that traditional progress measurements cannot capture. The measure goes beyond commodities and towards an interdisciplinary approach. Yet, despite the onset of the HDI, there is still an increasing concern of trying to accommodate the objectives

[81] Sen was concerned by the difficulties of capturing the full complexity of human capabilities in a single index, but was persuaded by Haq's insistence that only a single number could shift the attention of policy-makers from material output to human wellbeing as a real measure of progress.

of economic growth, the ecosystem, human wellbeing and excess consumption. The following framework is articulated to capture this.

3.7 Human-Economy-Environment Interaction Conceptual Framework

3.7.1 United Nations Commission on Sustainable Development

In 1995, the United Nations Commission on Sustainable Development (UNCSD) approved work on the indicators of sustainable development. The UNCSD operates under a pressure-state-response framework. Pressure indicators ask: why a said event happened? State indicators ask: what is happening? Whereas response indicators assess: what is being done about it? The framework was developed for environmental indicators but has been slightly reworked to allow the incorporation of economic, social and institutional indicators. It is the dominant conceptual model for sustainable development.

As the nature of the objectives suggests, the UNSCD deals with many of the issues beyond the scope of the GDP. In 2001, a final report featuring the framework of 15 themes and 38 sub-themes was developed. The primary goal of the indicator was to develop a means to assist national decision-making. Some have criticised this framework (the implied cycle of cause and effect) as too simplistic, while others note that the distinction between what constitutes a pressure, state or response can be quite ambiguous, as it is dependent on the epistemological standpoint of the viewer.

More importantly however, the indicator fails to address the issue of integration. That is, the selection essentially juxtaposes a list of environmental, economic and social indicators. The measure needs to illustrate the interactions between different sections of the economy more accurately.

The treatment of the elements as separate independent elements helps reinforce the status quo by legitimising the existing goals of society. By detaching the measure from its social and environmental context, it perpetuates the status quo and does not acknowledge that activities that contribute to progress can and do overlap. Furthermore, this detached outlook has nothing to say on how to deal with the unavoidably conflicting objectivities of economic rationality, social justice and environmental sustainability (Lehtonen, 2004).

The UNCSD neither endorses any single set of indicators nor produces comparable cross-national indicators, as a result the measure is quite vague. In fact, it fails to specify how greater progress can be achieved. Additionally, to measure the separate elements with the same universal analytical framework does not reflect the multidimensional nature of progress measurement. As such, determinants of progress are likely to be undervalued.

Many other attempts have been made to measure the progress of nations, some of which include:

- *adjusted gross product*;
- *economic aspects of welfare*;
- *integrated economic accounts*;
- *total income system of accounts*;
- *full gross domestic product*;
- *index of social health*;
- *index of economic wellbeing*;
- *the wellbeing of nations*;
- *ecological footprint*; and
- *human poverty index*.

Having already reviewed the more prominent progress measures with a view to constructing a conceptual framework built on their strengths and weaknesses, the present research does not intend to discuss the progress measures listed above. Instead, the next section will briefly examine some other progress measures pertinent to the present research due to their valuation approach.

3.8 Other Progress Measures

The physical quality of life index (PQLI) is considered the first composite measure of progress. Morris and his colleagues at the Overseas Development Council in Washington developed it. It was a breakthrough measure since it measured progress without utilising income or economic wellbeing. Morris believed that the reliance on GDP figures alone did not indicate anything regarding human wellbeing, while also ignoring differences in prices and the distribution of income (Morris, 1979).

The PQLI therefore arose due to the failure of alternative measures to the GDP to take hold due to their excessive complexity.[82] With this in mind, Morris decided to identify only certain conditions that had to be satisfied to direct policy towards helping the underprivileged. Hence, the PQLI employs an index ranging from 0 to 100 based on equal weights which measures infant mortality, life expectancy at age one and basic literacy. Here, rankings occurred due to changes in real life chances and not changes in income (Morris, 1996).

The PQLI had to satisfy six criteria. Firstly, it should not assume that there is only one pattern of development. Secondly, it should avoid standards that reflect the values of specific objectives. Thirdly, it should measure results, not inputs. Fourthly, it should be able to reflect the distribution of social needs. Fifthly, it should be simple to construct and easy to comprehend, and finally, it should lend itself to international comparison (Morris, 1979).[83]

The PQLI objective is deliberately very limited. Its aim is to measure specific life-serving social characteristics. The index shows that some countries have much poorer life-quality results at quite high per capita incomes than often is assumed, indicating that the growth of disposable personal income over time, does not necessarily improve progress. For example, the Mideast oil producing countries attained PQLI scores in the low 30s. On the other hand, countries that the GDP rank as being quite poor, such as Sri Lanka, attained a high PQLI score of 82 despite very low monetary incomes (Morris, 1996).

The PQLI was never intended to be a measure of economic development or total welfare. By purposely restricting itself to the provision of health and educational

[82] Attempts have been made to rectify this. In September 1986, *The Economist* introduced the Big Mac index as a more effective measure to overcome variations in the purchasing power of the dollar that made comparisons by the GDP unreliable. This could then give meaning to the percentage figure of persons who live on less than a dollar a day. Of course, the measure's irony was not lost given that very few people in poor countries can afford a Big Mac.
[83] According to Sirgy et al. (2007, p. 382), the PQLI was the direct forerunner of the HDI.

services, the PQLI is quite limited. An important outcome for the present research however, is that the findings of the PQLI lends support to the notion that any measure employed to assess a nation's progress cannot solely rely on income, or for that matter, a market-centric analysis. The accumulation of money and material wealth is not the sole indicator of progress, rather it is but one of many factors.[84]

Another non-monetary approach to measuring progress is GNH. It employs a Buddhist perspective of development striking a balance between materialism and spirituality. The term was first adopted in 1972 by Bhutan's King Jigme Singye Wangchuck whose aim was to displace the GDP as a measure of progress for Bhutan. The GNH is seen as a distinctively indigenous measure of aspirations for government and development activity in Bhutan (Faris, 2004). The GNH is broken into nine domains. They are: living standards, health, education, eco-system diversity and resilience, cultural vitality and diversity, time use and balance, good governance, community vitality and psychological wellbeing (Marks et al., 2006).

This attempt presents a radical paradigm shift away from the GDP. The natural science approach primarily adopted by classical economists excludes the ability to make qualitative distinctions (see Section 3.2.1). Yet, as Tideman (2004) argues, it is these qualitative aspects that are fundamental to our understanding of the ecological, social and psychological dimensions of economic activity. Thus, the GNH measure abandons definitions of the world that involve isolated market interactions; instead viewing humans as part of a larger whole.

The proponents of the GNH claim that a continued focus on 'things' (tangibles) will miss the relations and the whole context that makes the 'things' possible.[85] In effect, whole systems give rise to specific things not the other way around. Thus, patterns of relationships of material structures, and not the structures themselves, need to be considered for measuring progress; an understanding that is apparent in modern physics, biology, psychology and the social sciences (Tideman, 2004).

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[84] The next major non-monetary approach was the HDI, which was discussed in an earlier section.

[85] The assessment of the economy in the light of the whole system deals with 'universal social connection'. This connection is an issue that can be traced back to Aristotle and the epistemological question of the unity of knowledge about social reality (Zafirovski, 2005).

Of course, the GNH is not without its critics, Kahneman and Krueger (2006) argue that the GNH is overly ambitious given the present state of knowledge. Their preference is to employ subjective wellbeing measures to complement traditional analysis.[86]

A more recent non-monetary approach lies with the happy planet index (HPI). It has as its mantra to strip back the view of the economy to the absolute basics: what goes in (natural resources) and what comes out (length and happiness of lives). This differs from the array of measures that employ the GDP and then subtract social costs. Its goal is to assess the environmental efficiency towards sustaining wellbeing. It covers 178 countries. The HPI comprises of three indicators: life expectancy, ecological footprint and life satisfaction, where wellbeing is the ultimate end and resource consumption is the major input. High levels of wellbeing therefore must be tempered by responsible consumption, and economic development *must not* occur at the expense of other important contributors to wellbeing (Marks et al., 2006).[87]

Like the HDI, the HPI is quite crude consisting of only three variables, two of which: ecological footprint and life satisfaction, are contested. Although these variables are included in the current study model, they are grouped with other variables to ensure that their limitations are compensated for. Unfortunately this does not occur here. Such a heavy reliance on only three variables to capture something as complex as progress is not, the present research adds, analytically sound.

With so many measures in existence, each with their own epistemological standpoint, and with economic and scientific valuation techniques under greater scrutiny than ever before, the current climate for measuring progress (and economic assessment in general) seems somewhat uncertain. Yet, as the three measures discussed above and the HDI prove, a non-monetary approach to progress is both valid and justifiable.

3.9 Where To From Here?

Currently, traditional scientific discourse is undergoing a major transformation, as scientists in different schools argue over epistemological claims. The problematic nature

[86] Kahneman and Krueger (2006) propose a U-index connected to time allocation, where the U represents unpleasantness or undesirability.
[87] Nic Marks is also an advisor to the Centre for Bhutan Studies on the construction of GNH indicators.

of epistemology and its effect on dealing with integrating economic theory and modelling is perhaps best summed up by Hicks who views economics as being:

> … on the edge of science because it can make use of scientific, or quasi-scientific methods; but it is no more than on the edge, because the experiences that it analyses have so much that is non-repetitive about them … aspects of economic life which we need to select in order to make useful theories can be different at different times. Economics is in time, and therefore in history, in a way that science is not. (Hicks, cited in Redman, 1991, p. 106)

The debates revolving around epistemology are quite complex, and as stated earlier in this chapter, are not the main purpose of the current study. These debates however have opened the door to a number of methodological practices in progress measurement. The so-called 'collapse of the science view', has meant that the measurements employed in economics are now regarded as epistemology (Beed, 2005). This employment of epistemology however, must tread with caution.

> … epistemological clarity in the discipline of economics requires careful attention to the creation of bridges, connections or accordances between mathematico-economic structures on one hand, and real-world phenomena and policy recommendations on the other. Such bridges are essential if the structures erected are to assist in the provision of knowledge of actuality. (Katzner, 2003, pp. 565-566)

Thus epistemological clarity is needed, though given that the modern economy is constantly evolving, and embedded in a web of social institutions, customs, beliefs and attitudes (Solow, 1985), assigning values to emerging variables and factors is a very complicated process. The review of some of the existing progress measurements demonstrates that no one particular measure gives a privileged knowledge. Instead, as Wolff and Resnick (1987) state, different theories tell us different things depending on the assumptions and questions the researcher asks. Hence, any measure that claims to purport a single, absolute truth providing valid and superior knowledge is misguided.

The multidimensional nature of the progress concept requires a framework that can include and exclude factors that are important to the creation of progress. Moreover, this multidimensional framework should, at the very least, include measures of distribution, sustainability, social capacity, as well as human outcomes, such as health and education (Nelson, 1997). Of course, this does not mean that the proposed conceptual framework should try and explain all the existing interrelations as this would lead to the ‘theory of everything’ (see Section 3.2.2).

Once one accepts that knowledge is standpoint dependent, one can then argue for a pluralist accommodation of multiple theories. This resists the desire of researchers to establish the framework they prefer as the privileged ones. What is needed therefore is a framework that emphasises epistemological and discursive pluralism (Samuels, 1991).

The absence of a universal framework recognises that the determinants possess their own individual logic. The purpose of this type of approach is not necessarily to explain some underlying fundamental causation; instead it is to make us understand one or more parts of the progress phenomenon. This however, does not mean that anything goes, if anything one needs to be even more critical since one can no longer assume that what a researcher believes is unequivocally correct. Under this approach, the standard of proof is not as high, given that knowledge now only needs to be useful, rather than privileged.

To recap, Table 3.3 below provides a summary of the main progress measurements reviewed in this chapter. In particular, the table will review the advantages and disadvantages of these measures in capturing what the present research considers to be important contributors to national progress.

Table 3.3 Summary of the main progress measurements

Measure	Nature	Strengths	Weaknesses
Gross domestic product	A market driven measure. Measures total value of all production in money terms. Assumes market place equals progress.	Easily comparable among a whole range of nations. Critical in determining a range of socio-economic policies.	The stock of HC and NC, as well as other non-market resources, is largely ignored. Doesn't examine desirability of production.
Measure of economic welfare	Measures welfare by adding benefits and subtracting costs. Assumes market and welfare are not the same.	Goes beyond the scope of the market and national accounts in assessing welfare. Unlike GDP, the nature of the need is of concern.	Excludes renewable and non-renewable natural resources, due to long-run substitutability. Under-represents HCs impact on progress.
Environmentally adjusted net domestic product	Adjusts national accounts for changes in quality of natural environment and depletion of natural resources.	Indicates whether economic growth is sustainable. Highlights unsound production and consumption patterns.	Needs to emphasise other non-monetary areas. Excludes social costs and distributional issues.
Genuine savings	Meant as a new measure of sustainability, over whole range of assets – physical, natural and human. Comprise only of marketed values.	Easily comparable among a whole range of nations. Has expanded NC definition from previous measurements.	Concentrates on a narrow monetary measure. Thus, it omits the impact to society from air and water pollutants, forests, fisheries and biodiversity.
Genuine progress indicator	Index based on consumption and not production. Challenges notion that all growth is good.	Addresses impact of NC and income inequality issues. Indicates if economy is on a sustainable path.	To not account for HC at all totally underestimates a nation's progress. Ignores exchange activities that don't increase progress.
Human development index	Non-monetary approach. Measures aspects of longevity, knowledge and standard of living. Human wellbeing, and not national income, is its goal.	Important alternative to GDP, and is comparable among nations. Indicates a sustainable human development path.	Provides a rather limited view of NC and development in general. Results heavily influenced by GDP figures. A crude index.

Table 3.3 Summary of the main progress measurements (continued)

Measure	Nature	Strengths	Weaknesses
United Nation's Commission on Sustainable Development	Operates under a pressure-state-response framework. Developed to assist with national decision-making.	Assesses environmental, economic, social and institutional indicators. Comprehensive measure – 15 themes and 38 sub-themes.	No integration between the different indicators. Seen as a vague measure, failing to specify how greater progress can be achieved.
Physical quality of life Index	Non-monetary approach. First composite measure of progress. Measures progress without utilising income.	Provided distinct alternative to GDP. Focus was on results and not inputs. Comparable between nations.	A limited measure of progress. Restricted to the provision of health and educational services.
Gross national happiness	Non-monetary approach. Paradigm shift away from the GDP. Strikes a balance between spiritualism and materialism.	Accounts for qualitative aspects fundamental to progress. Comprehensive approach – divided into nine domains.	Overly ambitious measure given present state of knowledge. Subjective nature may lead to political manipulation.
Happy planet index	Non-monetary approach. Assesses environmental efficiency towards sustaining wellbeing.	Provides distinct alternative to GDP. Comparable between nations. Comprehensive conceptual approach – health, environment and subjective wellbeing.	A crude index. Consists of three variables, two of which are contentious.

3.10 Conclusion

In spite of recent trends towards methodological pluralism, mainstream economists are still reluctant to incorporate the role of values in economics, since this would require a very different conceptualisation of economic behaviour and processes (Van Staveren, 2001). This refusal means the standard theory of choice model continues to be the most prevalent model used in progress measurements, despite widespread and systematic deviations of actual behaviour from the normative model (Kahneman and Tversky, 2000).

A complex phenomenon such as progress should not be exclusively assessed with measurement tools that are designed for precise phenomena; after all, paraphrasing Keynes, 'to be vaguely right is preferable to being precisely wrong'. The intention of this statement is not to 'do away' with mathematics in economic analysis, for mathematics continues to be of great benefit in addressing real-world situations. In fact, it is of tremendous value in enabling the construction of models that allow one to reflect and better understand the socio-economic circumstances that confront a nation.

The Law of Incompatibility best illustrates this, which is part of Zadeh's theorem of fuzzy logic that deals with social complexity. Basically, Zadeh stated: 'As complexity rises, precise statements lose meaning and meaningful statements lose precision' (Zadeh, cited by McNeill and Freiberger, 1993, p. 43).[88]

Thus social complexity is contradictory, as it is the origin of numerous paradoxical and conflicting forces that potentially act together, while at the same time, it is a result of these forces. For example, how the natural and social environment impacts upon human behaviour, while at the same time human behaviour impacts on the social and natural environment. Under fuzzy logic, one must tolerate these opposing forces, by balancing them to the point where they complement rather than cancel each other out. To meaningfully describe such a complex reality, Zadeh proposes a set of plural descriptions based on either personal experiences or collaborative inquiry, where the

[88] In fact, Zadeh (1973, p. 28) was a bit more formal than this: "As the complexity of a system increases, our ability to make precise yet significant statements about its behavior diminishes until a threshold is reached beyond which precision and significance (or relevance) become almost mutually exclusive characteristics."

principles of non-exclusion and non-isolation are paramount (Dimitrov and Kopra, 1998).[89]

What is needed therefore is a framework that makes accommodation of different objectives of human behaviour. The first step to achieving this is to move beyond neoclassical definitions and measurements, which is very difficult given the lack of empirical data. Nevertheless, the definition and measurement of progress must arise from an interdisciplinary approach. As the review demonstrates, several authors have argued for the inclusion of various dimensions juxtaposed or articulated into a cohesive framework. Yet, most current approaches tend to underemphasise some contributions to progress. This is what this study intends to rectify.

In the next chapter, the present research will evaluate HC, NC and SC in the first step to constructing a conceptual framework to assist in measuring such a complex phenomenon, which will facilitate an interdisciplinary approach embracing methodological pluralism.

[89] Non-exclusion means that no alternative, no matter how questionable is barred from deliberation, while non-isolation means that chaotic actions do not favour one optimal solution (Dimitrov and Kopra, 1998).

The official definition of progress confuse ‘more’ with ‘better’, ‘costs’ with ‘gains’, ‘borrowing’ with ‘earnings’, and ‘means’ with ‘ends’. To achieve real progress we must learn to distinguish these again. (Sagoff, 1997, pp. 92-93)

Chapter 4: Evaluating Human Capital, Natural Capital and Social Capital

4.1 Introduction

The previous chapter reviewed the main progress measures and discussed economic epistemology. The review identified a prevalent recent trend towards comprehensive progress measurements that incorporated notions of HC, NC and SC. Although the current study concurs with this conceptual shift, it is the manner in which these recent measures have applied their analysis that is in need of improvement. Consequently this chapter will propose an approach, reflective of the present research’s criteria, to incorporate into the conceptual framework to help build a valid and reasonable measure of progress. To achieve this, a critical review of the three aforementioned types of capital follows.

Initially an historical overview of HC theory is undertaken, followed by an assessment of HC measurement approaches and a discussion on IC. This culminates in a justification for an expanded HC measurement approach, along with a workable definition. An examination of NC is next, focusing on its emergence in economic literature followed by a review of sustainability. A critical review of environmental valuation techniques is conducted leading to the validation of a broader NC approach. Finally, the SC concept is introduced with an assessment of its varied definitions and approaches to measurement. A discussion is then undertaken regarding some SC studies as well as the measurement limitations of SC. Drawing from this, a justifiable SC approach is presented. This chapter constitutes the first step to developing the conceptual framework proposed in the next chapter.

4.2 The Emergence of Human Capital Theory

Throughout history, advances in civilisation have been linked with the development and employment of knowledge, making it an essential contribution to progress. Its importance is reflected in the long intellectual tradition of employing knowledge sharing functions. For example, in Ancient Greek times Socrates’ thoughts were captured by his protégé Plato. Other examples include the *Analects of Confucius* and the *The Art of War* by Sun Tzu. All these examples involve the creation, diffusion and utilisation of knowledge (Boorstin, 1983). Table 4.1 below lists a more recent timeline of the prominent economists involved with HC measurement which will be discussed in the HC section.[90]

Table 4.1 Timeline of prominent HC approaches

Economist(s)	Year
William Petty	1690
Adam Smith	1776
William Farr	1853
Ernest Engel	1883
Jacob Mincer	1958; 1970
Theodore W Schultz	1961; 1963
Gary Becker	1962; 1964
Fritz Machlup	1962
Richard Nelson and Edmund Phelps	1966
John Kendrick	1976
Robert Eisner	1985
George Psacharopoulos and Ana-Maria Arriagada	1986; 1992
Paul Romer	1986
Robert Lucas	1988
Dale Jorgenson and Barbara Fraumeni	1989; 1992
Robert Barro	1991
Robert Barro and Jong-Wha Lee	1993; 2001
Jess Benhabib and Mark Spiegel	1994
Eric Hanusheck and Yong-Kuk Kim	1995
Casey Mulligan and Xavier Sala-i-Martin	1997

Despite the historical importance of knowledge, the first attempt to combine human and monetary evaluation from both a theoretical and mathematical level did not occur until 1690 via William Petty. Recognising the importance of labour quality differences, Petty claimed that any estimate of national income should include an evaluation of workers. Petty, who had an interest in public finance, leaned towards a monetary, or income-based, evaluation of labour. Here, the stock of HC was estimated by capitalising the wage bill, which was determined by deducting property income from national income to perpetuity at a five per cent interest rate. According to this method, Petty estimated the

[90] The table excludes the more recent phenomena of IC measurement which is discussed later.

total HC stock of England and Wales to be 520 million pounds, or 80 pounds per capita (Le, Gibson and Oxley, 2003).[91]

Petty's notion was further advanced by Adam Smith who focused on specialised labour, specifically the improvements in production and quality of output that could be attained via employees' knowledge and skills. Since specialised labour involved the use of scarce inputs (education and knowledge), Smith considered expenditure on education and training to be an investment in human beings. This helped justify higher wages for workers who partook in it. Smith's insight became the basis for future HC theorists (Nerdrum and Erikson, 2001).

Despite Petty's and Smith's efforts, it was William Farr in 1853 that produced the first truly scientific procedure that estimated the monetary value of a human being (Kiker, 1966). This was known as the capitalised-earnings or income-based approach. Farr valued individuals' HC as the entire income that could be created in the labour market over their lifespan. Thus, non-market output was akin to zero value, which made considerations of *use-value* inappropriate. Specifically, Farr's evaluation technique involved an estimation of the present value of an individual's net future earnings (future earnings minus personal living expenses), with an allowance being made for deaths in accordance with a life table (Kiker, 1966). Employing a 5 per cent discount rate, Farr estimated that the average net HC of an English agricultural labourer was 150 pounds (Le, Gibson and Oxley, 2003).[92] However, not everyone was enthused about the employment of an income-based measure to estimate HC.

Consequently, in 1883 Ernest Engel produced an alternative which took the form of a cost-of-production approach,[93] which focused on the cost of rearing children. Engel employed child-rearing costs from conception to age twenty-five as an estimate for HC. At 26, Engel considered a person to be fully produced and no longer in need of rearing costs. This estimate could be used as a measure of their monetary value to a nation (Kiker, 1966).

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[91] As Kiker (1966, p. 482) points out, Petty's attempt to place a monetary value on human beings was met with some astonishment. For example, Dean Swift cynically satirized Petty in his 'A Modest Proposal for Preventing the Children of Poor People from Being a Burden to Their Parents or the Country'.
[92] This amount was the difference between the average salary of 349 pounds and the average maintenance cost of 199 pounds (Le, Gibson and Oxley, 2003, p. 277).
[93] This was later to become known as the cost-based method.

Although Engel's approach is less difficult to estimate compared to valuing future earnings, the drawback was associating cost of production to its economic value. These difficulties meant that most economists were reluctant to evaluate human beings, despite acknowledging its importance to progress. For example Alfred Marshall, who perceived investment in human beings as the most valuable of all capital, attempted a capitalised-net-earnings approach before it was ultimately discarded due to its impracticality (Kiker, 1966). Other attempts were made to quantify the actuarial value of employees' knowledge and skills; however these attempts were mostly unfruitful.[94] Consequently, HC analysis virtually lay dormant until its re-emergence in the mid twentieth century through the work of Irving Fisher, whose capital theory defined income and capital in an all-inclusive manner. 'A *stock of wealth* existing at an *instant* of time is called *capital.* A *flow of services* through a *period* of time is called *income*' (Fisher, 1906, p. 52) [emphasis in original].

Hence for Fisher, tangible and intangible stock qualified as capital so long as it gave rise to income. Thus, contentious debates regarding the tangible, monetary, durable and repeatable nature of capital goods was seemingly accounted for. Moreover, it created the platform for theorists to analyse HC in a neoclassical capital theory framework similarly to conventional capital as evidenced by the works of Schultz in the early 1960s and Jacob Mincer in 1958 (Nerdrum and Erikson, 2001).

Despite different perspectives, both Schultz (who championed investment in HC to increase ones job opportunities and strongly associated education investment with productivity)[95] and before him Mincer (who used investment in education to explain wage differentials) leaned on Fisher's capital theory and considered HC similar to the productive and economic characteristics of 'normal' capital.[96] From this base HC theory rapidly developed, with the most important contribution made by Gary Becker in 1962 via a NBER conference paper that introduced the internal rate of return to schooling as a

[94] Many economists considered the HC concept, far too many to mention here. The more prominent include: Dublin and Lotka, Jean Baptise Say, John Stuart Mill, Frederich List, Nassau Senior, J.R. McCulloch, Henry D. Macleod, A. Barriol and Leon Walras. A discussion of this can be found in: Kiker (1966, pp. 481-499). Additionally, a summary of studies on measuring HC, from Petty onwards can be found in the appendix section of Le, Gibson and Oxley (2003).

[95] Schultz established the link while examining the reasons for Germany and Japan's speedy post Second World War recovery.

[96] According to Nerdrum and Erikson (2001, p. 129), Schultz approached HC on a macroeconomic level whereas Mincer's approach was on a microeconomic level.

central concept of HC theory. This was followed up in 1964 by his influential: *Human Capital: A Theoretical and Empirical Analysis with Special Reference to Education*, which equated HC to a physical means of production. All three economists reaffirmed the links between HC and economic growth.

These reaffirmed links meant that the HC concept had become important in explaining earnings differentials and helped make sense of human behaviour at both the individual and social level. Concurrently, the development of neoclassical growth theory, which used Solow's residual as a measure of technological progress equal to the difference between the rate of growth and output, failed to account for a HC framework as an engine of growth.[97] This framework came later with Romer (1986) and Lucas (1988) who proposed the inclusion of technology and knowledge as an essential feature of economic growth, but not as an independent factor of production. This new endogenous growth literature, which aims at examining the reciprocity between tangible and intangible capital, further stimulated HC as a determinant of economic growth (Laroche, Merette and Ruggeri, 1999).

The historical overview illustrates that: (i) HC is presumed to contribute positively to notions of progress; and (ii) a need exists to devise a measure that will capture it. In this light, the next section reviews some of the attempts to measure HC.

4.3 Approaches to Human Capital Measurement

Prior to reviewing the disparate approaches to HC measurement, it is important that one is aware of the intention of the researcher. As revealed in the previous chapter, the manner in which a concept is approached (via both definition and measurement) needs to be recognised. The main attempts at measuring HC are discussed below.[98]

A leading avenue for HC assessment is via the endogenous growth model, from which two main alternatives exist. The first was developed by Lucas (1988), who added to what Schultz (1961, 1963) and Becker (1964) defined as HC. He envisioned HC as an

[97] Growth accounting analyses the relationship between factor use and output that is based on a production function presented in 1928 in a seminal article titled, 'A Theory of Production', by Cobb and Douglas.
[98] Although many different HC attempts have been conducted, this section will review what this study considers to be the more influential based on the literature review conducted.

individual's general skill level; and wanted to know how HC affects current production and how time allocation affects HC accumulation (Lucas, 1988). In effect, Lucas expanded the concept of capital by treating HC like any other factor of production, where the unexplained growth rate was due to differences in the accumulation of HC over time. Alternatively, the Nelson-Phelps/Romer approach, assumes that a nation's existing HC stock determines that a country's ability to replicate and adjust new technologies is what ultimately leads to sustained growth (Engelbrecht, 2002; Krueger and Lindahl, 2001).[99] For Nelson and Phelps therefore, the key was the role of educated managers, whom they theorised, would make good innovators and speed technological diffusion by introducing new production techniques (Nelson and Phelps, 1966).

Engelbrecht's (2002) study compared the two main approaches mentioned above regarding HC and international knowledge spillovers. Engelbrecht found that in most OECD economies, the data, at least to a certain extent, supports both approaches. In fact, as Gundlach, Rudman and Wobmann (2002) add, HC can enter the production function in many different ways. Thus, no distinctive approach exists.[100]

Nevertheless, the standard growth accounting methodology with HC specified as a factor of production is seen in the following aggregate production function, which can be expressed as *y = f (k, l, h)*. Here, per capita income, *y* is dependent upon three input factors: physical capital *k*, labour *l*, and human capital *h* (Benhabib and Spiegel, 1994). This approach assumes a Cobb-Douglas technology, expressed as: $y_t = a_t k_t^{\alpha} l_t^{\beta} h_t^{\gamma} \varepsilon_t$ (Temple, 1999). This has the benefit of homogeneity which provides a simple way of modelling cross-country differences. The relationship for long-term growth, via rates of change, can be expressed as:

[99] Nelson and Phelps (1966) were the first to model this hypothesis. The view that individual productivity can be affected by the HC in the economy is also prominent in Jacobs (1966).

[100] For instance, Mankiw, Romer and Weil (1992), along with numerous empirical studies, employ HC as an ordinary input in the production function proxied by average years of schooling. Benhabib and Spiegel (1994) model HC as facilitating adoption of technology from abroad and creating appropriate domestic technologies rather than incorporating HC as a factor of production. Alternatively, Bils and Klenow (1998) model the macroeconomic stock of HC based on semi-logarithmic relation between income and average years of schooling (microeconomic Mincerian wage equation), which has been adapted to model the macroeconomic stock of HC. A summary of the above can be located in Gundlach, Rudman and Wobmann (2002).

$$
\begin{aligned}
&(\log y_t - \log y_0) = (\log a_t - \log a_0) + \alpha(\log k_t - \log k_0) + \beta(\log l_t - \log l_0) \\
&+ \gamma(\log h_t - \log h_0) + (\log \varepsilon_t - \log \varepsilon_0)
\end{aligned}
\tag{1}
$$

This approach however has some serious limitations, particularly regarding the interpretation of the coefficients. Given that HC is an index, the validity of taking rate of growth as an explanatory measure must be questioned as it is very difficult to interpret an increase in the size of an index in an explanatory model.

Furthermore, Benhabib and Spiegel (1994) employed a standard growth-accounting framework to determine whether a measure of the log change in years of schooling for the workforce in 1965 and 1985 related to the annualised growth rate of GDP. They found a negative coefficient on growth of years of schooling. This result casts doubt on assigning HC as a separate factor of production. Furthermore, they claim that it is the *stock* of education that matters for growth of total factor productivity due to its ability to adopt and innovate technology quickly (Krueger and Lindahl, 2001).

Topel (1999) however, argues that Benhabib and Spiegel’s findings result from their log specification of education, while Krueger and Lindahl (2001) find that cross-country regressions indicate that the change in education is positively associated with economic growth once measurement error in education is accounted for. Both Krueger and Lindahl (2001) and Topel (1999) believe that HC is best specified as an exponential function of schooling in a Cobb-Douglas production function.

The conjecture surrounding the measurement of HC is not limited to endogenous growth models. Like growth accounting, the evaluative techniques employed for HC in estimates of national wealth are also varied. The present research will briefly review the three main approaches used in many national wealth estimates.

4.3.1 The Cost-Based Approach

Although the origin of this approach lies with Engel, what is now regarded as the cost-based method is associated with Schultz (1961) and Machlup (1962) who improved upon Engel’s approach. Under this approach, HC is estimated on the assumption that the stock of HC equates to the depreciated value of expenditure on areas considered to be investments in HC, determined of course by the researcher's standpoint (Laroche and Merette, 2006). Nevertheless, the stock of HC is estimated by its inputs.

The most influential examples in this field belong to Kendrick (1976) and Eisner (1985). Kendrick estimated the stock of HC to comprise the tangible costs, which mainly included child-rearing costs, up to the age of 14. Intangible investments were also included and dealt with quality enhancement costs such as education and training as well as health and safety (Laroche and Merette, 2006; Aulin-Ahmavaara, 2004). This approach provided a measure of the flow of resources in both educational and other HC related sectors.

Kendrick estimated US yearly national wealth from 1929 to 1969, and found that except for the years 1929 and 1956, the stock of HC comprehensively outperformed physical capital. Kendrick showed that including HC in the national accounts doubled the wealth of the US (Le, Gibson and Oxley, 2003). Although the fact that HC doubles wealth may be due to Kendrick's self-fulfilling prophecy, the overriding point of his analysis suggests that any omission of HC constitutes only a partial assessment of wealth.

Eisner slightly modified Kendrick's approach making some allowances for the valuation of non-market household contributions and including investment in research and development (Le, Gibson and Oxley, 2003, pp. 274-276).[101] Not surprisingly, Eisner's estimates (where HC made up almost 50 per cent of total capital stock) are quite similar to Kendrick's. The difference however was that Eisner's HC estimates were normally just below physical capital stocks while Kendrick's were usually above (Le, Gibson and Oxley, 2003).

There are however, several limitations to these cost-based approaches.[102] One is the distributed lag effect. Here, the summation of historical costs ignores the lengthy gestation period (the time between the input and actualisation embodied in the individual) and the social costs that are invested in people. The other limitations involve alternative theories of value. For instance, the relationship between investment and

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[101] Kendrick divided the investments in HC into tangible and intangible components, whereas Eisner classified all HC investments as intangibles.
[102] The main limitations presented here are a summary of Le, Gibson and Oxley (2003, pp. 274-275) and Laroche and Merette (2006, pp. 3-4).

quality output is seen as too simplistic, since quality is not equal to cost. Critics argue that value is determined by the demand not from its cost. For example, to look after a healthy child costs less than an unhealthy child, thus employing this method will result in an overestimation of the unhealthy child's HC, and an underestimation of the HC of the healthy child. Additionally, for a cost-based measure, the prices employed are not well identified. The lack of existing empirical evidence to identify costs results in a heavy reliance on the assumption of the researcher, particularly with regard to the classification of what constitutes consumption and investment. This can lead to substantial bias in the measure. Moreover, the depreciation rate used significantly impacts on the final estimate of the HC stock. For instance, Kendrick depreciated the HC stock employing a modified double-declining balance schedule, whereas Eisner used the straight-line method. These two approaches ignore HC appreciation which, contrary to the empirical evidence, shows HC appreciating with working experience before depreciating in later life (Mincer, 1958, 1970). Finally, as Jorgenson and Fraumeni (1989) point out, the focus on education and rearing costs ignores the value of non-market activities.

For these reasons, the cost-based method alone should not be seen as an accurate estimation of HC. Given this, the next measurement approach to be reviewed adopts an income-based approach.

4.3.2 The Income-Based Approach

The income-based approach measures the stock of HC by an individual's remuneration in the labour market via market prices at a discounted value.[103] The employment of market prices is meant to account, to a certain extent, for the other factors that comprise HC in an interactive framework of HC supply and demand. This incorporates aspects such as: professional qualifications, ability and the institutional and technological structures of the economy (Dagum and Slottje, 2000).

For instance, Jorgenson and Fraumeni (1989, 1992) conducted an encompassing income-based measure of HC as part of its new system of national accounts, by discounting the value of future incomes earned by HC that comprised both market and

[103] The origins of the measure rest with William Petty and William Farr (Kiker, 1966).

non-market actions (Aulin-Ahmavaara, 2004). Consequently, non-market activities (except schooling) required an imputation for labour compensation. They were able to show that the size of HC was 12 to 16 times greater than physical capital. Their 1992 estimate found US HC to be 17.5 to 18.8 times higher than Kendrick's estimation. These figures, and the approach itself, have been criticised.

For instance, a key assumption of the approach is that differences in wages accurately reflect differences in productivity. However, wages may change for a myriad of reasons, such as reflecting changes in economic rent, leaving a distinct potential for bias. The present research will also add that high incomes are not necessarily reflective of contribution to progress, for instance, the high incomes paid to Hollywood actors. Furthermore, critics have accused Jorgenson and Fraumeni of overestimating the stock of HC due to its handling of non-market activities and setting the retirement age too high at 75. For example, given that non-work time is fully imputed as a non-market activity, there will be no change in HC stock if the labour force was fully employed or only half employed. Thus, unemployment does not affect HC stock (Conrad, 1992). Additionally, the use of school years as a measure of productivity biases estimates of future expected earnings, while another shortcoming is that earnings data may not be as widely available as investment data (Le, Gibson and Oxley, 2003).

In response to the criticisms of the income-based approach, Mulligan and Sala-i-Martin (1997) developed a labour income-based measure of HC for the US. Rather than adopting a monetary value, they arrive at an index value of HC. Hence HC is measured as the total labour income per capita divided by the wage of the uneducated. Since total labour income incorporates both a worker's skills and the physical capital available to them, workers in areas of higher physical capital will tend to earn more, which Mulligan and Sala-i-Martin insist wrongly reflects HC amounts. Therefore, by dividing labour income by the wage of a zero-schooling worker, aggregate physical capital on labour income is accounted for. Thus, workers who possess the same level of education are weighted in proportion to their average wage level. This approach makes the assumption, albeit implicit, that the stock of HC of uneducated workers is identical across time and space even though they may earn different incomes. Since quality of schooling varies, inter-temporal and interregional differences arise; hence the only rational measure is the uneducated worker (Le, Gibson and Oxley, 2003).

A distinct advantage of this method lies with its inclusion of physical capital and how it can affect labour income. This feature allows the measure to incorporate disparities in the quality of schooling. Furthermore, unlike most other approaches, not only is the elasticity of substitution across workers allowed to vary, but it also does not fix identical sums of skill on workers who share equal years of schooling. Finally, it requires little data for analysis (Laroche and Merette, 2006; Le, Gibson and Oxley, 2003).

As with Jorgenson and Fraumeni, a limitation of this approach deals with how wages may change for reasons other than reflecting the marginal value of HC. Further, the model greatly relies on the problematic assumptions that totally uneducated workers are indistinguishable and that workers who possess different educational attainment levels are perfectly substitutable (Wachtel, 1997).

Crucially, for the present research, this measure neglects the impact of large informal sectors due to the absence of wage rates in this field, as well omitting non-formal inputs, such as informal schooling, on-the-job training and health (Jeong, 2002).

Overall, the inclusion of physical capital and in particular the proxy quality of schooling is, the current study claims, an important aspect of a national HC measure. However, the failure to capture informal, non-market areas, especially given the rise of the knowledge-based economy, suggest that an income-based method alone would not be able to accurately reflect today’s inter-disciplinary conception of HC. The third and final HC approach to review is the output-based approach.

4.3.3 The Output-Based Approach

The output-based approach employs proxy measures to represent quality of labour input. Much of the current HC research is based on this approach, with the two most popular inputs being *school enrolment rates* and *adult literacy rates*.

School enrolment rates are the gross measure of students enrolled at a grade level relative to the total population of the corresponding age group. *Adult literacy rates* focuses on the ability to read and write at a basic level. Both approaches have been used as proxies for HC in many major studies in an attempt to control HC in cross-country regressions. For the former, the most significant studies belong to Barro (1991) and

Mankiw, Romer and Weil (1992), whereas for the latter it is Romer (1989) and Azariadis and Drazen (1990). Worldwide publications such as the United Nations Educational, Scientific and Cultural Organization (UNESCO) statistical yearbooks, which publish the relevant data across a number of countries, made this particular approach quite popular, as empirical work was easily achieved. However, there are some misgivings about the approach.

The output-based measure has been criticised for possessing severe shortcomings, which do not accurately reflect the HC theoretical concept, hence producing unsatisfactory results. For instance, the focus on basic literacy only accounts for the initial stages of HC accumulation. Consequently, other educational investments in HC gained beyond this point, such as scientific and technical knowledge, are omitted, implying that these additions do not significantly add to labour force productivity (Barro and Lee, 1993). On the other hand, school enrolment rates focus on the flow of investments in HC, rather than its stock. This narrow focus only captures a fraction of the continuous accumulation of the stock of HC (Laroche and Merette, 2006). Furthermore, investments in education are quite time-consuming with a long time lag between schooling and future additions to the stock of HC (Psacharopoulos and Arriagada, 1986).

Additionally, the use of gross rather than net enrolment rates, due to greater data availability, is erroneous given that the stock of HC is changed by net additions to the labour force (the difference between the HC embodied in those joining the labour force and those retiring from it). This allows measurement errors related to the possibility that graduates may not participate in the labour force, as well as the presence of grade repetition and dropouts, which is particularly relevant for developing nations (Wobmann, 2003; Barro and Lee, 1993). The limitations of both the *adult literacy rates* and *school enrolment rates* as proxies for HC, have led to additional output-based measures such as *levels of educational attainment* and *average years of schooling*.

Psacharopoulos and Arriagada (1986, 1992) developed a measure of HC stock that is currently used in production. The measure is based on *educational attainment*, via the mean years of formal education embodied in the labour force, and has been employed by Barro and Sala-i-Martin (1995), Barro and Lee (1993), Barro (1997, 2001), Benhabib and Spiegel (1994) and many others. This too has been criticised.

Problems with this approach include issues with data. Since most measures are obtained from census data, which is only performed every 5 or 10 years, data becomes too infrequent to enable rigorous analysis. Also, in some studies, education is only valued if one participates in the labour force, resulting in the HC stock being undervalued, particularly for women (Laroche and Merette, 2006).

Additionally, by specifying HC as *average years of schooling*, it implies that the productivity differentials among workers are proportional to their years of schooling. For instance, an individual with 6 years of schooling is 6 times more productive than an individual with 1 year of schooling. According to the work of Psacharopoulos (1994), this disregards microeconomic literature which shows decreasing returns to schooling. Such an interpretation however, depends on the size of the coefficient in the regression equation. Of course, any system which assigns the same weight to a year of schooling no matter what the school system fails to take into account issues of educational quality over time, such as: teaching, curriculum, infrastructure, student to teacher ratio, etc. (Wobmann, 2003).

These omissions highlight the importance of the need for more comprehensive measures. In developing such a measure, Wobmann (2003) argues that two vital features of HC specification need to be acknowledged, and if possible, incorporated to help avoid understating the HC variable. They are an accurate assessment of rates of return to education and quality of education. Wobmann declares that data on international differences in quality of education adds a large amount of extra information into the HC measure. As mentioned in the previous section, since the works of Mincer (1958, 1970) and, despite some variations, Becker (1962, 1964), countless studies assess the log earnings and report estimated coefficients.[104] Another one belongs to Ashenfelter and Rouse (1999) who assessed returns to education and concluded that additional years of schooling increased the future financial returns to education. In effect, possessing a degree earns a person a higher income over time. Another issue not

[104] In fact, many scholars refer to it as the “Mincer rates of return”.

dealt with is the trade-off between school and other, whether it is labour or leisure. One study conducted by Heckman, Lochner and Todd (2006), concluded that the large estimated psychic costs of schooling was one explanation for non-attendance at school despite the incentive of greater financial rewards.

In 2000, Bils and Klenow attempted to incorporate the rate of return; however problems of data availability, specifically the failure to assess ability and social benefits, gave the measure a bias that led to it carrying more noise than information (Barro and Lee, 2001). Attempts have also been made to assess quality of education, such as Barro (1991) who used *student-teacher ratios* as a proxy for quality of schooling. Then in 1995, Barro teamed up with Sala-i-Martin to employ a *government-spending ratio on education to GDP* (Barro and Sala-i-Martin, 1995). A year later, Barro and Lee (1996) expanded this notion to include *educational expenditure per student, student-teacher ratios*, *teacher salaries* and *length of school year*. In 2001, Lee and Barro added family inputs to the list, which proved to be a strong determinant of educational quality.

Interestingly, a study conducted by Hanushek and Kim (1995) that focused on test scores as the outcome measure, found that proxies for quality such as *teacher-to-pupil ratio* or *resources expended per student* did not possess significant correlation to results. This has since been reinforced by many other studies (Hanushek and Kimko, 2000). One reason given for this poor result is that quality of education is heavily influenced by differences in institutional features, such as educational infrastructure (Wobmann, 2003). An alternative lies in the direct measure of individuals’ cognitive skills, which can be assessed via the results of standardised international tests of student achievement in mathematics and natural sciences (Gundlach, Rudman and Wobmann, 2002).

The varied approaches suggest that there exists a myriad of ways to define HC, all dependent on the researcher’s intent. Human capital is a concept that encompasses many dimensions and acquiring points making it quite a complex phenomenon. For instance, since it is embodied in humans: it is non-tradeable (except in the case of slavery); has both qualitative and quantitative aspects; can be either general or specific; and contains external effects from the social environment and the institutional context in which they live, which continually shapes its acquisition (Laroche, Merette and Ruggeri, 1999).

Although the multifaceted nature of HC makes defining it problematic, a consensus of sorts emerged with the OECD (2001) definition. Here, HC is defined as comprising the knowledge, skills, competencies and attributes embodied in individuals that facilitate the creation of personal, social and economic wellbeing (OECD, 2001).

As the review demonstrates, the three main measurement approaches all exhibited major limitations. So much so, that leading researchers specialising in the knowledge economy are of the opinion that current HC specification alone, no matter which approach one takes, cannot accurately identify and assess developments in the field. At best, it is seen as a partial measure. This reasoning has led to the creation of IC measurements.

4.4 Intellectual Capital and Knowledge Management

As rapid technological change transforms society economists have adopted the term "knowledge economy". Although used to describe the present day, the idea itself is not a new one. One such precursor lies with the Industrial Revolution. During these times, the late eighteenth and early nineteenth centuries, countries also experienced a growth of useful knowledge that led to great technological changes that transformed society (Mokyr, 2002). From a conceptual standpoint, the term IC was first employed in 1958 by two financial analysts to depict the stock-market appraisal of several small science-based companies, of which Hewlett-Packard was one. They stated that the IC of these companies was perhaps their single most important element (Stewart, 2001).[105]

Currently, the introduction of knowledge into products and services has given labour an entirely different slant.

> In contrast to the majority of labour before, which was simple and routine, now the majority of labour is tied to knowledge and the ability of the employees to transform it into profitable action. (Pulic, 2000, p. 703)

The rapid pace of current technological breakthroughs has altered the traditional balance of the economy. This has enabled traditional capital, land and labour poor countries the opportunity for increased levels of progress via an emphasis on knowledge and

[105] In 1962, Machlup used the term IC to highlight the significance of general knowledge as indispensable to growth and development (Bontsis, 2004). However, it was not until the 1980s that Karl-Erik Sveiby produced the first analysis of the nature of IC, albeit at a firm level.

innovative production (Kahin, 2006).[106] This is best illustrated in the cases of Singapore, Taiwan and Hong Kong who have achieved higher levels of progress without the advantages of natural resource endowments (Abdulai, 2001).

Given the potential importance of knowledge to society, a measurement is required to ensure it is managed appropriately. Consequently, interest in IC measures is at its peak. However, like HC, the characteristic of IC makes it quite difficult to measure. Moreover, the increasing importance of defence and hi-tech industries to developed countries reinforces the need for an expanded HC measure that incorporates IC. Increasingly, the design stages in this industry are performed in developed countries, whereas the manufacturing takes place in developing countries. As a result, measurements of IC become more important for developed countries and essential for the measurement of economic value.

Given the rapid onset of information technologies, and the increasing importance of knowledge, new methods for the evaluation of intangible assets as well as the tangible aspects of process and outcome are needed. With innovation becoming an important condition of progress, it is imperative to introduce planned strategies (expert systems) for the collection and documentation of ideas and suggestions by employees (tacit knowledge), as well as the creation of an environment that stimulates creativity (Foray, 2004). In fact, Foray (2006) declares that the spirit of knowledge creation lies in its links with social wellbeing. Thus, any measure of human contribution to progress needs to integrate knowledge management theory to account for its intangible aspects.

Not surprisingly, concerns have arisen as to whether macroeconomic statistics can accurately trace the changes in the information society (Van Ark, 2002). Despite the vast majority of IC frameworks resulting from an accounting and financial perspective at the firm level, these concerns eventually led IC theorists to expand the concept to incorporate nations, which led to the onset of national IC measurements. Here, the IC of a nation consists of: '… the hidden values of individuals, enterprises, institutions, communities and regions that are the current and potential sources for wealth creation' (Bontsis, 2004, p. 14).

[106] Of course, this also applies to traditionally 'rich' countries as well.

For Bontsis (2004), Andriesson and Stam (2005), and many others, national IC measurement is addressed through a list of indicators based on the Skandia Navigator IC common nomenclature (Hervas-Oliver and Dalmau-Porta, 2007),[107] where the IC of a nation consists of HC as well as structural capital.[108] In essence, structural capital is the supportive infrastructure of HC, assisting a nation to own and utilise knowledge resources. It encompasses legal rights of ownership, technologies, inventions and publications as a means to transform knowledge into explicit knowledge measured by its benefit or value to society (Bontsis, 1998; Sullivan, 1999).

Hence, national IC measurements based on the Skandia Navigator employ four key constructs, they are: HC (which was reviewed earlier); process capital; market capital; and renewal capital.[109] Very briefly, process capital is the knowledge entrenched in a nation's information and communication technology (ICT) systems, such as its hardware, software databases, laboratories and organisational structures. All this enables knowledge to be processed stored and retrieved enhancing a nation's ability to derive value from it (Bontsis, 2004). This concentration on ICT structures will be employed and further explained in the next chapter, as part of the present research's conceptual framework (see Section 5.6.1).

Market capital is made up mostly of intangible assets, although it also incorporates quality exports. Essentially it involves social networks, which allows it to draw some comparisons with social capital, specifically national intra-relationships. These potential relationships allow the nation to enhance and extract value from knowledge. A part of this construct is the notion of a net brain gain, where knowledge transfer occurs via the migration of tertiary graduates (Bontsis, 2004).[110] The net brain gain concept will be taken up in greater detail in the next chapter (see Section 5.5.1).

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[107] Other national IC measurements can employ national competitiveness partially explained by IC components such as the *Global Competitiveness Index*, while another avenue is to employ a non-IC Skandia common nomenclature. The latter though is used more for a regional analysis (Hervas-Oliver and Dalmau-Porta, 2007).
[108] Structural capital consists of market capital and organisational capital, from which organisational capital is then split into process capital and renewal and development capital (Malhotra, 2003, p. 23).
[109] The national view of IC is only in its infancy. The more prominent national IC analyses are: Rembe (1999), Pasher (1999), Bontsis (2004), Andriesson and Stam (2005) and Edvinsson and Bounfour (2005). In the 1980s Karl-Erik Sveiby, began an investigation that produced the first analysis of the nature of IC, but it applied to organisations and not nations.
[110] What constitutes net brain gain is subjective. It can be defined as tertiary educated persons or those with a trade as well.

Renewal capital revolves around a nation's capacity for and investments in R&D. This concept demonstrates a link between continued investment and sustained economic growth. In fact, Bontsis (2004) adds that its imperativeness is due to the direct relationship it has to the success of a nation's financial system. Research and development expenditure, patents and scientific publications assess its effectiveness. The inclusion of patents under renewal capital is due to its ability to act as a fundamental incentive for innovation and renewal. Since it protects information, it provides firms with the ability to generate revenue and thus provides an incentive to undertake innovation. Of course, as Antonelli (1999) and Striukova (2007) point out, the downside is the tendency for patents to delay dissemination and for monopolistic rents to continue for too long. However, Striukova (2007) adds that public patent disclosure can also enhance knowledge spillovers of codified knowledge, facilitating creativity and innovation. This construct, with its strong emphasis and link between R&D and economic growth, will also be adopted in the next chapter under the heading knowledge renewal.

By offering an expanded alternative to traditional HC approaches, the interdisciplinary approach of IC measurements open up another avenue for the present research to draw on regarding its measurement.

4.5 The Need for a Greater Human Capital Measure

The IC review illustrates how the omission of IC would lead to a severe underestimation of the human resource contribution to progress. The complexity of attempting to measure HC is reflected by the sobering thought that even in countries that attempt to estimate the value of HC, official statistical agencies continue to omit their inclusion (Le, Gibson and Oxley, 2003).[111] This simply makes the need for a reliable measure even greater.

The interdisciplinary and heterogeneous characteristic of knowledge production emphasises the need for greater and more comprehensive measures than those employed in traditional HC measurement. In fact, any attempt at measurement must incorporate an interdisciplinary theoretical foundation, especially for concepts where one is dealing

[111] Of course, the statistical agencies may still publish data on their components and dimensions.

with, as Malhotra (2003, p. 36) states, 'an analysis of complex constructs that defy the bounded logic of specific disciplines'. Thus, what is needed is the combination of analytical thinking (the ability to think logically, break things down and recognise cause and effect) and synthetic thinking (the combination of ideas into a complex whole), where the latter is an essential part of the design process and the former assists with their representations.

It is essential therefore that any definition, measurement and specification of the human contribution to national progress allow it to capture *most* of its inherent features. Hence, the current study asserts that a national progress measure would be best served by integrating aspects of HC, IC and knowledge management theory under the one banner – human resources.

This broader conceptualisation acknowledges that many factors play a role in its acquisition. Consequently, a measurement reflecting the contribution of human resources to national progress should attempt to incorporate the quantity and quality of education, on-the-job training, medical care, nutrition and other informal activities that go alongside formal education (Wobmann, 2003). It also needs to integrate the concepts of net brain gain and knowledge renewal which were discussed above and are elaborated in the next chapter (see Section 5.5.1). As illustrated in the HC review, this can best be achieved via a non-monetary approach since it allows a greater representation of the aforementioned variables. A monetary approach, on the other hand, lacks accurate market valuations making the analysis too restrictive. By integrating information on these factors, the human resource contribution to progress can more readily fit into a more comprehensive national progress application.

Of course, comparisons based on these measures must be approached with caution given the combination of imprecise definitions and lack of data. This however, should not stop attempts at measurement,[112] since it acknowledges existence and broadens the scope for decision-making (Guthrie et al., 1999).

[112] This can be seen with the works of: Edvinsson and Malone (1997), Sveiby (1997), Kaplan and Norton (1992, 1996) and Roos et al. (1997). Although at a firm level, national IC measures refer to key elements of these approaches in their conceptualisation.

Another integral part of progress measurement to come under consideration is the concept of NC. Like HC, NC has also been subject to varied measurement approaches which will form the main focus of the following review.

4.6 The Emergence of Natural Capital

In the eighteenth and nineteenth centuries, classical economists had no genuine conception of scarce or depletable natural resources. In fact, economic growth was viewed as a net improvement to the overall resource base, and sustainable growth was synonymous with persistent short-term growth (Faucheux, Muir and O'Connor, 1997). By the late nineteenth century, the first accounts of what is now known as ecological economics appeared in the works of both Podolinsky (1880) and Sacher (1881).[113] The former attempted to measure the output/input ratio in agriculture in energy terms, while the latter discussed energy and human society.[114] Then, in 1931, Harold Hotelling conducted what was the best known of these early attempts on the economics of depletable resources (Martinez-Alier, 1987).

However such interdisciplinary approaches, like those mentioned above, were given scant attention. In fact, it was not until the late 1960s and in particular the energy crisis of the early 1970s that the issues of sustainability and economic growth were debated. During this time, a report to the Club of Rome, conducted by scientists at the Massachusetts Institute of Technology, launched the first computer-modelling attempt aimed at making mathematical predictions of when the earth's resources will be exhausted. The report was called *The Limits to Growth*. The results suggested that existing population and economic growth rates were unsustainable to the earth's environment and needed to be curbed (Meadows et al., 1972). The release of this report led to greater environmental awareness, placing the environment on the agenda for policymakers. However, the limits-to-growth argument had lost its popular appeal by the end of the 1970s, due to the failure of predicted short-term imminent disasters to materialise, and the non-depletion of oil and minerals (Beder, 1993).

[113] The term economic energetics was used back then (Martinez-Alier, 1987).
[114] Some scholars, such as Anderson (2004, pp. 333-334) claim it dates as far back to Malthus' *'An Essay on the Principle of Population'* in 1798, which claimed that imperfect human self-discipline would take population curves on a collision course with resource curves in the nineteenth century. Although Malthus' timing may have been wrong, his concern that a growing population must at some point outstrip earth's resources remains. This idea had been around prior to Malthus' work.

In the 1980s the issue of sustainability was renewed, however the focus had changed. With the national accounts fixation regarding market exchanges continuing to inadequately assess resource depletion, a growing consensus emerged regarding incorporating the concept of sustainability into national measurements. This led many economists to explore the idea of a sustainable development model.

Not surprisingly, approaches regarding the appropriate way to construct the sustainable development model varied depending on the researcher's epistemological standpoint. As a result, the issues surrounding the measurement of sustainability itself created controversy. In particular, there was much disagreement as to which type of sustainability best reflected the earth's current predicament. This issue, which is evaluated in the following section, is yet to be resolved.

4.7 The Sustainability Dilemma

In the 1940s, the impact of obsolescence on national income was seen as critical in economic analysis. Specifically, it concerned the maintenance of physical capital against economic capital. During this time, Pigou (1941), Hayek (1941) and Hicks (1942) all released papers regarding maintaining capital stocks as part of the definition of income. This was later expanded to incorporate NC aspects (Harris, 2005).

Environmental sustainability as it is known today revolves around the Hicksian income definition. The concept of Hicksian income however is a very complex one, a fact acknowledged in Hicks' work. In fact, Hicks went to some length to highlight the differences between an economic and accounting approach to income while providing a myriad of context specific income definitions, such as: constant wealth, non-declining consumption and price changes (Hicks, 1946). However, rather than acknowledging Hicks' linked income definitions, economists ignored this and instead converged Hicks' constant consumption definition with his capital maintenance definition to haphazardly arrive at a singular concept of Hicksian income. This oversimplification is contrary to Hicks' work on maintaining consumption possibilities (Harris, 2005).[115]

[115] Harris (2005) states that this oversimplification arising from Hicks is due to the many interpretations that are basically deviations on the idea of income as a return to wealth. This is the main premise in economic debates of income. Not surprisingly, Hicks was sceptical regarding the measurement of true sustainable consumption.

Nevertheless, the legitimisation of the singular Hicksian income was complete with the release of the 'The Brundtland Report' (Brundtland, 1987), which defines sustainable development along the aforementioned singular concept of Hicksian income. Here, sustainability must not compromise the ability of future generations to meet their needs while still satisfying present needs (Daly and Cobb, 1994).

This criterion for sustainability therefore is the maintenance of consumption levels defined as gross output minus investment. Under this scenario, capital is the all encompassing driving force that not only supplies production, but also stimulates consumption and in turn provides welfare. Consequently, welfare is inextricably linked with capital. Thus, non-declining capital becomes the equivalent to non-declining welfare. This oversimplification, which centres on the availability of capital, is seen as a useful, if imperfect, guide for resource allocation (Anderson, 2004).

Not surprisingly, the adoption of Hicksian income has brought much controversy, specifically over the question: what in fact constitutes sustainability? There exist two operational guiding principles, weak sustainability or strong sustainability.

A weak sustainability approach is a level of sustainability that revolves around a proper measure of sustainable income. A proper measure of income is seen as the maximum value that can be consumed in a given period without leaving a person or country worse off than before (El Serafy, 1997). A weak sustainability approach therefore, assumes that the creation of new technologies or the discovery of raw materials will allow a nation to adapt to the depletion of resources. Here, the make up of the stocks is immaterial since deteriorating NC should be offset by increases in physical capital, thus what matters is the total capital stock (Hartwick, 1977; Solow, 1986).

This weak sustainability approach is also known as Hartwick's rule, which was a rule for ensuring non-declining consumption through time (Barbier, Burgess and Folke, 1994).[116] Under this approach, a nation that has zero population growth and no physical capital depreciation will experience a constant per capita consumption as long as net returns from natural resources are invested in physical capital. This could be achieved

[116] In Barbier et al. (1994) Hartwick's rule is referred to as the Hartwick-Solow rule.

by investing all Hotelling rents from non-renewable resource extraction in man-made capital (Hartwick, 1977). The implication of the assumption of perfect substitutability, which is reviewed below, has raised concerns with some questioning the validity of the rule (Asheim, Buchholz and Withagen, 2003). Even so, the weak sustainability approach has widespread appeal due to its ability to incorporate environmental concerns into the GDP/GNP. It was a key platform of the GS measure reviewed in the previous chapter (see Section 3.5.3).

The implications for national progress measurement are disconcerting. For example, even though irreparable damage may occur to the NC or natural resources available for creating progress, so long as alternative sources for progress creation generate the same income, future generations will not be any worse off. This of course is contrary to the empirical evidence cited in Chapter 1 (see Section 1.4) regarding the non-linear relationship between income and welfare. Furthermore, this ease of substitutability makes the weak sustainability approach primarily about sustaining income flows, and not necessarily about sustaining the environment (Martinez-Alier, 1995). Thus, by the time an indicator that employs the weak sustainability methodology signals a change from positive to negative sustainability practices, significant and perhaps irreversible damage to the environment may have already occurred. Similarly, a country can maintain total capital stocks and yet experience environmental degradation and pollution. This has led some to argue that the neoclassical weak sustainability approach to measuring NC should be seen as merely didactic (Faucheux, Muir and O'Connor, 1997).

Contrary to weak sustainability, which merely views NC as an input to production, a strong sustainability approach focuses on maintaining the stocks of resources, both natural and human. This does not mean that no non-renewable natural resource can ever be used, but rather that total output capital should be kept intact. Thus, any reduction in one type of capital must be offset by accumulation of another type of capital (El Serafy, 1997). Here, NC is seen as a complement and not a substitute of physical capital and an important part of social welfare.

Those who argue for a strong sustainability approach often point out the properties of NC in making their defence. For instance, the non-substitutability of the ozone layer;

uncertainty over possible future substitutions of NC; irreversible losses with species and habitats that cannot be recreated through man-made capital; and issues of equity, for instance, substituting natural resources, may hurt the poor who then may not gain from other additional monetary benefits. Hence, assuming physical capital can take the place of water, air, biodiversity, etc. is a dangerous practice (Beder, 1993). Such measures of strong sustainability are *net carrying capacity* and the *ecological footprint*.

However, both the weak and strong sustainability approaches still share commonalities. For instance, both have an economic focus, more concerned with assessing the stage where environmental limits start impinging on economic growth, rather than the other way around (Martinez-Alier, 1995).

The debates surrounding sustainability could quite easily lead to an unhealthy preoccupation when determining whether to measure NC from a weak or strong sustainability perspective. The present research agrees with Harte (1995) who argues that the most fruitful path probably lies in following something between the two extremes. For example, it is unrealistic to think that no consumption of non-renewable resources will occur, hence some compromise between the environment and progress creation needs to occur when undertaking an evaluation; an evaluation made more difficult, given the dearth of visible market prices. This has led economists to propose a number of alternative approaches to evaluating environmental costs and benefits. The next section reviews the main ones.

4.8 Valuing the Environment

The main types of values that exist to assess NC are *use-values* and *passive-use values*. *Use-values* derive from the benefits that individuals obtain firsthand from environmental resources and their by-products, such as hiking trails or natural beauty. *Passive-use values*, on the other hand, can be broken into *option values* and *existence values*. An *option value* is the value to a person who might use the environment in the future, whereas *existence values* cover the possibility of not ever using the resource or its by-products (Barde and Pearce, 1991; Anderson, 2004).

These types of values have opened up the possibility for economists to employ a number of environmental valuation procedures for non-market situations. The main valuation techniques comprise the following.

Contingent valuation. This creates an artificial market via responses to hypothetical survey questions that ask people what they would be willing to pay for conserving or repairing the environment. This approach tends to reflect the minimum value people place on the environment as people normally underestimate the cost associated with repairing the environment if they think they are a chance to pay. It also ignores the conflict between personal preferences and social preferences (Swaney and Olson, 1992).

Hedonic pricing. This involves the use of proxies (normally property market or labour market values) by assessing the impact environmental change has had in these areas. This somewhat narrow focus (property and labour market) means that passive-use values are omitted.

Actual market values. This technique is based on aspects of the environment traded in the market place, such as the actual loss in industry output (soil erosion measured by value of crop output), or market place costs (price of food and clothing attributable to biodiversity) borne by consumers due to environmental changes. This also includes assessment of recreational benefits via the travel cost method, which takes market expenditures for travel as a complement to environmental goods. This provides an indirect indicator of the use-value of these assets.

Opportunity costs occur when a value is placed on an area of the environment that is to be preserved from development. This however, can only be a partial measure of environmental value. While *maintenance costs* are equal to the hypothetical cost of keeping environment standards intact. It is the lowest (hypothetical) cost of keeping the environmental standard unchanged during the accounting period.[117]

[117] The valuation methods were obtained from a combination of: Barde and Pearce (1991, pp. 5-6), Beder (1993, pp. 48-50), Anderson (2004, pp. 203-207) and Aaheim and Nyborg (1995, p. 61).

Another aspect to consider is discounting which allows economists to incorporate the time value of money, however much controversy surrounds this technique, which values modest instant gains more highly than future catastrophe costs.[118]

The valuation methods outlined above are in keeping with the predominantly microeconomic neoclassical attempts to employ monetary values on environment externalities. However some macroeconomic approaches do exist. In fact, a number of national progress measures attempt to incorporate the environment.

Most macroeconomic attempts usually follow one of two approaches. For environmental valuations seeking to comply with traditional economic analysis, a capital-theoretic approach is normally adopted. These adjusted net product measures more accurately reflect the Hicksian capital constant income measure (Harris, 2005). Under this first broad approach, changes to the stocks and flows of natural resources, which have been extended to include resources such as timber, oil, etc. are adjusted similar to physical capital.[119] Thus, the preservation of the stock of environmental assets, are accounted for by concentrating on the economic stocks and flows of NC.

The most notable example of this is SEEA, which accounts for the changes in the stock of environmental assets (see Section 3.5.2). Other attempts at the depreciation approach involve economists such as Repetto, Hartwick and Maler.

For El Serafy, this attempt at "green accounting" simply summons economic and accounting principles necessary for correctly estimating income, which are necessarily sustainable by definition. However, this meant that value judgements concerning the desirability of protecting the environment were excluded making the depreciation approach limited in its ability to detect environmental variations. This separation of the economy and the environment meant that a comprehensive account of environmental depreciation via the national accounts was ineffectual; hence El Serafy proposed a user-cost method for accounting for exhaustible resources (El Serafy, 1997).

[118] Daly and Cobb (1994, pp. 151-158) illustrate how discounting is a messy and disputed business about which even economists disagree.

[119] Aaheim and Nyborg (1995) cite Weitzman's (1976) seminal article, 'On the welfare significance of national product in a dynamic economy', as establishing the theoretical background for greening the net national product. For Weitzman, *all* sources of economic growth (HC, NC, etc.) had to be included in the notion of 'capital'.

The user-cost approach (also known as the El Serafy approach) argues against both treating resources as capital and the use of the depreciation approach, instead focusing on value-added. El Serafy's method proposes estimating the maintainable income flow that could be produced from the earnings of the resource depletion, as a more accurate account of the value-added from resource depletion. Furthermore, since the approach does *not* make an adjustment to net capital, it does not represent an adjustment from gross product to net product, making it a more accurate measure of value-added. The impact of this alternative approach[120] meant that many empirical studies, which employed both methods found great disparity in the findings (Harris, 2005).[121]

The other broad approach to "green" the national accounts is to use economic welfare indicators, which focus on the environment's effect on economic welfare. This broader estimation differs insofar as it includes aspects such as sustainability, non-market activity and defensive expenditures. Examples of these indicators are the index of sustainable welfare and the GPI (see Section 3.6.1).

Most economists favour the use of market prices as a valuation of the environment on both pragmatic grounds, and for the ease in which comparisons can be made. Not surprisingly, given that the environment is predominantly a non-market area, these valuation techniques have been criticised by many environmentalists due to their inappropriateness.

4.9 Critics of Valuation Techniques

Generally, when valuing the environment, economists tend to adopt an anthropocentric technique, which is based around human-centred beliefs that questions the environment's worth to humans. The alternative is an ecocentric standpoint, which assigns environmental values in the absence of human life. Consequently, the most fervent critics of anthropocentric analysis are, of course, ecocentrics. The major ecocentric views belong to deep ecologists and ecofeminism.[122]

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[120] Harris (2005) cites Hartwick and Hageman (1993) who argue that El Serafy's measure is not really an alternative approach. Rather, it is reconcilable with a capital-theoretic depreciation measure.
[121] See Common and Sanyal (1998) and Neumayer (2000), which contrast the differences between the two methods.
[122] Anderson (2004) also includes social ecology as a major ecocentric view. Social ecology connects environmental interests with socialistic ideas, and works within a framework of revolutionary libertarian socialism.

Deep ecologists favour an approach where ecological and not human need becomes the main framework for analysis (Barry, 1994). Thus, evaluations regarding environmental assets should be made on ecological principles and not one-dimensional economic assumptions, which are based exclusively on individual preferences. Such assumptions are insufficient, reductionist, and not in the national interest (Barde and Pearce, 1991). This deep ecology position has been criticised by the ecofeminism movement due to its apparent gender blindness.

Ecofeminism, which links environmentalism with feminism, argues that the control of women is connected with the control of nature, and is reflected in the measures of NC, which reinforce the domination of man over both the environment and women. Thus, women and nature remain on one side of the dualism, with man on the other side, separate from both. Thus, ecofeminism argues, it is this epistemological division of man from the environment that needs to be addressed. Ecofeminism therefore, advocates environmental measures to centre on the interrelated fields of feminism, development and community (Anderson, 2004).

Other broader criticisms regarding the use of market prices exist. For example, some view its application to assess resource scarcity as something that constitutes a fallacy of circular reasoning (Norgaard, 1990). Others claim that employing market prices tends to inaccurately reflect the real costs and benefits provided by the environment (Norton and Noonan, 2007), as indirect costs tend to be overlooked, leading to advocating policies that environmentalists consider undesirable (Aaheim and Nyborg, 1995). Further, as mentioned previously, the use of market prices tend to return positive results (such as the Hicksian change in value of capital stock), when in fact the nation may be pursuing an unsustainable path, questioning the reliability of the technique (Faucheux, Muir and O’Connor, 1997).

Additionally, by placing a price on the environment, it becomes part of a narrow economic debate, a debate where the priority will always be with the economic bottom line. The net result will lead to greater control for economists to exercise over the environmental process. Consequently, the status quo of having the environment play second fiddle to economic concerns is maintained. Hence, pursuing market valuations comes at the expense of fundamental change which would have economic considerations on par with both social (whose impact on the allocation of natural resources is omitted) and environmental considerations (Beder, 1993). Although there are approaches that include non-financial benefits into the economic bottom line, their consideration is of a secondary and subservient nature. This difference in standpoint lies at the heart of the matter.

The arguments surrounding valuation techniques are not new. However, although the thought of valuing the environment in dollar terms is anathema to most environmentalists, the fact remains that every time the environment is not valued it will be discounted. Moreover, every time a decision is made regarding the environment a monetary valuation is implied, for instance, the construction of the ‘missing link’ of the M3 motorway in Britain. In this particular example, building a tunnel that would have avoided destroying an area of natural beauty would have cost the government 92 million pounds, their decision to select the non-tunnel option implied that the environmental area was not worth this amount (Barde and Pearce, 1991). This is similar to the arguments put forward in the previous chapter (see Section 3.4.1), that unless environmental factors are explicitly included in the measure the implied value equates to zero (Cobb, Halstead and Rowe, 1995).

The recognition that the environment needs to be incorporated into progress studies is almost universal, and is reflected in the growing number of studies that have explicitly incorporated NC in their measure (MEW, GS, GPI, HPI, EDP, etc.). It has also, as this review has demonstrated, spawned a number of evaluative techniques. However, as yet there exists no agreement as to which is the preferred approach leaving the future of NC measurement somewhat in the air.

4.10 The Future of Natural Capital Measures

To continue with measurements that simply adjust GDP does not accurately represent the contribution that NC makes to progress. What is required is an approach that does not rest on narrow economic outcomes, but rather involves a more collectivist, interdisciplinary approach. Consequently, the valuation methods reviewed earlier that reflected micoreconomic neoclassical monetary valuations will *not* be incorporated.

The present research recognises that natural resources (used for consistency with the term human resources) perform many welfare-related functions (Barbier, 1989), and are a tangible source of progress mainly provided by, but not exclusive to, water, land, air, trees, fish and wildlife (Prescott-Allen, 2001). All these factors, as mentioned in the review of NC, are omitted or under-valued when adopting a monetary approach. This diversity of natural resources demands an interdisciplinary approach that will allow most of the aforementioned inherent features to be captured.

Given the environment's acknowledged importance to progress, any attempt to describe the environment's state should emphasise the significance of environmental stocks, in physical, *not* monetary, units. The use of monetary units can be more confusing than illuminating and lead to poor policy initiatives (El Serafy, 1997). This will provide a more accurate indicator of the environment (Aaheim and Nyborg, 1995).

As Norton and Noonan (2007) assert, if an integrated and comprehensive approach is favoured to assess environmental change, then one needs to develop a pluralistic, but integrated, system of evaluation and policy. This contribution can best be captured, this study argues, by adopting a pluralistic approach for the foundational principles of NC (Norgaard, 1989a; Harte, 1995). In effect, this will reflect a broader estimation similar to the GPI, with the significant difference being the use of physical (non-monetary) units rather than monetary values. Hence, it is outcomes that will take precedent.

The final concept in this chapter up for consideration is SC. Unlike the other two concepts; this has only very recently caught the widespread attention of economists regarding its potential value in progress estimation. However, this is where the agreement ends.

4.11 Introducing Social Capital

Although the concept of SC has come into prominence only relatively recently, it was Hanifan whom first introduced the term in 1916. He was writing to urge the importance of community involvement to provide quality education (see Hanifan, 1916, pp. 130-

138). Likewise, certain themes of SC can also be found in the economic literature of the 1920s regarding institutions (Grootaert, 1998).[123]

Despite these writings, the term SC laid dormant for over half a century before appearing in a study by Jacobs in 1961 that analysed the role of networks in city neighbourhoods (Productivity Commission, 2003). In 1977, Loury expanded the term to criticise the neoclassical narrow individualistic standpoint, which he believed denied the critical effect that an individual's social origin has on the amount of resources that is eventually invested in his or her development (DeFilippis, 2001).[124] This individual decision framework still exits in most progress measurements.

Such a framework excludes more complex aspects of human behaviour, such as collective decision-making, where fairness is just as important as selfishness in predicting human behaviour (Gowdy and Erickson, 2003). The present research argues that rather than excluding the impacts SC has on progress, an accurate progress measure needs to incorporate an explanation for the way in which economic actors interact and organise themselves.[125]

As with the HC and NC concept, a major factor in the exclusion of SC in progress measurement is due to the contentious nature of its conception and measurement. Consequently, this study will review the current literature and propose a justifiable and valid interpretation for its inclusion in progress measurement.

4.12 Social Capital as a Concept

Social capital is the most problematic of all the progress determination concepts. On a broad conceptual level there is agreement on the relevance of SC, which has been used to explain differences in progress exhibited by nations with similar NC, HC and

[123] Woolcock (1998, p. 160) adds that issues relating to SC can in fact be traced to the Durkheimian, Weberian and Marxist traditions in classical sociology. Additionally, the likes of Edmund Burke, David Hume and Adam Smith had also expressed related sentiments. Zafirovski (2005) adds that Durkheim and Weber were the basis for the social embeddedness concept.
[124] Loury (1977) introduced the term SC in an analysis that dealt with racial inequality. He used the term to describe the ethnic communities access to social resources.
[125] The attitude of economists towards SC can be summed up by (Krugman, 1994, cited in Fairbanks, 2000, p. 272), "Economists are notoriously uninterested in how people actually think or feel".

physical capital endowments.[126] However, no consensus exists over the definition of SC; its make up, how it operates, whom it applies to, and how to differentiate between its sources, manifestations and effects (Productivity Commission, 2003). Despite its problematic nature, four broad approaches exist that can help define it (OECD, 2001).[127]

(i) Anthropological: this has a biological basis for social order, where humans have a natural instinct for association and forming groups for mutual benefit is part of human nature (self-interest).

(ii) Sociological: emphasises social organisation, in particular aspects of trust, reciprocity, and networks of civic engagement, which reflects self-interest at an organisational level.

(iii) Economic: it focuses on how individuals' interact with each other out of self-interest (individual self-interest to maximise personal utility) and how they invest and draw on resources.

(iv) Political: emphasises the role of institutions, and political and social norms in shaping human behaviour.

Institutions, which are the rules that guide how people within societies live, work and interact with each other, consist of two types. Formal institutions are the written or codified rules (common law), such as organised markets and property rights, while informal institutions comprise the social and behavioural norms or traditions of society, like families (North, 1990). Institutional theory claims that, it is the quality of the political, legal and individual environment that societies find themselves surrounded by, which determines whether social groups are able to act in their collective interest. Institutions also help shape the development and maintenance of SC. For example, a lack of strong institutions can lead to corruption, property rights not being enforced and markets not "functioning efficiently".[128] All this increases uncertainty and adversely affects the allocation of resources, and ongoing trade and investment (North, 1990; Olson, 1982). The work of North and Olson assert that differences in per capita income

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[126] This can also be seen in the provocative title of Grootaert's (1998) article, 'Social Capital: The Missing Link?'.

[127] Of course, this generalised viewpoint does not imply that all scholars in these disciplines subscribe to it, rather a majority do.

[128] Grootaert (1998) reinforces this view. However, the belief that markets function effectively due to the presence of strong institutions is contested. This is demonstrated with measures such as the Australian and US GPI, which are responses, in part, to the inability for markets to operate effectively in the allocation of resources. Yet both countries are seen as possessing strong institutions.

of countries arise from their institutions, types of SC and public policies (Grootaert, 1998).

While the aforementioned disciplines (anthropological, sociological, economic and political) adhere to self-interest, whether it be at an organisational or individual level, all view SC as a way in which people can be empowered by gaining access to power and/or their ability to draw on resources via the set of norms, networks and organisations where policies are made. From this, notions of institutions, group memberships and cohesiveness are already identified.

Despite the identification of similar traits among these four diverse disciplines, agreeing on the make up of SC has proved to be quite difficult. This is reflected in the varied definitions of this concept, all of which mirror the different standpoint entries of their author. For instance, Bourdieu defines SC as:

> … the aggregate of the actual or potential resources which are linked to the possession of a durable network of more or less institutionalised relationships of mutual acquaintance and recognition – or in other words, to membership in a group – which provides each of its members with the backing of the collectivity-owned(sic) capital, a "credential" which entitles them to credit, in the various senses of the word. (Bourdieu, 1985, pp. 248-249)

Coleman views SC as defined by its function:

> It is not a single entity but a variety of entities, with two elements in common: they all consist of some aspect of social structures, and they facilitate certain actions of actors – whether persons or corporate actors – within the structure. (Coleman, 1988, p. s98)

For Putnam SC involves:

> … features of social organization, such as trust, norms, and networks, that can improve the efficiency of society by facilitating coordinated actions. (Putnam, 1993, p. 167)

Fukuyama regards SC as:

> … an instantiated informal norm that promotes cooperation between two or more individuals. (Fukuyama, 2000, p. 3)

The OECD defines SC as:

> … networks together with shared norms, values an understandings that facilitate co-operation within or among groups. (OECD, 2001, p. 41)

Social capital as viewed by the WB refers to:

> … the internal social and cultural coherence of society, the norms and values that govern interactions among people and the institutions in which they are embedded. Social capital is the glue that holds societies together. (Grootaert, 1998, p. iii)

Although the definitions underline the contentious nature of this concept, yet again issues of networks, memberships, shared norms (cohesion) and institutions reappear to allow some firming up of its meaning. Of the six standpoints, the following section will review three of the more prominent concepts belonging to Putnam, Coleman, and an alternative the present research associates in principle with Bourdieu. The next section will also identify shortcomings and suggest an alternative conception.

4.13 Analysing the Competing Concepts for Measurement

Bourdieu envisions SC via two elements: firstly, the size of one's relationship network (social relationships to gain access to resources); and secondly, the sum of its cumulated resources, both cultural and economic, with an emphasis on the social and economic resources embodied in social networks (the amount and quality of those resources). For Bourdieu, SC is never separated from economic capital; instead capital is expanded to include both material exchanges and non-economic forms of capital, in particular, cultural capital (Bourdieu, 1985).[129] Furthermore, Bourdieu emphasises that SC is realised by individuals and not possessed by them.

Under Bourdieu then, SC is reconnected to economic capital through a set of both economic and power relations (non-economic). Although Bourdieu completed the first major analysis of SC in 1985, it wasn't until three years later when Coleman, who stressed the complementariness between SC and HC regarding school attendance, instigated interest in studying SC. Putnam (1993) and Fukuyama (1995) followed with

[129] Landes (1998) and Harrison and Huntington (2000), amongst many others, believe differences in cultural capital are a major explanation of the vast differences in productivity and income among nations. Of course this also depends on the level of aspirations within countries, for instance Bhutan.

groundbreaking studies of their own which examined and applied the concept of SC at a national and regional level. Of these attempts, it was Putnam's that most academics adopted (Productivity Commission, 2003).[130] Hence, it is his work this section will largely review.

Putnam's concept possesses a narrow SC outlook, comprising a set of horizontal associations between people (Grootaert, 1998). Under this perspective, SC arises from connections among individuals, social networks (of civic engagement), and associated norms, all of which are closely related to civic virtue. Hence, high levels of SC help facilitate the coordination and cooperation for the mutual benefit of the members of the association (Putnam, 2000).

The influence of Putnam has seen SC emerge as the norms and networks that enable people to act collectively. This is evidenced by the OECD's approach to SC, which identifies with the attribute of networks.[131] Here, networks comprise relationships between family, friends, organisations, groups, etc. For these norms and networks to operate effectively, a correct balance of bonding, bridging and linking SC is required.

Bonding SC implies high network density and consists of relatively homogenous groups (ethnic, religious or socio-economic) with high levels of trust and shared norms. However, excessive amounts of this may possess negative outcomes. Bridging SC involves relatively diverse networks and different backgrounds (heterogenous). This not only strengthens ties across groups, but also provides these groups with access to a wider range of resources. Linking SC is crucial as it involves relations between those on different social divisions. Here, one has the opportunity to access resources, ideas and information from formal institutions that are not normally accessible to them (Productivity Commission, 2003; ABS, 2004c).[132]

[130] Fukuyama (1995) conducted an economic examination of a nation's wellbeing and reasons for its inability to compete, which he believes are conditioned by the level of trust inherent in society. In fact, Fukuyama found that ethical habits are crucial to organisational innovation and therefore progress.
[131] The Saguaro Group, a prominent US think tank of academics and policymakers organised by Robert Putnam, reinforces this.
[132] ABS (2004c) includes *isolation*, which comprises people who are not part of any network due to issues of loneliness, boredom, immobility, etc.

These three network types (bonding, bridging and linking) will be incorporated into the present research's conceptual framework. Specifically, notions of bonding and bridging SC will appear under the term *social connectedness*. This concept is seen as a strong indicator of perceived quality of life (Minicucci, 2000). Although rather broad, it encompasses social fragmentation and social cohesion, from which the latter comprises social inclusion and exclusion. Social inclusion refers to those who are able to greatly participate in a country's social and economic life, whereas social exclusion refers to those unable to participate adequately (ABS, 2004c).[133] Social fragmentation, on the other hand, deals with aspects of crime, suicide, divorce, etc. (Grootaert, 1998). The present research considers the dimension *social connectedness* to be an essential aspect of progress measurement due to its ability to effectively collaborate and organise collective action. This can help reduce uncertainty, leading to lower transaction costs. However, given that social networks have the capacity to be very dense yet unable to generate resources (DeFilippis, 2001), the current study deems this dimension as a necessary but not sufficient condition of SC.

The issue of linking SC, and its aforementioned connection with formal institutions, will be absorbed in the *institutional quality* dimension of the conceptual framework. *Institutional quality* will incorporate formalised institutions such as the rule of law and civil and political liberties. An advantage of adopting institutions is that it partially solves one of the measurement problems of SC, given that formal institutions are tangible structures that are easily identifiable (Grootaert, 1998).

The narrow conception adopted by Putnam has transformed the SC concept to basically voluntary associations and civil trust (Grootaert, 1998). This conception has drawn two main criticisms.

Firstly, under Putnam, SC becomes something that can or cannot be possessed by individuals, communities, countries, etc. This conception allows Putnam to aggregate individual attributes. The problem with this however, is that although an individual or an institution can possess something, societies cannot. Societies are not things; rather they are products of a complex set of social, political, cultural and economic

[133] Another factor is social isolation.

relationships, which are normally power-laden (DeFilippis, 1999; Massey, 1994). In this light, societies are not actors that exhibit any form of agency, but rather outcomes that can affect and constrain future possibilities. This standpoint suggests that societies are not exclusively a function of the internal characteristics of the people living and working there. To do so, would ignore the power relations that exist in determining their outcomes, either internally or externally between actors in the society and the rest of the world (DeFilippis, 2001).

Although Putnam has since made the transition from the individual to the larger group more explicit by acknowledging that SC can be a private good and a public good, he continues to measure SC with a form of methodological individualism which he then aggregates up (DeFilippis, 2001).

Secondly, there has also been criticism levelled at Putnam for positing that civil society and SC are almost synonymous, viewing networks of trust and voluntary non-government associations based on trust, as win-win situations through which SC is generated (DeFilippis, 2001). This standpoint allows Putnam to ignore existing power relations where more powerful groups experience greater returns (part of the aforementioned power relations that exist internally within the society). For example, the traditional monopoly that Jewish merchants exercise over the New York diamond trade implicitly restricts outsiders (Productivity Commission, 2003), or the way that established civic groups can suppress macroeconomic growth by securing a disproportionate share of national resources (Woolcock, 1998).

Putnam's belated acknowledgement of this dark side to SC led him to posit that any negative externalities could be overcome through the concept of bridging SC. However, this on its own cannot change people's situations since those who lack access to resources (predominately the deprived) do so because they are on the wrong end of the power relations in society. Hence, power relations must change rather than the level of connections. The implication of Putnam's narrow conception therefore, is that SC loses its connection to the term capital (DeFilippis, 2001).

To help overcome this, the present research asserts that SC must be explicitly linked to the *economic security*, determined via access to resources of people in low-income areas. This makes up the third and final dimension relating to the SC concept. Consequently, the conceptual framework will make provision for this identified shortcoming of Putnam and use it as a springboard to a more comprehensive SC measurement, in keeping with Bourdieu's conception of reconnecting SC to economic capital.

Another approach to SC measurement, which is broader than Putnam's, belongs to Coleman (Grootaert, 1998). Rather than attempting to measure SC on a local, regional or national level, Coleman devised indicators of SC in particular contexts, such as the SC relevant to children's academic success. His functional approach meant that SC was neither an instrument, nor an object or even an outcome; rather it can be either or all of them. What could be useful to one group could be harmful or useless to another. Hence, the form SC takes (positive, negative or neutral) is not important, as long as it permits people or institutions to take action by facilitating access to the necessary resources (Coleman, 1988).

Coleman's approach incorporates vertical as well as horizontal associations, social structures at large and the group of norms overriding interpersonal actions (Grootaert, 1998). The views of both Putnam and Coleman, who essentially adopt a microeconomic view, fall short of a comprehensive approach to SC. Traditionally, such comprehensive approaches have been considered in two ways.

The first is via growth accounting methodology, which views GDP growth as a function of the growth of labour, capital and technology. Here, the residual in the growth model represents both HC and SC, from which HC, after its estimation, is separated. The major drawbacks of this approach are that direct estimations of HC are yet to be successful and that the only function permissible for the four factors of production is growth. This severely restricts its function. The second approach is a direct estimation method of specific SC components and its contribution to economic growth, investment and equity (Grootaert, 1998). In principle the present study supports the latter method, albeit in a more comprehensive manner.

In light of the above review, the present research will employ the term socio-cultural environment to reflect the social, political, legal and cultural environment. This is an integration of Bourdieu's SC concept, which happens to possess some common themes with Putnam and Coleman, along with the work on institutions from North and Olson. The present research aims to follow Bourdieu's work, which clearly separates the resources acquired from SC from the concept itself (Portes, 1998). Specifically, three dimensions were put forward for inclusion in the conceptual framework to be presented in the next chapter; they are as follows.

Social connectedness. This incorporates: (i) social cohesion or positive aspects of SC reflecting an inclusive outlook, and (ii) social fragmentation which deals with aspects of social disintegration, in particular, the disconnection that can exist in society by those people who lack access to resources. The current study considers this dimension as a necessary but not sufficient condition of SC.

Institutional quality (political and legal). Based on the works of North and Olson, it acknowledges the vital part played by both formal and informal institutions in shaping behaviour, allowing nations to operate effectively, and develop and maintain SC.

Economic Security. Adopting Bourdieu's notion of reconnecting SC to economic capital, SC is only effective if it provides access to resources. The present research regards this as an important aspect of SC.

The review of the competing SC concepts has provided some justification for the inclusion of the aforementioned dimensions. However to further validate the current research's choice of dimensions, an identification of common themes that occur in SC analysis is necessary to determine whether these are covered, which will assist in validating the approach taken.

4.14 Identifying Social Capital Themes

There is consensus in the literature that social networks and social norms help people act collectively. Hence, this aspect needs to be incorporated into any measurement of SC as an avenue to assess the social cohesion of a nation.

According to Serageldin and Grootaert (2000) and Productivity Commission (2003), SC themes should reflect the following.

- The linking of economic, social and political spheres relating to both societal and economic outcomes.
- The ability of formal and informal channels to improve the efficiency of all economic actors.
- The positive aspects of SC. For example, the reduction of transaction costs, facilitation of knowledge and innovation diffusion and averting narrow self-interest by promoting cooperative behaviour.
- The negative aspects to SC. Although not unique to SC,[134] negative impacts can adversely affect outsiders from groups such as the Mafia, cartels and the aforementioned monopoly of Jewish merchants in the diamond trade in New York. There are also adverse affects on insiders such as pressures to conform, which can restrict individual freedom.

The three socio-cultural environment dimensions to be included in the present research's progress study, *social connectedness*, *institutional quality* and *economic security*, account for the common themes listed above.

The identification of a set of common themes has raised the ire of some sceptics, such as Dasgupta who queries the breadth of the concept. Dasgupta (2000) asserts that this will lead researchers to justify the inclusion of variables that lend weight to their argument. Others such as Temple, view SC measurement as both a mechanism to bridge the interdisciplinary gaps that exist in economic analysis and a way to enhance public policy (Productivity Commission, 2003).[135]

Nevertheless, despite conceptual difficulties via its evolving and complex nature, a number of SC measurements have taken place. This study will review some of the results.

[134] Many elements of the GDP have negative aspects, such as the negative aspects linked to production where the market-based allocation diverts resources away from 'more useful' activities.
[135] Aspects such as government-owned infrastructure (schools, hospitals, etc.) and community facilities (parks, libraries, etc.) have not found their way into most of the major analyses (Productivity Commission, 2003).

4.15 Social Capital Measurement Reviewed

Due to the multidisciplinary nature of the SC concept, the measurement of SC is even more controversial than its definition. In fact, many indicators that have been used to account for SC have been openly criticised.

Apart from the identification of some common themes, the measurement of SC can be made more manageable by overcoming the chasm that exists between the theoretical underpinnings of SC and its measurement. To achieve this, some key guiding principles are recommended (Stone and Hughes, 2002; Productivity Commission, 2003; OECD, 2001):

- measurement must be theoretically informed, with an illustration of the clear links between the theory and the measure;
- empirical work should mirror the multidimensional nature of SC;[136]
- must clearly distinguish between measures of SC and measures of its outcomes and determinants;
- a balance needs to be struck between subjective and objective measures;
- national-level analysis needs to incorporate distributional implications, as well as explicitly identifying SC as a national resource for collective action;
- an acknowledgement that measuring this concept is still in the early stages of development should be made clear; and
- need to distinguish between the three types of SC: bonding, bridging and linking.

One of the best-known approaches towards the measurement of SC is the WB social capital assessment tool, which involves both qualitative and quantitative methods at the household, organisation and community level. This suite-of-indicators approach, used by the WB, OECD, and found in most empirical literature, reflects the multidimensional nature of SC. A suite-of-indicators approach lists the key measures of SC alongside each other, as well as an assessment of the links between them. It finds a balance between trust and memberships, and covers what it considers to be the key dimensions,

[136] Despite acknowledging SC's multidimensional nature, which would imply a multidimensional conceptualisation and measurement, a number of studies rely upon indicators that represent only a single factor of SC and thus ignore other aspects of SC (Stone, 2001).

eight in the case of the WB and the OECD, encompassing networks, values and norms (Productivity Commission, 2003).

The recognition of the guiding principle is vital since this can heavily influence the results of a study. Generally, empirical studies have shown that there is support for the role of SC in influencing the effectiveness of public institutions and government efficacy, as well as a range of social and economic variables (OECD, 2001).

From an international perspective, comparisons normally incorporate *World Values Survey* data (see Veenhoven, 2005) for cross-country comparisons of trust and civic cooperation indexes where results vary. For example, Knack (2001) found a positive correlation, which was statistically significant, between trust and the level of investment in 25 OECD countries whereas Helliwell (1996) found a negative relationship between the trust index and GDP growth in a sample of 17 OECD countries. Additionally, Inglehart (1997) found no correlation between the survey's index of group membership and economic growth.

National studies are more frequent, with the most famous being those of Putnam. In 1993, Putnam examined SC and government effectiveness. He devised an index of civic engagement based on: density of associations, newspaper readership, voter turnout and preference voting in general elections. He concluded that the south of Italy exhibited significantly less civic engagement than the central and northern regions. This, he cites, is one of the major reasons that the south is less economically developed than the north. In 2000, Putnam examined SC in the US by constructing a composite indicator comprising 14 variables that assessed 5 separate dimensions of SC: community or organisational life; engagement in public affairs; community volunteerism; informal sociability; and social trust. Putnam found that over the last three decades the levels of SC had declined, in large part due to changes in family structure, suburban sprawl and television viewing habits (Putnam, 1993, 2000).[137] Putnam's index of SC was used by Casey and Christ (2005) and integrated into cross-sectional regression models incorporating physical and human capital to gauge economic performance in the US.

[137] Interestingly, the south of Italy's lower economic development outcome is due to lower rates of civic engagement, yet the US, which has traditionally high rates of economic development, experiences a decline in SC due to this factor.

They found that SC had no discernible influence on output and employment but impacts significantly on economic equality and employment stability.

Another study by Knack and Keefer's (1997), equated SC with the quality of a society's political, legal and economic institutions. The cross-country empirical examination of the relationship between SC and national economic wealth found a statistically significant positive relationship between levels of trust and civic cooperation in a society, and economic growth rates. Specifically, the results showed that from the time span of 1980 to 1992, as trust rose by 10 percentage points, annual GDP growth increased by 0.8 percentage points. In addition, for each 8 percentage point rise in civic cooperation, growth increased by more than 1 per cent (Productivity Commission, 2003). The results indicate that higher trust reduces the cost of transactions, corruption and bureaucratic delays. Furthermore, it showed that a lack of property rights stifles economic wealth.

Knack and Keefer also concluded that contrary to Putnam's 1993 findings for the Italian regions, associational activity is *not* correlated with economic performance. Likewise, the promotion of horizontal associations via the encouragement and formation of groups may in fact be counterproductive (Knack and Keefer, 1997).

Many other national studies have been conducted, some of which involve Britain, France, The Netherlands, Sweden, France, Germany, Japan and Australia.[138] Given that many of the studies performed are open to criticism, the difficulties and accompanying limitations involved in measuring SC need to be recognised. The main complications involved with measuring SC centre around data availability, methodologies employed, and conceptualising SC and its linkages.

4.16 Limitations of Measuring Social Capital

Data problems seem to pervade most SC measurements. Firstly, international sources of data are difficult to obtain. Secondly, since the data that is attainable is primarily designed for other purposes it is doubtful that a conceptually rigorous measure could be found. Consequently, connections between the measure and the theoretical definition of

[138] A brief summary of these nations results can be located in Productivity Commission (2003, p. 30). For Australian results refer to Onyx and Bullen (2000), Cox (2002), and Stone and Hughes (2002).

SC can be quite poor, which can lead to questionable results (Stone, 2001). This, of course, is not unique to SC and is an argument that can also be directed towards GDP, employment, inflation, etc.

Additionally, the use of survey questions means that even a slight change in the wording of the questions, as well as evolving attitudes, values and aspirations can lead to non-comparability over time. Furthermore, the method of aggregating the responses of individuals to calculate SC, which arguably is a societal characteristic, leads to the possibility of an inaccurate measurement (UKONS, 2001 cited in Productivity Commission, 2003).

Another major limitation of SC measurement lays in the methodology, in particular the lack of a general agreement on where SC ends and its outcomes begin. Some suggest that most measures of SC are measures of its outcomes rather than SC itself (Stone, 2001; Chan, To and Chan, 2006). For example, trust is seen as an outcome of repeated interactions, credible legal institutions, etc. just like test results are an outcome of HC (Woolcock, 2001). This is an important consideration.

Thus, SC conceptualisations centre on the role of networks and social structures, or on proxy outcomes such as trust (Foley and Edwards, 1999). The present research supports both conceptualisations on the basis that there exists a strong and established relationship between measures of SC, and various determinants and outcomes. From this, such outcomes could then be used as SC indicators (Stone and Hughes, 2002).

Regarding the suite-of-indicators approach, one such limitation involves its reliance on quantitative indicators (interactions, trust, attitudes, etc.) and not on qualitative indicators, despite both being essential in assessing SC (UKONS, 2001 cited in Productivity Commission, 2003). This has the tendency to omit negative outcomes of SC. To overcome this, some measures focus on the absence of SC via crime rates, drug use, suicide, etc.

Conceptually a number of authors, such as those with the HDI, blur the distinction between SC and HC favouring the use of indicators about people as opposed to measures about institutions or associations. This direction is not consistent with the definitions of SC (Grootaert, 1998). Furthermore, the distinctions made between bridging, bonding and linking SC rarely find their way into empirical studies, although the lack of any real distinction between them makes this a very difficult task. This blurred distinction can also be seen by this study's attempts to incorporate the three aforementioned types of SC into two dimensions: *social connectedness* and *institutional quality*.

This is not surprising given that establishing links between the SC dimensions is quite difficult. More so when one considers that causal links in SC are generally unclear. For example, a recent Australian study found that SC might not in fact have a direct impact on wellbeing, instead operating as an intermediate variable influencing the causal link between various indicators of wellbeing (Vinson, 2004).[139]

Finally, another limitation involves the statistical methods employed in SC analysis, which are rather restricted in their descriptive power since they neither separate cause from effect, nor control sufficiently for unconnected aspects. Once again, this problem is not unique to SC (Productivity Commission, 2003, p. 45).[140]

The overriding difficulties of measuring SC have to be acknowledged, especially since many aspects pertinent to SC are hard to measure, making informed analysis complex. This is due to SC being dependent on different combinations of horizontal versus hierarchical ties, pre-existing values and the legal and political environment of the nation (Serageldin and Grootaert, 2000).

The difficulty of measuring SC is further reinforced with the omission of issues relating to racial/ethnic segregation due to a lack of standardised international data. Nevertheless, it needs to be acknowledged that racial segregation affects a community's residents in many ways such as through inequitable service levels. It can also limit housing, employment, economic and network opportunities (Musterd, 2005).

[139] This is not unique to SC however, as it is also the case for income and employment studies.
[140] While regression analyses can control for extraneous influences, some have been criticised for insufficient sophistication.

4.17 Where it Stands

Ideally, a more vigorous and theoretically grounded measure is needed via further testing and retesting. Until then, all findings need to be treated as suggestions rather than definitive explanations (Stone and Hughes, 2002; Productivity Commission, 2003). As with the previous two concepts (HC and NC), the interdisciplinary nature of SC is not reason enough to omit measurement, especially given the recognition, via the proliferation of SC measures, that SC plays in achieving wellbeing (Grootaert, 1998). Furthermore, as with the majority of studies in this theme, the nature and breadth of issues involved requires that a non-monetary approach be utilised as a gauge to accurately account for its contribution to progress.

Currently, most SC measurements adopt the Putnam line of analysis. As mentioned previously, Putnam's conception of civil associations and density levels is a necessary but not sufficient condition of national SC measurement. Consequently the present research explicitly rejects this narrow conception as the sole measure of SC. Instead, this study agrees with the philosophy of Stone and Hughes (2002) who find fault with how many authors treat SC as one overall multidimensional concept, rather than as a number of different dimensions that are conceptually distinct.

The plethora of SC definitions has led the current study to employ an operational definition that will enable measurement to occur. This is to take the form of a socio-cultural environment, which as stated previously, encompasses the views associated with Bourdieu, North and Olson. Subsequently, the framework employed will incorporate the three dimensions cited earlier: s*ocial connectedness*, *institutional quality (political and legal)* and *economic security*. This outlook will ensure that the focus remains on both the individual and communities ability to realise greater control and power over access to resources. This will be achieved by reconnecting the concept to economic capital, which is crucial for progress and for SC to have any meaning (DeFilippis, 2001).

4.18 Conclusion

The purpose of this chapter was to highlight the complexities surrounding the measurement of HC, NC and SC and to propose an approach to incorporate them into the conceptual framework. In essence, this chapter constitutes the first step to developing the conceptual framework to help construct a reasonable and valid measure of progress. This can be best achieved, this study asserts, by adopting more comprehensive measures that include an interdisciplinary approach integrating conceptually distinct theories. The lack of a readily useable price for convenient evaluations for human, environmental and social concerns leads to the omission of their major impacts and restricts debates to the economic bottom line. Hence, a non-monetary approach is employed.

The present research argues that a national HC measure should integrate aspects of HC, IC and knowledge management theory under the one banner – human resources. The measurement of NC, on the other hand, also requires the acceptance of a pluralistic approach based on ecological theory and practice. As for SC, this present study will integrate the three conceptually distinct dimensions discussed above into the progress framework. Furthermore, it was concluded that the best way to account for these broad concepts was via a non-monetary evaluation.

This chapter has argued for the use of an alternative and more comprehensive measure for HC, NC and SC based on current inadequacies in measurements. As the last two chapters have demonstrated, most current approaches – especially those employing a market approach - either underemphasise or omit the linkages that occur in the real world. In the next chapter the present research will construct a framework that adopts an interdisciplinary approach, which embraces methodological pluralism while adopting a non-monetary evaluation to rectify this. It will deal with issues of overlapping and interconnected concepts. From a progress measurement perspective, this approach views progress creation arising from the relationship of a whole range of determinants and social processes.

> (Marshall) was … convinced that the useful economist has to be interdisciplinary in approach as was required to capture the multi-faceted nature of the phenomena to be studied. (Reisman, 1990, p. 264) [content in parenthesis added]

> Methodologically it is preferable … to have the right framework with omissions, because one is then aware of the omissions and can seek both to allow for and minimize them, rather than having the wrong framework which appears complete but actually excludes important variables. (Ekins and Max-Neef, 1992, p. 239)

Chapter 5: Conceptual Framework

5.1 Introduction

The previous chapter assessed different evaluative techniques that have been employed to measure human, natural and social capital, all of which are key contributors to national progress. The different approaches and evaluative techniques, the present research claims, are due to issues of epistemology. Limitations in epistemic privilege regarding progress measurement combined with the restrictions of employing a reductionist single index of progress, specifically their weakened coverage and explanatory power deficiencies, have led the current study to adopt a methodological pluralist framework approach.

Such an approach, of course, is nothing new. As one of the leading exponents of pluralism in national accounts it, was Norgaard (1989a, 1989b) who when examining the success of extending national accounts to incorporate the value of resources, environmental systems and their services, concluded that the most viable approach to measuring multidimensional concepts was to abandon any single standardised system of accounts. The alternative strategy, he argued, was to develop and employ multiple approaches. Hence, one of the tasks of this chapter is to identify the most pertinent theories for creating and maintaining progress and incorporate them into a workable framework. This is in keeping with the second and third objectives of this study.

To reflect this pluralist approach, the proposed framework will be structured to enable the use of a composite indicator (CI). Achieving this requires operationalising the conceptual framework, a task which can be quite daunting and requiring some compromises. Not surprisingly, the use of a CI has drawn many criticisms, especially from official statisticians.

In the following section this chapter will summarise the main arguments, both for and against the use of CIs. These arguments will range from the ability of a CI to attract public interest, and to the potential dangers of employing a measure that is quite responsive to the inherent subjectiveness of the researcher.

5.2 The Case For and Against the Use of Composite Indicators

Composite indicators are used by a variety of organisations (national and international, including statistical offices). It is used to communicate information regarding the standing of countries in areas such as the economy, environment, society and technological development (Saisana, Saltelli and Tarantola, 2005). The more prominent examples of CIs are the GDP and the consumer price index.

Given its contentious nature, the use of a CI has long been debated. A review of the main criticisms (for and against) is summarised below (see from Saisana, Saltelli and Tarantola, 2005; Freudenberg, 2003; Booysen, 2002; and Cox et al., 1992).

The arguments for the use of CIs are:

- Composite indicators enable a researcher to integrate both factors such as social, political, environmental and economic, and also concepts such as sustainability and welfare. This ability to summarise complex multidimensional issues that reflect the nature of society is one of the great advantages of the measure.
- The results from a CI provide a ‘big picture’ view of society that can be used to rank performances of countries’ over time on complex issues. This helps attract public interest which has long been seen as beneficial in attracting the interest of policymakers.
- Composite indicators are flexible measures. This includes allowing the possibility to add more information within the existing size limit and adapt to changing conditions, making them a powerful policy implementation tool.
- Composite indicators can assist in identifying potential areas for action to be used to support policy initiatives. This feature enables interested parties to assess trends that show the amount of deviation that occurs from the optimal target.

The arguments against the use of CIs are:

- Even though CIs can support policy initiatives, a poorly constructed CI can produce mixed interpretations resulting in inadequate policy initiatives. Although this is the case for all measures, specifically this deals with the nature of the CIs aggregation techniques.
- The construction of a CI requires judgements that deal with the selection of sub-indicators, choice of model, sensitivity of results to different weighting and problems of treating missing data. The degree of subjectivity in the construction of a CI is considered a major drawback; making it an unreliable indicator that may possesses little social meaning.
- The selection of weights could become the target of a challenge. This view of CIs as ideological statements is disingenuous given that ideological incursion into economics is not unique to CIs (see Section 3.2.2). However, a transparent analysis based on sound statistical procedures could reduce some of these acknowledged problems.
- Composite indicators are quite time consuming, particularly given the amount of data CIs require for its sub-indicators to meet a statistically significant criteria. This normally elicits an outcry from statisticians who resent CIs because all these large amounts of data are 'wasted or hidden behind a single number of dubious significance'. The irony of course, is that despite the high level of aggregation required, it is the method of disaggregation that allows the articulation of effective policies.

Despite the debates surrounding the merits of applying CIs for measurement purposes, the current study asserts that the difficulties a CI possesses in measuring multidimensional concepts are somewhat over-exaggerated due to the perpetuation of certain 'common fallacies', which also apply to currently used measures as well. These fallacies have been addressed by the World Economic Forum (WEF, 2005, p. 19) as detailed below.[141]

1) *The concept is too abstract*. Although the study of progress is an abstract concept, abstractness does not equate to non-measurement, for instance, the

[141] WEF (2005, p. 19) limit their concerns to addressing the misunderstandings of measuring environmental sustainability; however the multidimensional nature of that topic makes it relevant to this discussion.

GDP. Furthermore, the abstract concepts of inflation and stock market performance have not stopped the widespread use of the consumer price index, and the all ordinaries index respectively.

2) *The concept is too multi-faceted*. The fact that a multi-faceted measure will contain variables and indicators that possess complex causal structures are not a reason for inaction. If anything, such indicators can help unravel causality by strengthening the empirical nature of policy debates. It is also a key justification for the current research to attempt an alternative progress measurement.
3) *The concept covers too wide a range of issues.* The dimensions included in this research cover a wide array of issues: social, political, cultural, environmental, economic, etc., that are embedded in the progress concept. This makes the need for a broad measure even clearer.
4) *There is no common unit of measurement*. Here, the transformation techniques employed to achieve a common unit of measurement will bias the results, masking most of the analytical work. To limit this, it is important that variables are made comparable on a cross-national level using GDP, or people, or populated land area. This is the preferred method when dealing with such a variety of data.

It is important to note that when measuring macroeconomic behaviour, CIs are not the only form of measurement available to researchers. In fact, when the ABS (2002, 2004a, 2006) decided on its preferred measure of progress, it narrowed the alternatives to three broad possible measurements: (i) single value approach, (ii) accounting framework, and (iii) suite-of-indicators approach. Firstly, the single value approach combines several indicators representing areas such as health, economy, etc. into a single CI. Although useful, this measure has the tendency to oversimplify a complex system and give potentially misleading signals. Secondly, the employment of an accounting framework presents different dimensions (social, economic and environmental) into one unified system of accounts, such as is the case with the Dutch system of economic and social accounting matrices and extensions. This approach however is not only quite complex, it is also difficult to determine the links and the effect these have on progress. This extension of national accounts (monetary measure) reinforces the reification of economic statistics and also results in a narrow conception of progress, which is a broad concept (see sections 1.3 and 1.4). Finally, there is the suite-of-indicators approach, favoured by the ABS, which sets out key aspects of progress side-by-side and discusses the link between them (ABS, 2006).[142] In keeping with adopting a more robust CI, the present research prefers to adopt a pluralistic approach due to its greater reliability in examining complex phenomena (Norgaard, 1989b; Harte, 1995; Norton and Noonan, 2007).

Furthermore, given the dynamic nature of macroeconomic behaviour, it is difficult for an individual indicator to explain cyclical fluctuation over a period of time in overall activity (Nilsson, 2000). Thus, what is required is a conceptual framework approach that is able to provide information on the overall impact of progress as well as on the individual components of progress. This approach is favoured by this study and will help overcome the limitation of the single value approach.

The use of a CI, this study insists, remains the most realistic way to approach progress measurement. This is reflected by the range of organisations that adopt CIs as an attempt to convey ideas about areas previously judged unworthy of economic measurement. Below are some examples of the many existing CIs:

- gross domestic product;
- consumer price index;
- all ordinaries index;
- human development index;
- physical quality of life index; and
- environmental sustainability index (ESI).

The examples listed above establish that a CI is not only useful, but its employment by various disciplines shows it to be a valid and appropriate approach to measuring multidimensional concepts such as progress. Furthermore, given that the present research is conducting an analysis over a period of time (1990-2004) where the economy exhibits cyclical fluctuation (growth to recession back to growth), the reliance on the single value approach alone could not accurately reflect the objective of the current study. Hence, the next step is to develop a conceptual framework that can rectify this situation.

[142] This is reflected in the releases from the ABS (2002, 2004a, 2006).

For this to occur, the conceptual framework underlying CIs must facilitate practical application. This can be achieved in four steps as follows (Comim, 2001):

i) *Conceptualisation*: establishing sound and consistent theoretical concepts with potential empirical significance (current chapter).

ii) *Measurement*: employing the theoretical concepts as basis of inclusion/exclusion of empirical variables (Chapter 6).

iii) *Application*: qualitative impact of both the included and excluded variables (Chapter 7).

iv) *Quantification*: use of these variables in quantitative empirical analysis (chapters 6 and 8).

These four steps should not be viewed as a 'one size fits all' arrangement because the conceptual framework adopted influences the choice of technique used. For example, those working within a market-centred framework will tend to employ only the last step (quantification) as its operationalisation procedure. The current study however, requires an adherence to all four steps.

The present research's stated preference for a CI as its methodological approach means that the rest of this chapter will focus on establishing a comprehensive CI, one that is reflective of the current interdisciplinary progress concept as the basis for its national progress measurement.

5.3 Establishing the Conceptual Framework

The explicit identification of a conceptual framework is considered essential as it locates the researcher's stance amongst a vast number of perspectives, and prevents the eventual model from simply being an arbitrary collection of components (OECD, 2005a). Establishing a rigorous framework is especially important for the current study when one considers that the theoretical underpinnings of most CIs are not sufficiently developed (Freudenberg, 2003).

Hence, the term progress needs to be meaningfully defined. Although the definition and measurement of progress is contested, progress refers to the condition of wellbeing, a concept that moves beyond the acquisition of financial wealth or money. Here, the goal is to manage life's most important resources for improved or sustained wellbeing (see Section 1.3).

Prior to establishing the progress framework, the point in Chapter 3 (see Section 3.2.3) needs to be reiterated. If one accepts that knowledge is standpoint dependent, then one stops looking for ultimate truths and causes. Consequently, multidimensional concepts such as progress will always give rise to a number of different theories or explanations. Moreover, given the contested nature of epistemic privilege for multidimensional concepts, each of the availing theories will possess different standards of truth where their evaluation will be based on not whether their explanations are privileged but whether they are useful (Wolff and Resnick, 1987). On this basis, an alternative progress measurement approach does *not necessarily* have to explain some underlying fundamental causation; instead it is one of several alternative explanations that make us understand one or more parts of the progress phenomenon. The knowledge claims derived from this approach are, as with all progress measurement approaches, partial, incomplete and a product of the researcher's subjectivity.

Given then the nature of the problem, the present research adopts an interdisciplinary approach that is similar to the 'overdetermination' approach proposed by Wolff and Resnick but used in a different context.[143] This interdisciplinary approach ignores the idea that some aspects in life are static; instead the dynamic nature of all aspects in society is determined by their constant interaction with one another.

This type of inquiry rejects the notion of a singular irreducible truth, and is consistent with a realist interpretation of entities and causal relationships that leads to complex notions of causality (Waller, 1999). Consequently, every aspect of society is a cause and an effect. This theory of cause and effect argues that all determinants are significant in determining all other processes, and therefore significant in determining progress. Here, progress is shaped by a complex interaction of political, economic, cultural, social and environmental processes.

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[143] Wolff and Resnick (1987) adopt Althusser's concept of overdetermination regarding social formation. The term was first used in a social scientific context by Freud; however Althusser used it as a critique of classical Marxism's determinism. His intention was to create space for a non-economist and non-reductionist analysis. Wolff and Resnick transform it into a post-structuralist version of Marxian theory.

This notion is central to the less material variants of Marxian theory and in contrast to the neoclassical concept of causation (economic determinism), which views some aspects as causes but not as effects (Wolff and Resnick, 1987). The recognition of this is significant as it enables current study to provide another alternative view to the singular conception of the market. Hence the market becomes one part of the composition of national progress.

Such an interdisciplinary approach requires that the proposed alternative framework be aware of, and incorporate when necessary, diverse disciplines and techniques utilised beyond econometrics. For instance, although it is impossible to measure the different dimensions of wellbeing in directly comparable units, arriving at a summary decision across domains that are conceptually different is nothing new, especially for individuals. An example of this is how citizens weigh up different alternatives and make decisions regarding how much to spend on knowledge and health (Osberg and Sharpe, 2005). This approach facilitates the use of methodological pluralism, with its emphasis that none of the dimensions be excluded from the analysis *a priori* (Lehtonen, 2004).

Thus, in keeping with the present research's conceptual framework requirement cited earlier, the employment of a CI under a comprehensive approach means that the framework must be able to provide information on the overall impact of progress as well as on the individual components of progress. By doing so, the limitation associated with the single value approach can be overcome.

This requires the integration of incompatible measurements, for example, average school life expectancy measured in years, and education expenditure as a per cent of GDP. In broad terms, this dilemma can be dealt with via the use of two constructs. The first demands the utilisation of a universal measuring method that will not misrepresent the value of the selected variables. This common unit of measurement normally takes one of three forms: a physical unit, monetary value or a performance score (Prescott-Allen, 2001). The second procedure requires assigning a suitable weighting scale to each of the dimensions outlined in the conceptual framework.

Both of these essential constructs will be discussed and justified in the following chapter. Such constructs are unavoidable when adopting an interdisciplinary methodological pluralist approach, and although this lends itself to some open-endedness in the framework, this merely reflects the nature of the progress concept.

Furthermore, the progress framework incorporates Robeyns' claims about how the three traditional frameworks used in progress measurement: income metrics, resourcism and capabilities, are best seen as complementary rather than purely rival alternatives (Robeyns, 2005a). This complementariness between resources, capabilities and income provides a good stepping-stone for this present research's framework.

5.4 The Resource-Infrastructure-Environment Framework

The basic structure of the framework will revolve around the employment of a constructivist approach. A constructivist approach covers a broad set of interconnected theories that suggest that knowledge is at least as much a human construction as a discovery (Danforth, 2005). The adoption of a constructivist perspective is deemed useful because it attempts to encompass both collective activity and individual experience, areas that the current study argues reflect progress creation's myriad of determinants and social processes, to construct a meaningful representation of progress creation. This constructivist perspective, which tends to accommodate multiple views rather than a single overriding view, will be reflected by a multidimensional approach. In particular, the framework will be based on a progress literature review, which this study considers integral to national progress.

The review of the progress indicators in Chapter 3 highlighted, in part, how new measures arose from a growing consensus regarding the increasing futility of employing traditional inputs such as land, labour and capital as the sole explanation for progress. This limitation was further explored in Chapter 4 via an assessment of other theoretical approaches that are recognised contributors to progress, such as HC, IC, NC and SC.

The most pertinent of these different theoretical approaches were chosen for integration into a framework. They are: resources, capabilities, IC, environmental sustainability, SC and institutions. These approaches, either on their own or in combination, have emerged in various fields from mainstream welfare economics to heterodox economics and all share interdisciplinary characteristics. These interdisciplinary characteristics permit the inclusion of a mixture of inputs, processes, outputs, outcomes, stocks and flows.

Specifically, the framework is structured around the explicit acknowledgement that differences in resource endowments, infrastructure, technology, laws, attitudes and behaviours, institutions, environment, etc. between countries, all impact on the type of progress opportunities that can arise. This pluralist outlook embraces a combination of an individualistic and social approach and will examine the adaptation of an individual or a society to a number of external constraints.

Hence, the framework needs to adopt the premise that a country's ability to promote and maintain progress is built primarily from its interaction with localised capabilities. However, the focus on localised capabilities, normally referring to a closed economy, does not preclude international factors that are also included in the framework as they can also affect a nation's progress. Thus, the present research intends to modify and build on the framework outlined in Maskell and Malmberg (1999), which examines how firms locate and build their competitiveness via a regional analysis. In particular, the modifications to Maskell and Malmberg's article involve changing their firm level regional analysis to a country-based analysis and incorporating possible international effects. This change in emphasis does not in any way diminish the point being made, which is that localised capabilities significantly impact on a country's progress. These localised capabilities consist of:

- the country's infrastructure and built environment;
- the natural resources accessible in the country;
- the country's specific institutional endowment; and
- the knowledge and skills available in the country.[144]

In Maskell and Malmberg's framework, resources are defined as those available either internally or made available through import from regions, whereas institutional endowment is purposefully defined broadly. It encompasses all the rules, practices, routines, habits, etc. associated with the internal supply of capital, land and labour. It also includes the moral beliefs, political traditions, culture, religion and other basic

[144] This criterion is similar to the factor endowments necessary for national competitive advantage espoused by Porter (1990).

values that characterise the country. The institutional endowment dimension therefore interacts with all the dimensions in the progress model such as the country's infrastructure and physical environment, its natural resources (environment) and its human resources (knowledge and skills). These factors constitute a country's localised capabilities, and can either enhance or halt the potential progress of a country depending on the types of interaction that occur (Maskell and Malmberg, 1999).

The intent is to explicitly emphasise interactions between the social, environmental and economic spheres. This ability to apply the capability concept to individuals and societies, such as the roles of social actors, sets this approach apart from the traditional methodological individualism approach of explaining all social phenomena via the individual (Lehtonen, 2004).

Such an approach also acknowledges that these interactive dimensions do not always result in positive outcomes. For instance, an improvement in some aspects of progress such as increased social cohesion of a certain group may come at the cost of further alienating another social group. This awareness is reflective of the contradictory (push-pull) nature of the changes arising from such a complex interaction of factors. The present research's framework therefore will modify and build on Maskell and Malmberg.

The proposed progress framework will be split into 3 areas, which comprise a country's resources, infrastructure, and environment, to be known as the *resource-infrastructure-environment* (RIE) framework.

Traditionally in economic analysis, the identification of three areas such as resources, infrastructure, and environment is subject to a three-pillar model which treats the areas as separate and independent of each other. However, as Lehtonen (2004, citing Le Bot, 2002) argues, such a construction produces a false consensus by continuing to detach the economic from other context forms, such as social.

Instead, what is required is an acknowledgement in the framework of interdependency. That is, that multiple relations and overlap occur between the themes, which can take the form of either simple causal or complex links. This interdependency reflects the idea that economic process is not some closed mechanical process, but rather an open system where there is constant interaction between the components.

The framework will be quite broad in its scope and nature. The structure of the framework incorporates the 3 main areas which will then be broken into themes, dimensions and, where relevant, characteristics. In all, there are 7 themes, 23 dimensions and 21 characteristics. Table 5.1 defines the hierarchy of the RIE framework.

Table 5.1 The RIE framework building blocks

Hierarchy	Logic
Area	Three main areas that interact with the each other to create or deplete progress.
Theme	Breaks the areas into more manageable parts. A main focus area of the framework.
Dimension	Parts of the theme that provide the specific performance criteria of the themes.
Characteristic	Gives dimensions more structure by splitting it into more understandable elements.

Quite simply, the three identified areas: resources, infrastructure and environment are then divided into their respective themes. For example, resources are divided into three themes: human, natural and generated. These themes are then subdivided into dimensions. The dimensions are considered the fundamental building blocks to the proposed progress model. The characteristics are employed only at the conceptual level and act as a device to provide greater awareness to those dimensions that are broader in structure. Table 5.2 below lists only the areas, themes and dimensions chosen by this study.

Table 5.2 Components of national progress

	Areas		
	Resources	*Infrastructure*	*Environment*
Themes and dimensions	**Human** Health Population Food Consumption Education and Training Knowledge Renewal Net Brain Gain	**Information and Communication Technology** ICT Access	**Physical** Air Quality Greenhouse Gas Emissions Conspicuous Consumption Built Environment Access to Essential Services
	Natural Land & Agricultural Use Energy Production and Use Water Fisheries Biodiversity	**Transportation** Transportation Efficiency	**Socio-Cultural** Social Connectedness Institutional Quality Economic Security
	Generated Financial Physical		

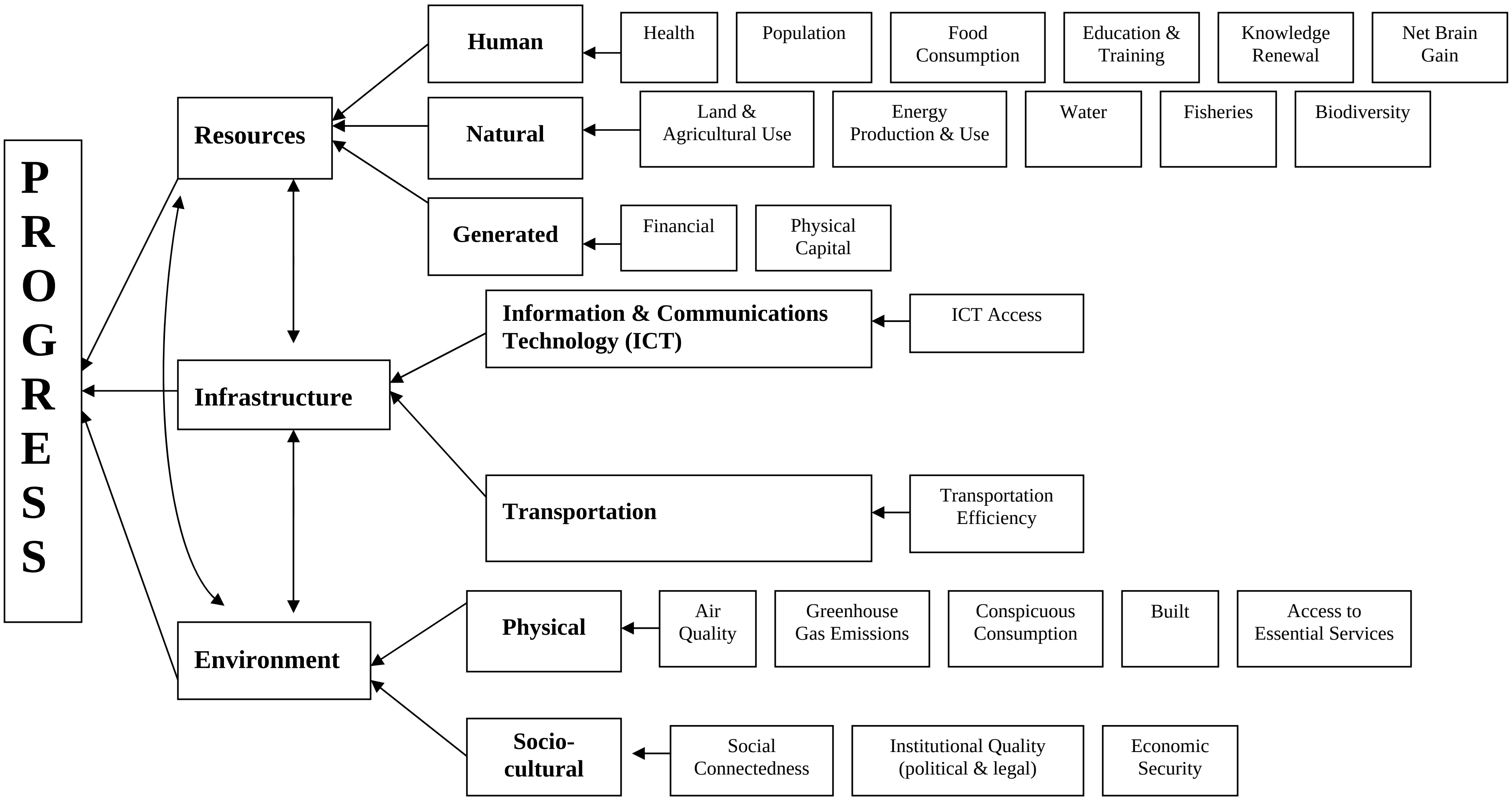
The following section will present a justification of the choice of the above components in Table 5.2, which are also presented in Figure 5.1 below. The first area under review deals with resource themes, dimensions and characteristics.

5.5 Resource Themes

From its inception, economics has dealt with the allocation of scarce resources for the satisfaction of human wants. The ability to manage its own resources is part of a country's capabilities. The combination of both resources and capabilities represents a solid base for national progress.

The term resources, which was defined in Section 1.3, comprises the machines, workers, money, land, raw materials and other things that a country can use to produce goods and services to make its economy grow (WB, 2005). Traditionally, resources have been divided into three categories, land, labour and capital. The current study also splits resources into three themes of a similar nature: human, natural and generated. The three themes and their respective dimensions and characteristics will be reviewed. The first theme is human resources.

Figure 5.1 The resource-infrastructure-environment (RIE) framework



5.5.1 Human Resources

As the previous chapter demonstrated, with great technological advances rapidly transforming knowledge and skills, traditional measures of HC, which consist of investment through health, education and training, are now seen as inadequate when used on their own. Consequently, an approach is needed that accounts for its impact on a nation's progress.

To accurately reflect the knowledge criteria of the human resource definition, the current study needs to initially view some workers as intellectual assets. Additionally, it must determine whether a country has established a nurturing environment conducive for creating progress (Bontsis, 2004). Alongside knowledge, many other aspects play a role in the acquisition of greater human resources. As mentioned in Section 4.5, these comprise: the quantity and quality of education, on-the-job training, medical care, nutrition, improvements in working conditions and other informal (non-market) activities that go alongside formal education (Wobmann, 2003). Consequently, an accurate specification of the human contribution to national progress has to incorporate aspects of HC, IC and knowledge management theory.

The proposed RIE framework will account for the aforementioned issues under the human resources theme, reflective of a more comprehensive national progress application. This will be achieved by splitting the human resources theme into six dimensions. The six dimensions and their respective characteristics are reviewed below.

The first dimension is *health*. This focuses on the degree of physical wellbeing of individuals that makes up part of the stock of human resources. It is considered a central input to poverty reduction and socio-economic development (WHO, 2003a). This framework concerns itself with the support of health systems and the quality of life of its citizens. The characteristics of this dimension are:

- *Health status:* this deals with health outcomes, incorporating people's quality of life.
- *Access to health:* can be used to gauge the commitment to health a country employs.

The second dimension is *population*. It assesses the renewal of the stock of human resources. This will determine whether a country is regenerating at an adequate rate. It consists of one characteristic.

- *Demographic:* represents the rate of regeneration of this resource.

Given that by the year 2020 chronic diseases, largely preventable, is reported to account for almost three-quarters of deaths worldwide, and the fact that diet, or *food consumption*, plays a key role as a major risk factor for it (WHO, 2003a), justifies this study's inclusion of it as the third dimension in the human resource theme. Since the latter half of last century, great modifications in diet have occurred where plant-based diets have been substituted by high-fat, energy-dense diets. The RIE framework will therefore reflect the extent to which the countries have taken up this change in dietary habits. This dimension has no characteristics.

The three dimensions above however, only constitute a part of the overall human resource component. Equally important is how a country develops these human resources. This is achieved primarily through the fourth dimension, *education and training*. This deals with the activities that assist in expanding the knowledge and skills of a country, which amongst other things, helps develop technologies and produce better capital goods (Bontsis, 2004). The RIE framework will focus on the quantity and quality of education. The characteristics of this dimension are:

- *Access to education:* focusing on the extent of education (outcome) and the quantity of utilisation by expected users at tertiary level.
- *Investment and educational quality:* the significance of educational quality was made clear in the previous chapter. Hence this dimension will intend to assess this aspect via a mixture of input assessment, expenditure by government and teacher provisions, and processes focusing on the quantity of utilisation.

The shift from knowledge as *use-value* to knowledge as *exchange-value* occurs with the next dimension. Given the intangible nature of knowledge, also referred to as invisible wealth (Andriesson and Stam, 2004), the benefits arising from its codification are optimally exploited via sound knowledge management techniques (Arthur, 1994). Exploiting these techniques for a country's future progress is referred to as *knowledge renewal*. The key parameter for this lies in a country's R&D whose significance, Bontsis (2004) argues, is only further reinforced when one considers the direct relationship between continued investment in improving the effectiveness of R&D and sustained economic growth. Furthermore patents, despite impeding dissemination, allow an environment that is conducive for innovation and thus for knowledge renewal to occur (Antonelli, 1999). Although large amounts of knowledge remain in tacit form, which measurements are yet to capture, Section 4.4 highlighted that knowledge spillovers (which facilitate creativity and innovation) are enhanced when knowledge is codified through public patent disclosures (Striukova, 2007).

Given the close link between IC and economic growth, which Bontsis (2004) argues has become a leading factor of production for advanced economies, the RIE framework will focus on the investment and stock of knowledge,[145] while incorporating both the processes and outcomes of this. The characteristics of this dimension are:

- *Investment and stock of knowledge:* refers to expenditure on R&D by government and business. Moreover, it comprises information about current research numbers and the number of high technology exports.
- *Codifying knowledge and ideas:* another part of knowledge renewal, which assesses a country's *potential* to perform, and is normally represented by patents and scientific publications (Bontsis, 2004).

Any realistic assessment of progress needs to abandon the idea that the progress model is strictly linear; an idea that sees inputs enter one end of the framework and increased progress come out the other end. The *net brain gain*, with its ability to produce a positive or negative outcome, is reflective of this.

The significance of the net brain gain, the sixth and final dimension of human resources, has been discussed in new growth theory. A net brain gain (drain) occurs when the number of highly skilled people departing their country to pursue better opportunities overseas is lower (higher) than the incoming number. A net brain drain has the ability to undervalue the effect of investment in education, ultimately impairing the source country. This can result in substantial leakages of the country's most important resource (UN, 2004). Determining whether a country endures a gain or a drain is not clear, since

[145] In fact, Ducharme (1998) reports that the impact of research on innovation is strengthened when one considers that empirical literature shows that rates of return of R&D vary between 25 and 50 per cent.

the theory has progressed further than the evidence. For instance, as Saxenian (2004) states, does a country that experiences a high outward flow of workers (e.g. India) lure more inhabitants to pursue education, which could then became the catalyst for an indigenous software industry? Despite the inherent complexities, a number of studies have been attempted,[146] of which this present research is able to identify one key characteristic to this dimension:

- *Net skilled migration*: looks at the international transfer of human resources via the migration of relatively highly educated individuals.

The next theme identified from the literature is natural resources.

5.5.2 Natural Resources

The recent concerns about the natural environment have come to the forefront of public opinion, which has led many economists and ecologists to unite. It was established in Section 4.10 that natural resources perform many welfare-related functions and are a material source of progress, which take the form of both renewable (can be regenerated if used carefully) and non-renewable (cannot be replaced by human action). Furthermore, two types of environmental sustainability that have a tradition of being incorporated into progress measurements were also outlined. Briefly, the first approach is weak sustainability, which is a criterion that calls for the maintenance of total capital stock. The alternative approach, strong sustainability focuses on maintaining the structure and functioning of its natural resources. Here, natural and generated resources are complements and not substitutes (Martinez-Alier, 1995).

The review in Chapter 4 concluded that the chosen approach must derive from ecological theory and practice (an interdisciplinary research approach); however this is made difficult given the uncertainty surrounding the scientific and epistemological foundations of ecology.

This uncertainty has meant that the union between many economists and ecologists seems somewhat fragmented. For instance, to facilitate a dialogue with ecologists,

[146] Studies include: Carrington and Detragiache (1999), Dumont and Lemaitre (2005), Docquier and Marfouk (2004) and Kapur and McHale (2005).

economists adopted the term environmental capital, an approach that has raised the ire of ecologists (Harte, 1995).

The uncertainty arises from the vast array of natural resources that exist. The myriad of natural resources makes it incumbent on this framework to bring together disciplines related to soil, vegetation, water, fisheries and organisms to achieve an integrated multidisciplinary approach for understanding and managing natural resources. A pluralistic approach to the measurement of natural resources is seen as the preferred method for environmental evaluation (Norgaard, 1989b; Harte, 1995; Norton and Noonan 2007), and is favoured by the current study.

As is the case with most environmental sustainability measures however, it is outcomes that matter in the end. Hence, this framework will make outcomes a major focus of this theme. The approach to natural resources will be presented as a function of 5 dimensions.

The first dimension is *land and agricultural use*. This includes the production of crops, the raising of livestock and forest areas that have been logged. The use of land in producing goods and services is the most significant human alteration of the earth's system. Practices such as converting forests and grasslands into low biomass ecosystems modify the configuration and performance of ecosystems, and how it interacts with the atmosphere, aquatic systems and surrounding land (Vitousek and Mooney, 1997). Ensuring that land practices are sustainable, via proper land cultivation, means that the many benefits currently enjoyed do not impinge on future generations. Hence, the characteristics of this dimension are:

- *Land management*: assesses the farming practices that can impact greatly on the natural environment in both a positive and negative manner, and can possess high ecological implications, as well land use and protected areas.
- *Agricultural production efficiency:* deals with the intensity of use regarding production efficiency for livestock and crop production.

However, sustainable land practices alone will not guarantee the sustainability of a country's natural resources. It also requires that the production of energy, a major drain on a country's natural resources, be used efficiently. Therefore, the second dimension is *energy production and use*, particularly in production and manufacturing. This, like most other dimensions, has the ability to both contribute to and hinder national progress. The characteristic of this dimension is:

- *Energy efficiency and alternative sources*: the undesirable effects of burning fossil fuels and nuclear waste product (damage to ecosystem) has made countries focus on ways to more efficiently harness energy. A key indicator of this commitment can be found in either the availability of viable substitutes, or the appropriate level of investment in traditional versus alternative fuels.

Another critical natural resource of a country is *water*. The selection of this is self-explanatory as it is essential for livelihood. This dimension will assess the volume or amount of water available to a country as well assessing water quality. The recognition of safe drinking water levels, as a prerequisite for a healthy environment has long been recognised. Moreover, water quality supports a rich and varied community of organisms and protects public health (WHO, 2003b). The characteristic of this dimension is:

- *Water availability and quality*: this is an important indicator of environmental services, and is crucial in providing support for the needs of the population.

The fourth dimension is *fisheries*. This dimension considers fish stocks as an important component of marine ecosystems. Historically, as long as fisherman can earn a profit, they continue to catch fish to the point where overfishing occurs (Gordon, 1954). In 1995, two-thirds of the world's recognised marine fisheries were either over-exploited or at their limit of exploitation (Vitousek and Mooney, 1997). Ideally, this measure will assess whether the areas of the ocean with large populations of commercial fish and other aquatic species are being maintained at a sustainable rate. The characteristic of this dimension is:

- *Overfishing*: overfishing upsets the earth balance by placing undue pressure on the ecosystem as well as contributing to biodiversity.

All these natural resource pressures have led the International Panel on Climate Change (IPCC) to recently claim that many species of microorganisms, plants and animals would soon be unable to adapt to changes in their environment or to immigrate to more habitable areas (IPCC, 2001). One of the largest contributors to *biodiversity* losses has been the clearing of forests through the almost universal spread of agriculture into even the most marginally productive areas (Nadeau, 2002). Although many economists find the concept of biodiversity difficult to measure, this dimension is included due to the consensus of its importance. As Swaney and Olson (1992) state, continued under-valuation can occur or even a change in valuation, however what cannot happen is to choose *not* to value it. The issue of biodiversity studies the impact that current economic practices have had on the abundance and richness of species in a region or the world.

The five dimensions outlined above reflect a broad pluralistic approach to the measurement of the natural resource theme. Furthermore, the present research acknowledges that other factors, such as the prevailing social, physical, economic and cultural constructs of a country also give rise to environmental preferences (Harte, 1995). This dynamic nature of natural resources and progress is reflected later on in the framework.

The third and final theme in this area is generated resources.

5.5.3 Generated Resources

Traditionally, it has been perceived as comprising the traditional wealth of a country and is included in most progress measurements. Generated resources are a combination of both human and natural resources in the form of the finance and physical capital available to a country.[147] This theme will be presented as a function of two dimensions, with the progress framework mainly focusing on outcome aspects. The first dimension involves the *financial* resources of a country. In particular, it represents the funds that are available to a country to acquire real capital. The three characteristics of this dimension are:

- *Traditional capital investment funds:* deals with the availability and allocation of traditional investment funds such as, banks, foreign direct investment (FDI), etc.
- *Quality of funds:* assesses whether funds are being utilised in an efficient and suitable manner. This is due to the growing concern of increased paper wealth.
- *Cost of funds:* this examines the major costs of borrowing money and assesses the impediments to members in accessing funds.

[147] The term physical capital is proxied with the measure of machinery in the present research.

The other dimension of generated resources is *physical capital*, which comprises the machinery vital to produce goods and services. The characteristic of this dimension is:

- *Manufacturing and agricultural machinery efficiency:* assesses the efficiency of the machinery of these two significant industries, which helps determine the sustainability of the practice of 'adding value'.

The second major area this study will review is infrastructure, an area that helps maintain and improve national progress.

5.6 Infrastructure Themes

As discussed in Section 1.3, infrastructure involves the basic facilities, services and installations needed for the functioning of a community or society. It includes roads, railways, canals, ports, airports and communications, and is manifested by its network structure, for instance, the road or rail network (Banister and Berechman, 2000). It is imperative that a country's infrastructure supports its resources to ensure long-term prosperity. This is recognised by the WB (1994) whom view an efficient infrastructure set-up as a key to facilitating economic growth, poverty reduction and improved environmental outcomes. Investment per se is not sufficient, since poor management can cancel any potential benefits.

This present research identifies two key infrastructure themes. They are information and communication technology (ICT) and transportation. Both possess one dimension each. The first theme is ICT.

5.6.1 ICT Infrastructure

Information and communication technology infrastructure has formed one of the major parts of national IC measurement, under the term process capital, which was reviewed in Section 4.4. Knowledge is materialised through production and innovation, and is optimally exploited via the establishment of suitable infrastructure (Maskell and Malmberg, 1999; Foray, 2006). The current study employs ICT infrastructure to represent the non-human storehouses of knowledge found in hardware, software, databases and organisational structures. Thus, the traditional factors of production contributing to economic growth have been supplanted by the rapid innovations in ICT.

In fact, knowledge is now considered a leading factor of production in many developed countries (Bontsis, 2004).

Hence the dimension representing this theme is *ICT access*. These rapid transformations of knowledge require the appropriate infrastructure to sustain and externalise its output, thus inadequate ICT infrastructure is seen as a major impediment to attaining higher levels of knowledge-induced levels of progress (Bontsis, 2004). Hence the focus will be on both ICT infrastructure and its availability to its citizens. This dimension has no characteristics.

5.6.2 Transportation Infrastructure

Unlike ICT, transportation infrastructure consists of the means and equipment necessary for the movement of goods or passengers. Although transportation infrastructure represents the more traditional form of a country’s infrastructure, it is still central to development. As the WB (1996) point out, physical access to resources is essential for progress since poorly designed transport strategies can make the poor worse off, damage the environment and drain public finances. Thus, the dimension will assess *transportation efficiency*.

This term refers to a country’s capability to move goods and passengers via air, sea, rail and roads. The dimension possesses a duality in as much that while infrastructure can nurture progress on one hand, it can also hinder progress via the externalities mentioned above. This example reflects the push-pull nature of progress itself. Hence, the focus will be on inputs and efficiency. This dimension has no characteristics.

5.7 Environment Themes

The third and final area of the conceptual framework deals with a country’s environment. This area covers a vast array of factors influencing progress determination, and has been used in a number of studies assessing local and national progress. The term environment was defined in Section 1.3. It represents the complex set of physical, geographic, biological, social, cultural and political conditions that surround an individual or organism and that ultimately determine its form and nature of its survival (WB, 2005). In sum, it refers to the external conditions under which people live and engage in.

The inclusion of this area supports the view of interdependent progress creation, where traditional non-economic factors have the ability to impact both positively and negatively on progress. This has been demonstrated with the inclusion of the knowledge renewal dimension and the natural resource area. The two environment themes identified in the current study focus on the interconnected duo of the physical and socio-cultural environment. These themes, and their respective dimensions and characteristics, will be reviewed. The first is physical environment.

5.7.1 Physical Environment

Since the physical environment represents the external conditions under which people live, the framework will concentrate on the following aspects: environmental quality, access to services and the built environment, all of which have been utilised in other studies.[148] These aspects can be presented as a function of five dimensions, of which four deal with environmental quality. The five dimensions have no characteristics and focus mainly on outcome aspects.

The first dimension is *air quality*. If air pollution occurs at sufficient levels it can adversely affect both the health of its inhabitants (respiratory illness and lung damage) and the ecosystem, significantly affecting people's wellbeing. The second dimension assesses *greenhouse gas emissions*. According to the IPCC (2001) there is a discernible human influence on global climate change, mainly via the release of carbon dioxide emissions into the atmosphere generated by the burning of fossil fuels. This framework will attempt to capture this global climate change and its impact on human health and life-supporting functions.

Other dimensions of environmental quality included in the present research's conceptual framework are *conspicuous consumption*, *built environment* and *access to essential services.* Conspicuous consumption refers to consumption that satisfies social needs such as prestige more than material needs. This excess consumption places an undue

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[148] These studies include: 'Environmental indicators for national state of the environment reporting: Human settlements' (Newton et al., 1998), and 'Quality of Life in Canada: A Citizens' Report Card' (Canadian Policy Research Network, 2002).

strain on the natural environment. Consequently, an assessment is required to determine whether a country's natural environment can be sustained given its citizens' current spending patterns. Admittedly contentious, attempts have been made to assess this dimension such as the ecological footprint. The fourth dimension deals with a country's built environment, which includes structures such as buildings, roads, homes, etc. that alter the natural environment. Moreover, this dimension has the capacity to directly and indirectly effect people's physical and mental health (Canadian Policy Research Network, 2002). The fifth and final dimension, access to essential services, is a staple of most comprehensive progress measurements, this will refer to whether a country is meeting the basic needs required for a decent quality of life.

From a focus on external conditions, the framework now shifts its attention to an analysis of 'engagement'.

5.7.2 Socio-Cultural Environment

The final theme, socio-cultural, refers to the extent to which people engage with each other, both on a social and economic level. There has recently been resurgence in incorporating social dimensions into economics (see Section 4.15). Its resurgence is due to the fact that many resource use problems can be traced in part to some elements of this dimension, whether it is difference in religion, ethics, cultural diversity and social institutions (Berkes and Folke, 1992). From this flows the fact that people make their decisions as a result of the values, habits and structures they find themselves surrounded by (Court, cited by Solow, 1985, p. 330). This suggests that these components are equally important in determining progress.

However, as the review in Section 4.12 illustrates, the varied theoretical underpinnings exemplified by the many existing definitions of the concept, makes it quite problematic. Aside from the definitional problems, there also exists widespread debate as to whether SC actually influences wellbeing. For instance, the results on an Australian study showed that SC did not necessarily have a direct impact on wellbeing. Instead, it was viewed as an intermediate variable, influencing the causal link between various indicators of wellbeing (Vinson, 2004). While acknowledging these complexities, this study agrees with the recent resurgence of SC in national progress analysis, and views it as an area that *must* be incorporated.

Given this, of the three main competing concepts reviewed in Chapter 4, the present research concluded that the best approach to adopt for the SC concept involved Bourdieu's definition of SC:

> … the aggregate of the actual or potential resources which are linked to the possession of a durable network of more or less institutionalised relationships of mutual acquaintance and recognition – or in other words, to membership in a group – which provides each of its members with the backing of the collectivity-owned(sic) capital, a "credential" which entitles then to credit, in the various senses of the word. (Bourdieu, 1985, pp. 248-249)

For Bourdieu building up networks, which has traditionally been viewed as the key to SC, is a necessary but ultimately not sufficient condition. Instead, the effectiveness of networks depends upon the extent of access to resources it provides. Consequently, any accurate indicator of progress must include an access to resources component.

The review in Section 4.12 also identified institutional theory as another aspect in determining the social contribution to progress. Under this approach the strength of community networks reflect the quality of the political, legal and individual environment, under which one resides (North, 1990). The economic impact of SC and institutions was reinforced by Knack and Keefer's (1997) study.

The implications of Knack and Keefer's (1997) study for the present research are twofold. Firstly, that institutional ineffectiveness constitutes barriers to progress, and secondly, that greater participation in horizontal associations may be counterproductive, highlighting that associations (networks) alone are not sufficient for increased progress. As outlined in Section 4.17, the socio-cultural environment will be presented as a function of three dimensions that incorporate both inputs and outcomes. They are: *social connectedness, institutional quality (political and legal)*, and *economic security*.

The first dimension is *social connectedness*. If there were no real sense of nexus between people, then apart from family, little trust would exist, especially to those with power. This may lead to people only feeling good about what they themselves can provide. Thus, a sense of national wellbeing lies in the connections that exist at a personal and broader social level (Cox, 1998). Although arguments exist as to whether trust can be viewed as a cause or effect,[149] it has nevertheless been used in many national analyses.[150] It also acts as a complement to a country's institutions. For instance, as Knight (1992) claims, even though a society may have strong institutions, if it is based on fear and power and not on trust, it can lead to unjust societies.

Ideally, a more accurate picture of SC would distinguish between the SC embodied in sports clubs and churches and those resource-oriented groups dealing with water and irrigation management (Pretty and Ward, 2001). Although greater social connectedness may not help remove uncertainty, which represents market failure, it can help overcome this by creating mutual knowledge and enforcing behavioural expectations leading to lower transaction costs (Grootaert, 1998). The current study will employ two characteristics as a heuristic guide to this singular dimension:

- *Social cohesion:* high levels of social cohesion allow societies to organise collective action that can help reduce uncertainty. This characteristic will focus on the extent of group memberships, individual perceptions of satisfaction and work valuation (both market and non-market).
- *Social disconnection:* refers to the negative externalities, usually resulting from an absence of social connectedness, and manifests itself via prisoners, suicide rates, etc. These characteristics reflect the push-pull nature of this dimension.

The second dimension, *institutional quality (political and legal)*, assesses any institutional effects on human interaction. Quite simply, the role of institutions not only helps shape behaviour but also endeavours to prevent progress depletion from occurring especially from instances emanating from corruption and rule of law (property rights). As Hardin (1968) illustrated, a lack of property rights can lead to the degradation of natural resources. Here, the 'Tragedy of the Commons' problem emerges, as institutions exercise no guardianship over natural resources. Thus, a lack of an adequate framework for the distribution of the costs results in over-exploitation.[151]

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[149] Refer to Woolcock (2001) who views trust as not part of SC but an outcome of repeated interactions, reputable legal institutions, etc.
[150] These studies were mentioned in the previous chapter (see Section 4.15).
[151] As mentioned in Section 4.12 (Footnote 128) this is a contested assertion. Even when strong institutions exist (such as in Australia and US) natural resource degradation can still occur due to the markets inability to operate effectively in the allocation of resources.

The final dimension, *economic security*, reflects Bourdieu's concept as it provides an indication of people's access or command over resources. This reflects the power relations inherent in SC. For instance, a lack of access to resources demonstrates that one is at the poor end of power relations in society (DeFillipis, 2001). The inclusion of this concept assumes that the RIE is both an outcome and a cause of the same policies that emerge from power relations. Although this is to be expected, given the pervasive nature of power relations, the desire of the RIE to identify and ultimately change these power relations can be demonstrated by the explicit link that exists between SC and economic security. Specifically, this can be achieved via focusing on the extent to which people are engaged in and benefit from economic activity (market and non-market), for instance, a person's financial security against economic collapse. To accurately capture the extent of people's command over resources this dimension is split into two characteristics, comprising:

- *Unemployment:* helps assess the extent of engagement in economic activity. Specifically, this refers to the non-utilisation and under-utilisation of its labour force which greatly affects the attainment of economic security.
- *Financial pressures:* can be both a consequence of excess material aspects of progress or due to living in squalid conditions. It deals with poverty and longer working hours, all extra burdens on people's wellbeing.

Having outlined and justified the reasons for including the relevant areas, themes, dimensions and characteristics to incorporate into the conceptual progress framework, the following section will list the specific variables this study considers to be relevant to the characteristics and dimensions mentioned above.

5.8 List of Variables for Measurement

The selected variables (listed in Box 5.1 below) are at the characteristic level, or where no characteristic exists, the dimension level. A justification for their inclusion will be presented in the next chapter.

Box 5.1 Variables for the RIE framework

Health

Health status

Life expectancy at birth (years)
Infant mortality rate (per 1,000 live births)
Health-adjusted life expectancy (HALE) (years)

Access to health

Physicians (per 1,000 people)

Population

Demographics

Annual population growth rate (%)
Total fertility rate (average births per woman)

Food Consumption

Total calories intake (calories per capita per day)
Total fat intake (grammes per capita per day)
Sugar consumption (kilos per capita)

Education and Training

Access to education

Average school life expectancy – primary to tertiary (years)
Net enrolment rate –secondary all programmes (% corresponding population)

Investment and educational quality

Public expenditure on education (% of GDP)
Tertiary students in science, math and engineering (% of all tertiary students)
Pupil/teacher ratio primary (students per teacher)
PISA International student assessment (science mean score)

Knowledge Renewal

Investment and stock of knowledge

R&D expenditure (% of GDP)
Researchers in R&D (per thousand in total employment)
High-technology exports (% of manufacturing exports)

Codifying knowledge and ideas

Patents granted by office (per million people)
Local scientific and technical publications (per million people)

Net Brain Gain

Net skilled migration

Net foreign-born persons tertiary educated (% of total resident tertiary attainment)
Highly skilled immigration (% of highly skilled stock)
Net tertiary gain (% of working aged residents)

Land and Agricultural Use

Land management

Forest area (% of land area)
Agricultural land (% of land area)
Arable land (% of land area)
Irrigated land (% of cropland)
Fertilizer consumption (100 grams per hectare of arable land)
Tractor use intensity (hectares per tractor)

Agricultural production efficiency

Agricultural production per capita index (1999-2001 = 100)
Food production per capita index (1999-2001 = 100)

Box 5.1 Variables for the RIE framework (continued)

Energy Production and Use

Energy efficiency and alternative sources

GDP per unit of energy use (US$ PPP 2000 per kg of oil equivalent)
Renewable energy supply (% total primary energy supply)
Electric power consumption (kilowatt-hours per capita)

Water

Water availability and quality

Freshwater availability (thousand cubic metres per capita)
Internal groundwater availability (thousand cubic metres per capita)
Water withdrawal (% of internal resources)
Daily organic water pollutant emissions (kg per 1,000 people)

Fisheries

Overfishing

Fish captures – primary product (% of world total)
Fish consumption (kg per capita)

Biodiversity

National biodiversity index
Threatened mammal species (% of mammal species)
Threatened bird species (% of bird species)

Financial

Traditional capital investment funds

Net domestic credit (per capita current LCU)
Domestic credit provided by banking sector (% of GDP)
Foreign direct investment, net inflows (% of GDP)
Net lending/net borrowing (per capita US$ PPP current prices)

Quality of funds

Market capitalisation of listed companies (% of GDP)
Stocks traded – total value (% of GDP)

Cost of funds

Real interest rate (%)
Real effective annual exchange rate (2000 = 100)

Physical Capital

Manufacturing and agricultural machinery efficiency

Machinery and transport equipment (% of value added in manufacturing)
Gross fixed capital formation – machinery and equipment (% of GDP)

ICT Access

Telephone mainlines (per 1,000 people)
Personal computers (per 1,000 people)
Radio receivers (per 1,000 people)
Television sets (per 1,000 people)
Daily newspapers (per 1,000 people)
ICT expenditure (% of GDP)

Box 5.1 Variables for the RIE framework (continued)

Transportation Efficiency
- Air transport freight (million tons per km)
- Air transport, passengers carried (per million people)
- Container port traffic (TEU: 20 foot equivalent units per million people)
- Railways and roads goods transported (million ton per km)
- Railway passengers carried (million passengers per km)
- Roads, goods vehicles in use (per million people)

Air Quality
- Sulphur oxide emissions (kilograms per capita)
- Nitrogen oxide emissions (kilograms per capita)
- Carbon monoxide emissions (kilograms per capita)

Greenhouse Gas Emissions
- Carbon dioxide emissions (metric tons per capita)
- Carbon dioxide emissions (% share of world total)

Conspicuous Consumption
- Ecological footprint (hectares of biologically productive land required per capita)
- Final consumption expenditure (% gross national disposable income)
- Defensive expenditures (US$ million per 1,000 people)

Built Environment
- Roads, paved (% of total roads)
- Gross fixed capital formation (% of GDP)
- Average number of occupants (per household)
- Housing stock (per capita)

Access to Essential Services
- Population with sustainable access to affordable essential drugs (% range)
- Population with sustainable access to an improved water source (%)
- Population with sustainable access to improved sanitation (%)

Social Connectedness

Social cohesion
- Group membership (average groups respondent belong to)
- Life satisfaction ages 18+ (mean score: 0 = dissatisfied to 10 = satisfied)
- Household work hours (hours per person aged 15+ per week)
- GNI PPP (per capita current international $)
- Income inequality measure (Gini coefficient)

Social fragmentation
- Youth unemployment rate (% labour force ages 15-24)
- Divorce rate (per 100 marriages)
- Prisoners – convicted adults (per 100,000 people)
- Suicide rates (per 100,000 people)

Box 5.1 Variables for the RIE framework (continued)

Institutional Quality (political and legal)
- Control of corruption index
- Rule of law index
- Government effectiveness index
- Political stability index
- Voice and accountability index

Economic Security

Unemployment
- Civilian employment rates (% of ages 15-64)
- Adult unemployment rate (% of 25-54 year olds)
- Long-term unemployment (% of total unemployment)

Financial pressures
- Overwork hours (per person in employment)
- Jobless households (% of total population)
- Relative poverty rate (% of population)
- Relative poverty rate among elderly (% of population aged 66 and above)

5.9 Conclusion

The purpose of this chapter was to propose an appropriate framework to accurately capture the conceptually complex nature of progress. This required integrating an interdisciplinary approach that enables interaction amongst the many themes and dimensions of progress. Despite the criticisms surrounding the use of CIs for economic measurement, the present research concluded that a CI was the most appropriate method to capture the intricate nature of progress. The use of a CI enhances the interconnections between the areas, themes, dimensions, and characteristics reviewed above. Hence, 7 themes, 23 dimensions, and 21 characteristics relevant to progress were identified and their inclusion justified via a comprehensive account of the issues in progress literature. These were then integrated to make up the RIE framework.

Having established a conceptual progress framework, the following chapter presents a justification of all the variables that have been selected to represent their particular themes and dimensions and some which have been omitted, to ensure consistency between theory and practice. Furthermore, a discussion of the methods employed by the present research is undertaken, as well as a brief review of the emerging thinking and ideal variables in the field of progress.

Measuring the total wealth of a country necessarily involves some heroic assumptions.
(Dixon and Hamilton, 1996, p. 16)

A fully rounded account of progress or well-being will require us to measure and give due weight to qualities and values which, however important, are essentially intangible, or at least hard to quantify, and often controversial. For that reason, they have often been avoided or underestimated by politicians and statisticians alike…
(Salvaris, 1998, p. 37)

Chapter 6: Methods Used and Data

6.1 Introduction

Having established the interdisciplinary RIE framework in the previous chapter as a means to comprehensively capture the progress concept, the focus for this chapter is to provide details of the methods used to test the heuristic RIE index. The methods employed in this chapter reflect the stated objectives of the current study, which is to devise an alternative measure of progress that enables a nation to manage its most important resources for improved or sustained progress.

In keeping with the assertions in sections 3.2.3 and 5.1 regarding valid and privileged claims, the proposed RIE index does not purport to include or represent everything that comprises progress. Instead, it sets out to develop an index that could detect the meaningful underlying dimensions contributing to national progress. To reflect this, the RIE index comprises 23 dimensions, incorporating 101 variables.

As the previous chapters have highlighted, the market is an inappropriate place to truly encapsulate the progress concept since certain factors vital to progress lack a readily useable price for an expedient estimation. Hence, the RIE index incorporates factors not present in more popular progress measures, such as the GDP, HDI and the GPI.

An appropriate methodology therefore, must reflect the fact that progress results from both market and non-market factors. Furthermore, the methodology must ensure that factors that do not contribute to progress are excluded, such as expenditure on auto accidents and health insurance.

As Figure 5.1 illustrated, the conceptually complex nature of progress is reflected via the framework’s interdisciplinary form. This type of conceptualisation called for the integration and interaction of many different theoretical standpoints (representing RIE themes and dimensions). This required a ‘new’ perception of value that moved away from goods as a measure of progress.

The RIE index consists of three main areas: resources, infrastructure and environment. Here, resources are headlined by three themes: human, natural and generated; infrastructure, on the other hand, is headlined by two themes: information and communication technology, and transportation; while the environment is also headlined by two themes: physical and socio-cultural. All seven themes reflect diverse entry standpoints as well as different units of measurement, while consolidating major flows and stocks relevant to their particular area, and ultimately, to national progress.

This chapter will commence with a justification of the countries chosen. This will be followed by an assessment of the data that was employed for analysis, specifically dealing with the quality of data chosen. Additionally, this chapter will provide a justification of the stages that were preferred in developing the RIE index, which include, but are not limited to, normalisation, the weighting and aggregation procedures,[152] and sensitivity analysis. The goal here is to ensure that a logical consistency emerges between the conceptual basis and the RIE index. The methods employed in this chapter, and the discussion of results in the following chapter, also comprise the fulfilment of the fourth and final objective of the present research. A brief review is then conducted on the emerging thinking in the area of progress, leading to a list of potential variables that may be used in future analysis.

6.2 Country Selection Criteria and Variable Standardisation

The countries selected for this study are representative of different clusters. This decision relied on country size, perceived economic strength and capabilities, and data (variable) coverage. Subsequently, the countries chosen were Australia, Mexico and the USA. These countries have been carefully chosen to demonstrate the application of the RIE measure, which as stated in chapter 1, sets out to provide a foundation for an alternative approach to progress measurement.

[152] Natoli and Zuhair (2007) details the weighting allocation scheme and the aggregation method employed in this chapter.

Regarding perceived economic strength, the three nations selected represent one highly industrialised nation (USA), one mid-industrialised nation (Australia) and a transitional economic nation (Mexico). While the choice of the USA and Australia were fairly straightforward, the choice of Mexico was made in part due to its association with the OECD. Specifically, the OECD's efforts in organising and collecting data meant that potential issues of variable coverage and quality, or lack thereof, were minimised. Although as the next section will demonstrate, not altogether done away with.

6.3 Selection and Quality of Variables

International agencies generate numerous amounts of data on issues ranging from the economic, environment and the social. Although these permit international comparisons, often the information collated between countries is not methodologically consistent. This makes comparability difficult and can hinder the usefulness of a comprehensive index. Hence an assessment criterion on the quality of the selected variables, which follows quality framework guidelines similar to those discussed by Eurostat's (2004) six components, has been developed.[153]

The current study truncates the six components into three: (i) whether the variable chosen matches the dimension it is meant to represent – partly based on the variable's use in other well established measures; (ii) methodological consistency and appropriateness – is the approach defensible; and (iii) the frequency and reliability of the data. Thus, variables are chosen, 'on the basis of their analytical soundness, measurability, country coverage, relevance to the phenomenon being measured, and relationship to each other' (Freudenberg, 2003, p. 8).

This section therefore is divided into two parts. The first part will focus on justifying the selection of the variables, whereas the second part will summarise the results of the data quality in a table format.

6.3.1 Selecting Variables

The task of selecting variables needs to, as Shweder (2000) posits, deal with the issue of 'morally mapping the world', since measuring progress requires making decisions

[153] According to the Eurostat high quality declaration (2004, p. 175), the six components are: accuracy, timeliness, relevance, availability, comparability and response burden.

regarding desirability. This subjective process leads to the researcher morally mapping the world. One example Shweder mentions is the variable *life expectancy at birth*, a commonly used variable representing the health status of a nation. He questions why a variable such as *life expectancy at 40* is not used, or even *life expectancy at conception*? The results, he expects, would be far more different if this was to occur. For Shweder, the issue is whose ideals become the benchmark for a good life?

Clearly the variables selected in the RIE index, as with all progress measurements, are subject to this same criticism. Given this, it is essential that the selection process be conducted in a transparent and appropriate manner that mirrors the key objectives of the present research.

The RIE framework differs from most progress frameworks in the sense that it does not claim to include only aspects that are, in principle, prone to 'objective' measurement. As mentioned in Section 3.2.3, claiming epistemic privilege over contested areas in progress measurement, of which there are many, does not do this difficult concept justice. Subsequently some variables were included despite the fact that 'official' statisticians would be reluctant to incorporate them. For instance, the dimensions *net brain gain*, *biodiversity* and *institutional quality*. However, allowing measurement in dimensions that 'official' statisticians may frown upon does not give the current study *carte blanche* when selecting variables. In fact, the variables selected still need to comply with most of the data quality criteria.

Hence by *not* adopting a dogmatic approach to variable selection, the present research adopts a key point of difference compared to other comprehensive progress measures. Here, the importance and usefulness of variables in dimensions recognised as contributing to progress is an imperative consideration in justifying the selection of variables.

Given that methodological differences between nations will arise, practical compromises are essential to the success of the RIE index. One such compromise involves the inclusion of variables based on their usefulness despite exhibiting some methodological inconsistency.[154] Moreover, variables are included only where international comparisons are possible thus omitting country-specific issues.

With this criterion in mind the following variables were selected for the 7 themes, 23 dimensions and 21 characteristics that comprise the RIE index. To assist the readability, the variable justification will be broken into smaller segments preceded by a summary table. The variables are discussed at the level of their smallest grouping.[155]

A. Human Resources

1. Health (a. Health status; b. Access to health)
2. Population (c. Demographics)
3. Food consumption
4. Education and training (d. Access to education; e. Investment and educational quality)
5. Knowledge renewal (f. Investment and stock of knowledge; g. Codifying knowledge and ideas)
6. Net brain gain (h. Net skilled migration)

Health status. The variables *life expectancy at birth (years)*, and *infant mortality rate (per 1,000 live births)* are considered the most general and best-known measures of the health status of the population, and have long been used in numerous studies including the OECD's 2005, *Society at a Glance* (OSG) health indicators and the HDI (UNDP, 2005). Although some discrepancy exists between methodologies there is a considerable match between the variable and the issue, as well as frequent observations.[156] Thus, their inclusion is relatively straightforward.

However as Wolfson (1996) points out, the above measures are based on a death status thus ignoring the health status of a living person and their quality of life. Consequently, the WHO introduced a summary health measure that incorporated this, the *health-adjusted life expectancy – HALE (years)*. The HALE summarises the expected number

[154] For instance, the variable *infant mortality rate (per 1,000 people)* possesses variations insofar as some countries registering very premature deaths as live births while other countries do not. Yet despite this, it is a variable that is still included in most comparative health studies (WHO, 2000).
[155] The RIE index is broken down by theme (A, B, C, etc.), dimension (1, 2, 3, etc.) and, where applicable, characteristics (a, b, c, etc.).
[156] Please note that details on each variable's methodological approach are detailed in Appendix A.

of years to be lived in 'full health' that is responsive to the likelihood of survival and death as well as the frequency and severity of a comprehensive set of health states between the inhabitants (Mathers, 2002).[157] Issues regarding the reliability and comparability of HALE estimates do exist, with some fine-tuning still expected to improve its comparability (Williams, 1999). According to the WHO's statistical annex section, the HALE methodology has been peer reviewed by the Scientific Peer Review Group and the methodology is now considered well advanced (WHO, 2004). Consequently, it has been used to complement the traditional measures of health status, making up one of five health indicators used by the OECD, as well as a part World Health Report (OECD, 2005a, 2006b; WHO, 2006).

This representation of health status excludes variables that measure *lifestyle and water-borne diseases*. These were excluded on the basis that the inclusion of the HALE estimate already incorporates the burden of disease.

Access to health. The one variable in this characteristic is considered more a contributing, rather than direct, factor dealing with health. The variable *physicians (per 1,000 people)* represents direct access to health and is a part of the HDR's commitment to health segment. Although some discrepancies exist in the methodology, all three countries still have much in common (OECD, 2006a). Furthermore, the frequency of data for the specified time period is high.

The variables *hospital beds per 1,000 people* and *health expenditure per capita (US$ PPP)* are excluded. The former is excluded on the grounds that as technology improves and expands, the time spent in hospital decreases thereby diminishing the usefulness of hospital beds as an indicator of healthcare. The latter is due to the fact that health system expenditure is not reflective of outcomes, often seeming to make little difference to health status (WHO, 2000). This is reinforced by the fact that only recently the Cuban infant mortality rate fell below that of the US (WHO, 2006), highlighting how expenditure, even in real terms, may not be strongly linked to outcome. Other health-related (though less direct) variables, such as access to water and sanitation, are included elsewhere in the RIE index.

[157] This measure began its conception as the *disability-adjusted life expectancy (DALE)* in the WHO *World Health Report 2000*, and afterwards as HALE in the 2001 report.

Demographics. The variables *annual population growth rate (%)* and *total fertility rate (births per woman)* have been used in studies such as the HDR (demographic trends), *OECD Social Indicators*, the WDI in the WB (2006b) and are a part of the UN's millennium development indicators. The variables exhibit a high frequency, consistent methodology (indicating at what rate human resources are being regenerated), and are considered the best-known population indicators. Hence, they are included in the RIE index.

Food consumption. The variables selected to represent this dimension are *total calories intake (calories per capita per day)*, *total fat intake (grammes per capita per day)*, and *sugar consumption (kilos per capita)*. These variables are originally part of the UN's Food and Agricultural Organisation (FAO) database and make up over half the food consumption variables in the *OECD Health Data*. In fact, the combination of these variables (with others) makes up the foundation of food balance sheets. The data has been revised under the auspices of FAOSTAT, the FAO statistical database, and exhibits high frequency. It has been used for national policy setting and by the academic community (FAO, 2006).

Access to education. The variables are *average school life expectancy – primary to tertiary (years)* and *net enrolment rate – secondary all programmes (% of corresponding population)*. UNESCO's Institute for Statistics (UIS) collates both variables. The UIS issued a break in the classification system in 1997, making comparisons between pre-1998 and post-1998 unreliable, limiting the data frequency. Both variables are a part of the UIS *World Education Indicators* and the World Resource Institute's EarthTrends (WRIE) amongst others. Additionally, the inclusion of net secondary enrolment rate is to complement school life expectancy which is best interpreted via a complementary indicator (UNESCO, 2005; UIS, 2005).

Although these variables are employed by major organisations such as the OECD, availability and quality of data from the UIS can vary. Hence, comparisons need to be made with caution.

Investment and educational quality. With regard to investment in education one variable is selected, *public expenditure on education (% of GDP)*. The match between the variable and the dimension is illustrated via its employment in many studies including the HDR's commitment to education segment, and also Bontsis' (2004) national intellectual capital index. Although the variable's methodology is relatively straightforward, akin to the characteristic above, the UIS issued a break in the classification system in 1997, affecting comparisons between pre-1998 and post-1998 data, which should be avoided (UNESCO, 2005). Hence, the current study has the raw data for 1999 onwards.

As reviewed in Chapter 4, the controversy regarding appropriately measuring educational quality needs reiterating here. Briefly, studies conducted by Barro and Sala-i-Martin (1995) and Barro and Lee (1993) used student-teacher ratios as a proxy for quality of schooling. However, Hanushek and Kim's (1995) study argued that it is an inconclusive proxy. Furthermore, Gundlach, Rudman and Wobmann (2002) argue that an assessment of student achievements in mathematics and natural sciences via standardised international tests, a direct measure of individuals' cognitive skills, is preferable. This however is tempered by the fact that differences in education outlook, such as focusing on world matters compared to a job-oriented training, may result in misleading findings (Streeten, 1994).

In sum, the complexity of the educational quality concept requires the use of proxies that are, in their own way, unsatisfactory. Of these though, a learning outcome measure is the most appropriate (UNESCO, 2005).

Consequently, the RIE index includes the variable *tertiary students in science, math and engineering (% of all tertiary students)*, which has been included in the HDI due to its perceived importance in education, and unlike the humanities area, its measurable impact on progress. Additionally, *pupil/teacher ratio primary (students per teacher)* is also included, as well as the OECD's *Programme for International Student Assessment (PISA) science mean score*. PISA is a three-yearly survey that proxies learning outcomes for science, mathematics, reading and problem solving which are essential for full participation in society (OECD, 2005a). Its usefulness, the present research argues, outweighs its poor data frequency.

The most notable omission from this characteristic is the variable *adult literacy rate (% ages 15 and above)*. It was felt that the aforementioned educational quality variables were sufficient.

Investment and stock of knowledge. Of the three variables included in the RIE index, the first two, *R&D expenditure (% GDP)* and *researchers in R&D (per thousand in total employment)*, are straightforward inclusions. The third, *high technology exports (% of manufactured exports)* is included since it reflects products that are intellectually intensive or possessing a high R&D intensity (Bontsis, 2004), which can act as a gauge of a country's adaptability to the knowledge economy.

All three variables have been employed in Bontsis' (2004) influential national intellectual capital index,[158] as well as Malhotra (2000), Pasher (1999), Hervas-Oliver and Dalmau-Porta (2007), OECD (2005d), the Institute for Management Development's (2005) *World Competitiveness Yearbook* (WCY), and the HDR (part of technology diffusion and creation, and structure of trade). This characteristic is very well represented and contains reasonable frequency. The only real concern lies with the exclusion of military research personnel from the number of US researchers, which may slightly affect comparability.

Codifying knowledge and ideas. For knowledge and ideas to be useful, it needs to be retrievable. The most commonly used devices for transferring knowledge deals with patents and journal publications (Bontsis, 2004). Hence, the inclusion of the variables *patents granted by office (per million people)* and *local scientific and technical publications (per million people)*. Both variables can be found in the HDR, the WCY and various IC measures. This represents considerable relevance between the variables and the characteristic. Other than the usual restrictions with respect to questionnaire data, the methodology is reliable (World Intellectual Property Organisation, 2006).

The main exclusion arising from this characteristic is the WEF's innovation index. Since innovation results from a combination of patents, R&D and percentage of high-technology workers (all of which are already included), it was decided to omit the

[158] A slight variation exists as Bontis (2004) used researchers employed by university and ministry employees. However, the principle of a variable focusing on employees in R&D remains.

innovation index. Furthermore, the variable *trademark application* was omitted since the variable, patents granted, can adequately capture this potential knowledge base area.

Net skilled migration. With the onset of the knowledge economy, emphasis on assessing the effects of a potential net brain gain has become more pronounced (see Section 5.5.1). Although measurement is still controversial it has not prevented estimates being conducted by institutions such as the OECD. Currently, there exists some agreement on some main indicators such as international migration, in particular the assessment of skilled migration and remittances (Schiff and Ozden, 2005).

To represent skilled migration the RIE index includes the variable *net foreign-born persons – tertiary educated (% total residents with tertiary attainment),* which is employed in the OECD's International Migration Outlook, as part of its migration of the highly educated.[159] Another variable is *highly skilled migration (% of total highly skilled stock),* which can be found in Dumont and Lemaitre (2005). It offers an insight to those nations who have gained the most from the brain gain phenomena. Finally, the variable *net tertiary gain (% of working aged residents)* is included. It is a part of a World Bank Policy Research Working Paper by Docquier and Marfouk (2004), which approximates brain drain in 1990 and also in 2000 by estimating the stock of skilled migrants with at least tertiary educational attainment. It acts as a complement to the highly skilled stock variable with the added value of detecting a trend due to its time span.

Although the inclusion of the aforementioned variables seems satisfactory, data on international migration, represented by a solitary data point obtained from the 2000 round of population census, is recognised as being poor since no international standards exist for defining an immigrant. Nevertheless as Kapur and McHale (2005) argue, a rough statistical portrait of relevant stocks and flows can still be achieved and comparability is valid.

The main exclusion from this characteristic is remittances. Remittances are transfers of money by foreign workers to their home country and have become an increasingly

[159] Variations of this variable exist in Adams (2003) and Carrington and Detragiache (1999), appearing as net migrant flow per capita (tertiary educated).

important source of external financing, and a major flow on effect of international migration, helping to compensate some of the output losses experienced by developing countries (UN, 2004). Unfortunately though, due to a lack of data availability for Australia and the US, this variable has been omitted. The next grouping of variables belongs to the natural resource theme.

B. Natural Resources

7. Land and agricultural use (i. Land management; j. Agricultural production and efficiency)
8. Energy production and use (k. Energy efficiency and alternative sources)
9. Water (l. Water availability and quality)
10. Fisheries (m. Overfishing)
11. Biodiversity

Land management. The variables *forest area (% of land area)*, *agricultural land (% of land area)*, *arable land (% of land area)*, *irrigated land (% of cropland)*, *fertilizer consumption (100 grams per hectare of arable land)*, and *tractor use intensity (hectares per tractor)*, make up this characteristic, with the last two focusing on farming techniques.

These first five variables comprise the WDI land use and agricultural production segment, and are an automatic inclusion for this characteristic. A mixture of these variables are also part of the OECD's *Environmental Data Compendium* (OEC) data, WRIE, and the United Nations Environment Programme (UNEP) core indicators for land resources.[160] The final variable is used by the ESI as well as WRIE and is obtained from the FAO.

Given its widespread use and its central relevance to the characteristic, its inclusion was relatively straightforward, subject to the caveat that countries have different capability levels for collating precise land use data. For instance, the variables possess some inconsistencies, in particular irrigated land which is especially difficult to measure. In fact, the data is only a rough estimate and appropriate caution needs to be exercised.

[160] UNEP (2003) released a listing of core indicators in a number of environmental areas such as land resources, biodiversity, water resources and air.

Furthermore the definition of the forest area variable, which contains only two observations, 1990 and 2000, varies among nations from year to year (FAO, 2006). Finally, tractor use does not discriminate between the types of tractors in terms of size and horsepower (FAO, 2006). Hence, comparisons can be made with land use data, but special care is required in the interpretation (OECD, 2005b).

The main exclusion from this characteristic was *pesticide consumption per hectare of arable land*. The variables fertilizer consumption and tractor use intensity are deemed an adequate gauge of farming techniques.

Agricultural production efficiency. The agricultural sector is an important component of land use for many nations. This characteristic assesses its efficiency. The variables chosen are: *agricultural production per capita index (1999-2001 = 100)*, which includes all livestock and crop products and *food production per capita index (1999–2001 = 100)*, which covers all edible agricultural products. Although a myriad of variables are available for measurement, these fall within the OEC segment on agriculture, and are a part of the WDI. While the variables provide a strong match with the characteristic and possess a standardised methodology, subjectivity cannot be avoided since the data arises from a set of algorithms. Thus depending on the accuracy of the production and price data, reliability is restricted to comparisons and trends over time while strict score rankings are discouraged (FAO, 2006).

Energy efficiency and alternative sources. The RIE index incorporates the variables *GDP per unit of energy use (2000 US$ PPP per kg of oil equivalent)*, *renewable energy supply (% total primary energy supply)*, and *electric power consumption (kilowatt hours per capita)* to help assess this characteristic. The middle variable is part of the OECD's environmental energy statistics (OECD, 2006a), while the other two variables are employed in the HDR's energy and the environment segment. The three variables combined illustrate the concept of sustainability and preserving natural assets, demonstrating a strong relationship to the characteristic while also possessing high frequency. Although the data is not strictly comparable between nations, due to some inconsistencies in collection, broad impressions can easily be derived (OECD, 2006a).

Water availability and quality. To measure water availability, three variables were chosen. The first two are part of the ESI measure for water quantity and are also a part of the UNEP's (2003) core indicators for water resources. They are: *Freshwater availability (thousand cubic metres per person),* and *internal groundwater availability (thousand cubic metres per capita)*. The final variable *water withdrawal (% of internal resources)* assesses water stress levels and is a part of the OECD's *Environmental Performance Reviews* (OECD, 2003).

Selecting water quality variables proved more difficult, as only one reliable variable was able to be located, *daily organic water pollutant emissions (kg per 1,000 people)*. This variable is considered a standard water treatment test for the presence of organic pollutants and a reliable indicator of water quality (UNEP, 2003), hence its inclusion. Other variables that appear in other studies, such as *dissolved oxygen concentration (milligrams dissolved oxygen per litre water)* and *phosphorous concentrations (milligrams phosphorous per litre water)* encountered significant problems with data collection. Consequently, this sole variable will be used to proxy water quality.

With water being such a critical resource, an assessment in this area is considered vital. However, despite the attempts of AQUASTAT, the FAO's global information system on water, to ensure greater comparability with the data, the fact is that estimation methods employed between nations vary considerably. Thus, caution needs to be taken in interpreting the figures. For example, according to the OECD (2006a), data availability and quality for water withdrawal (consisting of only two observations) works best for abstractions for public supply, which represents about 15 per cent of the total water abstracted in OECD countries.

Overfishing. Traditionally, the most common data available for fish stocks applies to their yield (the number of fish caught). This characteristic is considered an important resource for humans and for human activities (OECD, 2005b) and is appropriately captured by the variables *fish captures – primary product (% world total),* and *fish consumption (kg per capita)*. They are a part of FAO's fisheries segment, and OEC, with the latter exhibiting poor frequency with only three of fifteen observations. As elsewhere, issues with self-reporting can lead to the data being overstated or understated, as well as the fact that fish populations may vary due to reasons other than overfishing. Hence, comparisons need to be carefully made.

Biodiversity. The present research supports the inclusion of biodiversity, which constitutes an important non-market environmental resource. As has occurred in other measures, ESI for one, significant data gaps and conceptual limitations have meant that the actual dimension falls short of the ideal. For instance, some issues were omitted due to inadequate data, while those included are covered up to the extent that the data will permit (WEF, 2005).

The RIE index will include the variables: *national biodiversity index, threatened mammal species (% of mammal species)* and *threatened bird species (% of bird species).* All are included in the ESI, with the last two also part of UNEP's core indicators on biodiversity, OEC and WRIE. Although some figures may not necessarily be comparable among countries due to taxonomic issues and the extent of varying knowledge from one country to another, the numbers for birds and mammals, which is what the current study includes, are generally well known (WRI, 2006a).

C. Generated Resources

The next grouping of variables belongs to the generated resource theme.

12. Financial (n. Traditional capital investment funds; o. Quality of funds; p. Costs of funds)
13. Physical capital (q. Manufacturing and agricultural machinery efficiency)

Traditional capital investment funds. When assessing the funds available to invest in capital goods, the selected variables need to examine both foreign and domestic sources. Additionally, an overall assessment of finance funds is needed. Consequently, the variables chosen are *net domestic credit (per capita current LCU), domestic credit provided by banking sector (% GDP), foreign direct investment, net inflows (% GDP)* and *net lending/net borrowing (per capita US$ PPP).*

Variables assessing financial resources are quite common and possess high frequency. The first three variables are a part of the WDI's financial and monetary segment, while the latter is located in the OECD's National Accounts (OECD, 2006d). The foreign investment variable, which is also a part of the HDR, assesses the sum of equity capital, reinvestment of earnings and other long-term and short-term capital (UNDP, 2005).

Quality of funds. An assessment of quality complements the quantity analysis above. An efficient utilisation of financial resources would be reflected by similar rates of growth in both the stock market and physical capital. Hence this characteristic incorporates *market capitalisation of listed companies (% GDP)* and *stocks traded – total value (% GDP)*. Both variables are a part of the WDI and WCY. In particular, the two variables will assess the growth, or otherwise, of the stock market. The combination of these variables provides the basis of this characteristic. The data itself originates with Standard and Poors and exhibits a very high frequency.

Cost of funds. The final characteristic concerns access to available funds. A fundamental barrier to access is cost and, more specifically, interest rates (Mankiw, 2007b). This cost component will be represented by the variables: *real interest rate (%)* and *real effective exchange rate index*. These variables are incorporated in most national money supply indicators and are a part of the WDI and WCY. Similar to other financial variables, the data appears quite frequently and reflects the objective. Although some issues of comparability do exist with exchange rate data, especially short-term movements, it is still the primary indicator of competitiveness.

Manufacturing and agricultural machinery efficiency. Traditionally viewed as a part of the physical capital of a nation, the two variables *machinery and transport equipment (% of value added in manufacturing)*, and *gross fixed capital formation – machinery and equipment (% of GDP)*, are included to measure this characteristic. Although seemingly crude measures, the two variables will act as proxies in this area. The first variable examines efficiency via value added, which is the sum of gross output less the value of intermediate inputs used in production for major industries (OECD, 2006a). The latter reflects the investment in this area. Even though the data for the first variable is surprisingly patchy for Australia, the variables that are derived from National Accounts provide good comparability since the nations follow the international 1993 System of National Accounts. The next grouping of variables combines two themes, ICT and transportation.

D. Information and Communication Technology

14. ICT Access

ICT access. ICT can improve the delivery of education and health care by enhancing a nation's capability to convert needs into application, while also assisting in alleviating poverty (ITU, 2003a). The variables chosen to measure this particular dimension have been identified in the national intellectual capital literature (Malhotra, 2000; Pasher, 1999; Bontsis, 2004; Hervas-Oliver and Dalmau-Porta, 2007). They are *telephone mainlines (per 1,000 people), personal computers (per 1,000 people), radio receivers (per 1,000 people), television sets (per 1,000 people), daily newspapers (per 1,000 people)* and *ICT expenditure (% of GDP).*

The first two variables are also part of the WCY. All the variables are a part of the *World Telecommunication Indicators Database* released by the ITU (2005).[161] Comparisons of data for the majority of these variables are used for rough estimates, consequently evaluations are confined to general trends (ITU, 2005). According to Gault (2006), greater collaborative effort is needed to obtain better policy indicators.

The most notable exclusions in this dimension are *mobile phone subscribers (per 1,000 people),* and *internet users (per 1,000 people)*. The former is due to the lack of any perceived connection with mobile phones and meaningful progress. The latter was excluded on practical grounds, since its inclusion *significantly* biased the RIE index in favour of the US, thus it was decided to employ personal computers as a rough proxy for the internet. Additionally, a knowledge-based CI was omitted due to it conflicting with the nature of the RIE index.[162]

E. Transportation

15. Transportation efficiency

Transportation efficiency. The movement of goods and passengers is vitally important to national progress as it enables people access, whether it is to and from employment,

[161] The WDI and the WRI also incorporate parts of these variables.
[162] Some recent examples of knowledge-based CIs include, *World's First Global ICT Ranking* (ITU, 2003b) and 'Network Readiness Index', (WEF, 2001).

crucial health services, or having goods transported. Consequently, the RIE index employs variables to assess the efficiency of a nation's basic infrastructure: roads, railways, sea and air (IMD, 2005). Specifically, the variables are *air transport freight (million tons per km), air transport passengers carried (per million people),* c*ontainer port traffic (TEU: 20 foot equivalent units per million people), railways and roads goods transported (million ton-km), railway passengers carried (million passengers-km)* and *roads goods vehicles in use (per 1,000 people).*

The variables are located in both the WDI, with roads and railway goods combined to form one variable, as well as the OEC transport segment. Furthermore, assessments of these four areas (road, railways, sea and air) are found in the WCY. The frequencies for the air transport data are quite high and seem fairly reliable, whereas the data for the other variables are somewhat patchy. Consequently, comparisons regarding general trends can still be made but strict estimates cannot.

F. Physical Environment

The penultimate grouping of variables belong to the physical environment theme.

16. Air quality
17. Greenhouse gas emissions
18. Conspicuous consumption
19. Built environment
20. Access to essential services

Air quality. Poor air quality affects both the people and the environment. There exist six common air pollutants that possess harmful effects to society (Environmental Protection Agency, 2005; UNEP, 2003). Of those, most environmental studies include the variables *sulphur oxide (SOx)*, *nitrogen oxide (NOx)* and *carbon monoxide (CO)* that make up the OEC, and also form part of both the ESI and UNEP's core indicators of air quality (WEF, 2005; UNEP, 2003).

The differences between countries in defining and measuring air quality data make this dimension problematic, a fact acknowledged by the EPA and OECD *Health Data*. However, the usefulness of air quality data outweighs the comparability problem, which is not indefensible. This is demonstrated by its inclusion in many major environmental evaluations.

Greenhouse gas emissions. According to the Energy Information Administration (2002) just over 80 per cent of total US human made greenhouse gas emissions is derived from energy-related carbon dioxide emissions, which contributes to climate change. In other countries it is also a very significant factor. Consequently, the present research includes two variables *carbon dioxide emissions (metric tons per capita)* and *carbon dioxide emissions (% share of world total)* to represent greenhouse gas emissions. These variables have been incorporated in many studies; some include the ESI, HDR, WCY and WRIE.

The estimates of emissions are based on long established institutionalised accounting methodologies, and undergo rigorous review and adjustments (WRI, 2006a). Thus, comparability issues are of little concern.

Conspicuous consumption. The first variable representing this dimension is the e*cological footprint per capita (hectares of biologically productive land required per capita)*. It provides some insight into the links between consumption and their environmental impacts and sustainability (Simpson, Petroeschevsky and Lowe, 2000). Its emphasis on regenerative capacity provides a reliable proxy for the life-supporting capacity of natural capital (Monfreda, Wackernagel and Deumling, 2004). It is a part of the ESI, WCY, the Environmental Quality Index and many national studies.

Although the ecological footprint is a contested variable, its methodology has improved greatly over the years. Its shortcomings arise from a lack of data availability and three-year time lag. Despite this, the indicator continues to be used in many measures due to its ability to detect general trends.

However, as the WEF (2005) rightly point out, reducing a multidimensional aspect to a one-dimensional measure is inadequate. Thus, two other consumption indicators are included, *final consumption expenditure (% gross national disposable income)*, although a slightly modified version to reflect gross disposable income can be found in the National Accounts and *defensive expenditures (US$ million per 1,000 people)*.

While the former is self-explanatory, the latter is derived from the GPI (see Section 3.6.1). It indicates the part of consumption expenditure that does not represent an addition to welfare (Hamilton, 1998). The notion of exchange costs, which was dealt with earlier in this study, argues that certain industries possessing exchange activities that were not welfare enhancing, such as insurance, should not positively add to any progress index.

The variable defensive expenditure involves a large degree of subjectivity. Briefly, the areas consumption of fixed capital, health, insurance, defence and social security, and welfare were employed.[163] Although direct comparisons are difficult, the weight of literature demands its inclusion in the RIE index. As with other variables its interpretation should be limited to general trends.

The present research excludes two widely used variables *waste recycling rates* and the *generation of hazardous waste (metric tons)*. This was mainly due to the lack of available and comparable data for the three countries.

Built environment. Traditionally considered aspects of this dimension relate to the numerous man-made surroundings that facilitate human activity. Of these, roads, homes and buildings, schools, and hospitals are considered the most vital. For instance, policymakers acknowledge that housing influences quality of life and general wellbeing (Faulkner et al., 2002). Hence, four variables have been employed to ensure a match with the dimension. They are: *roads, paved (% total roads)*, which can be located in the WDI and the WCY, *gross fixed capital formation (% of GDP)*,[164] a part of the National Accounts which includes expenditure on schools and hospitals, *average number of occupants per household* and *housing stock (per capita)*. The final two variables are derived from Euromomitor International *Global Market Information Database* (2006).

All variables exhibit a high frequency, except for roads paved, although it is still quite good. Comparability is reasonable however care needs to be taken into the interpretation

[163] For detailed information regarding its construction please refer to Appendix A, which contains the methodological approach employed.
[164] The total figure was subtracted from the variable *gross fixed capital formation - machinery and equipment* to avoid double counting.

of cultural differences, especially with the third variable (*average number of occupants per household*). For instance, are higher numbers reflective of desire or lack of choice?

Access to essential services. The variables *population with sustainable access to affordable essential drugs, population with sustainable access to an improved water source (%)* and *population with sustainable access to improved sanitation (%)* assesses whether a country is meeting the basic needs of its population. Their inclusion in many studies implies comparability is acceptable;[165] however the variables all exhibit poor frequency and rely on a myriad of sources for data collection, all of varying quality. Furthermore, the data for essential drugs was transformed from a percentage range (interval estimate) to a single data point (point estimate) by taking the mean. Nevertheless, its usefulness outweighs these shortcomings, although as (UNICEF, 2005) points out that comparisons should be made with care.

G. Socio-cultural Environment

The socio-cultural environment makes up the final grouping of variables.

21. Social connectedness (r. Social cohesion; s. Social fragmentation)
22. Institutional quality
23. Economic security (t. Unemployment; u. Financial pressures)

Social cohesion. As mentioned in Section 4.13, Bourdieu's emphasis on access to the social and economic resources embodied in social networks included both material exchanges and non-economic forms of capital (Bourdieu, 1985). According to Wilson (2006), a broad suite of indices is required to enable data collection in this area. Numerous studies have been devoted to measuring this characteristic. One in particular, Easterly, Ritzen and Woolcock (2006) lists some common variables that include direct measures such as group memberships and trust levels, and indirect measures like income per capita and the Gini coefficient. The former acts as a basic gauge for access to economic resources, while the latter assesses the extent to which income is fairly distributed throughout the nation. This is important since, as Streeten (1994) asserts, average income per capita hides the vast inequalities that can exist in society.

[165] These variables can be located, amongst many others, in United Nations Statistics Division (2007), while the WRIE incorporates the final two in its water and sanitation segment.

Of these, the RIE index incorporates *group membership (average groups respondent belong to), GNI per capita PPP (current international $)* and *gini coefficient*. Additionally, the variables *household work (hours per person aged 15+ per week)* and *life satisfaction (ages 18+)* are also included.

Household work acts as a complement to paid work (GNI per capita), by focusing on the extent to which people engage in, and benefit from, non-market work. Its importance is reflected in the fact that the SNA adopted satellite accounts which incorporate unpaid (household) work via the national agencies (ABS, 1993, 1997; National Institute of Statistics, 1997, 2003; Bureau of Labor Statistics, 2005). In fact, as Goldschmidt-Clermont (1990) argued, studies show that unrecorded household production may amount to some 30 to 50 per cent of the measured GDP. Hence, any measure of progress that omits this variable seriously undervalues a nation's welfare.[166]

Life satisfaction, on the other hand, has only recently begun to be included in national progress measures. As opposed to happiness measures that focus on individual daily changes, life satisfaction assesses group feelings. Although subjective measures of wellbeing are far from perfect, due to the impact of measurement errors, tests have shown that when used as a general indicator for the state of wellbeing, a high correlation exists between this single question and other national-level statistics (Marks et al., 2006). Interestingly, variances in subjective wellbeing are only partly explained by changes in personal income, instead other studies show that most of it is explained by non-financial variables such as joblessness, family relationships, social ties, institutional quality and income inequality (Boarini, Johansson and d'Ercole, 2006).

Although the variables exhibit a strong match with the characteristic, problems arise regarding data frequency and methodology. Other than GNI per capita, the rest possess patchy data, with some modifications needed. For instance, data located for Mexico was of household work time for age eight and above. This was used to proxy age fifteen and above.

[166] The time-use approach adopted for this variable has been criticised in its use in other studies since it ignores capital contribution, however Gershuny (2005) is an exception to this, as he includes capital in his time-based accounts.

Life satisfaction data for Australia, via the *World Values Survey*, consisted of only one data point (Veenhoven, 2005). Despite the solitary data point, one could argue that this is still sufficient, given Leigh and Wolfers (2006) article, 'Happiness and the Human Development Index: Australia Is Not a Paradox' in *The Australian Economic Review* which stated that other surveys confirmed that life satisfaction results for Australia have been stable over the past decade. Nevertheless, the present research decided to incorporate a similar life satisfaction survey performed by HILDA (Household, Income and Labour Dynamics in Australia)[167] which has recorded a mean of 8.0 in 2001, 7.9 in 2002, and 8.0 in 2003.[168]

And finally, information on the Gini coefficient is available from the Luxembourg Income Study (2005) with the ABS supplementing some data points (ABS, 2005a). Although some comparability issues exist, the fact that many studies continue to employ these variables, with the help of additional variables to present a more reliable picture, suggests that they are useful.

Social fragmentation. This deals with the disconnection that can exist in society by those people who lack access to resources. The variables are *youth unemployment rate (% labour force ages 15-24), divorce rate (per 100 marriages), prisoners – convicted adults (per 100,000 people)* and *suicide rates (per 100,000 people)*. The ages 15-24 is a crucial development phase for reasons of individual wellbeing and potential contribution to national wellbeing (Hartley, 1992), hence its inclusion. In fact, all these variables form part of Grootaert's (1998) wider list of variables to assess social integration, and have been used in empirical studies covering many countries.

Despite good frequency of data, some limitations in comparability exist in all the variables. For instance: the convicted prisoners data is collected on a single day which is deemed representative of the whole year; youth unemployment suffers from varying definitions of what constitutes unemployment; the stigma of suicide in some nations may lead to an under representation in the official estimates; whereas divorce rates need to be carefully interpreted as the ratio can be stable because both marriage and divorce

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[167] HILDA is part of the Melbourne Institute of Applied Economic and Social Research from the Faculty of Economics and Commerce, University of Melbourne. It is nationally and internationally renowned.

[168] Even though additional Australian data exists for life satisfaction, such as Headley and Wooden (2004), it was omitted as the observation deals with 25-54 year olds.

rates have changed in the same proportion (OECD, 2005a). Although the need for improved data measures is universally acknowledged, this is the most reliable data available, as is reflected by the numerous studies that employ these variables.

Some of the more prominent variables to have been excluded from this characteristic include, *homicide rates* and *hours spent watching television* – which Putnam (2000) argues significantly contributes to the erosion of SC. The former is excluded due to the belief that the prisoner variable is sufficient to encapsulate crime, while the latter was excluded due to a lack of available data.

Institutional quality (political and legal). This dimension examines the formal laws that help shape behaviour which can facilitate an optimal allocation of resources by reducing inefficiencies. The RIE index includes the following measures for institutional capacity: *control of corruption index*, which assesses whether public power is used for private gain; *rule of law index*, which examines whether the rules of the game are being played, in particular contract enforcement quality; *government effectiveness index*, which assesses credibility and commitment by the government to policies; *political stability index*, deals with the likelihood of a destabilised government; and *voice and accountability index*, which examines participation of citizens in selecting government and associated freedoms (Kaufmann, Kraay and Mastruzzi, 2004). All the variables are a part of the *Aggregate Governance Indicators* (WB, 2006c) and form a part of numerous studies including Grootaert (1998), Easterly, Ritzen and Woolcock (2006) and the ESI.

The frequency of the data occurrence, biannual from 1996 onwards is sufficient to allow for emerging trends. However, the caveat arises when dealing with comparability across countries. When contrasting governance across countries, Kaufmann, Kraay and Mastruzzi (2004) suggest that margins of error should be incorporated. However even with this, he adds, precise country rankings cannot be inferred from this data.[169] Nonetheless, results indicate that the aggregate governance indicators employed above are sufficiently informative that statistical significant differences can result (Kaufmann,

[169] Please note that although more recent papers exist, specifically Kaufmann, Kraay and Mastruzzi (2006), the methodology has not changed from past years.

Kraay and Mastruzzi, 2006). The current study insists that despite this anomaly, it is the best indicator of institutional capacity.

Some of the more prominent indicators excluded in this dimension include *democracy measure* and *enforcement of contracts and property rights*. It was felt that the five chosen indicators provide adequate coverage on institutional quality concerns. Furthermore, *voter turnout* is omitted since in Australia and Mexico voting is compulsory while in the US it is not, thus greatly diminishing the indicator's effectiveness.

Unemployment. Shifts in the labour market lead to both unemployment and underemployment of individuals and eventually skill obsolescence. This characteristic, in turn, directly affects the individual's economic security. Consequently, the following variables were selected: *civilian employment rates (% of ages 15-64), adult unemployment rate (% of labour force ages 25-54),* and *long-term unemployment (% of total unemployment)*. All these variables can be found in the International Labour Organization's *Key Indicators of the Labour Market* (ILO, 2006), OECD's *Labour Force Statistics* (OECD, 2006c), WCY, and the HDR, amongst many others.

The data for all three variables are based on national labour force surveys, where registration rules differ between countries, making direct comparison difficult. Additionally, Mexico's operational definition slightly varies from other OECD nations which employ International Labour Organization guidelines in measuring employment and unemployment. The data is also affected by changes in the survey design and conduct, as is illustrated with the respective variable methodologies in Appendix A. Furthermore, institutional arrangements impact on comparisons where nations with more generous benefits may have a larger share of long-term unemployed. Despite all this, the rates are likely to be fairly consistent over time (OECD, 2006a), and although direct comparison should be avoided, the assessment of trends can be undertaken.

An important variable that is excluded is *underemployment*, which is due to a lack of appropriate and available data for Mexico.

Financial pressures. The variables for this characteristic are *overwork hours (per person in employment), jobless households (% of total population), relative poverty rate (% of population)* and *relative poverty rate among elderly (% of population aged 66 and above)*. The first variable is similar to the Australian GPI, and can be seen as an alternative measure of leisure, as it reflects the growing concern over individuals being 'time poor' which reduces leisure and family time. The remaining three variables deal with poverty and are a part of the OECD's equity indicators, which forms a part of the OSG publication.

Although the variables are a strong match for this characteristic, comparisons are quite restricted. In fact, due to a lack of available data comprising full-time workers only, estimates on overwork hours are based on *all* workers. Additionally, rather than subtracting yearly total hours from the minimum observation in the period as the Australian GPI does, the method employed here is to subtract yearly hours from the average yearly work hours over the time series.[170] Consequently, only partial comparisons can be made.

The last three variables rely on census data with the relative poverty variables possessing only two of fifteen observations (Forster and d'Ercole, 2006). These shortcomings however are overcome by the inclusion of complementary variables. Thus, as the OSG asserts, the variables still enable one to describe trends in these areas (OECD, 2005a).

Finally, when selecting the variables, other considerations were also taken into account. For instance, variables that possessed an urban/rural distinction were omitted because: (a) they add further computational complexity to the current study, and (b) urban/rural distinctions are not as marked across the nations. Additionally, in direct contrast to the HDI (UNDP, 1995, p. 1) which states: "Human development, if not engendered, is endangered", the RIE index excludes any explicit gender related variables. Currently, the RIE index includes the valuation of non-market activities such as child-care and household work, roles traditionally performed by women.

[170] This was mainly done in an attempt to overcome methodological differences in the Mexican data which resulted in some fairly low observations and potentially distorting the outcome.

Furthermore, and more importantly, although no one denies that incorporating gender would be beneficial for a more accurate picture of progress, arriving at some sort of acceptable standard gender role, even amongst the three nations in this study is both politically and intellectually contentious. Hence, the present research will omit this concept.

6.3.2 Summarising Data Quality

As demonstrated above, the measurement of some variables is both difficult and contentious (for example, *defensive expenditures*, *household work*, *life satisfaction*, *overwork hours*, etc.), however ignoring these variables may lead to misleading conclusions if variations exist (Boarini, Johannson and d'Ercole, 2006). Table 6.1 below, which follows the guidelines outlined earlier, provides a quick summary of the quality of the data based on the match between variable and issue, variable methodology, and availability of reliable volume of data. The variables are graded from 1-5, where: 1 = Poor; 2 = Satisfactory; 3 = Good; 4 = Very Good; and 5 = Excellent. All judgements are reflective of the current researcher's assessment.

Although some variables chosen for the RIE index possessed limitations and shortcomings, the present research argues that this is an inherent trait of progress measurement.[171] And when faced with the choice of adopting the 'heroic assumptions' stated by Dixon and Hamilton to begin this chapter, as opposed to completely erroneous ones, it is this present research's contention that it has erred on the former, rather than the latter. Most of the variables selected were ready for inter-country comparisons, however when this was not the case the data was standardised by identifying an appropriate denominator such as GDP, total population, total land area, etc. to ensure comparability. Furthermore, in keeping with producing a transparent and robust measure, the current study contains profiles of all 101 variables selected for the RIE index. This includes a description of the variable, the unit it is measured in, its source, a brief description of the logic behind its inclusion, as well as the methodology used to obtain the figure.[172]

[171] In fact, this is reflected by the fact that these limitations made up part of the discussions during the Second OECD World Forum on Statistics, Knowledge and Policy, 'Measuring and Fostering the Progress of Societies', held in Istanbul Turkey, June 27-30, 2007.
[172] This is located in Appendix A.

Table 6.1 Quality assessment of RIE variables

Variable	Match between variable and issue	Variable methodology	Consistent and reliable time series
Human Resources			
Health			
Health status			
Life expectancy at birth (years)	4	5	5
Infant mortality rate (per 1,000 live births)	4	3.5	5
Health-adjusted life expectancy - HALE (years)	5	3.5	1
Access to health			
Physicians (per 1,000 people)	2.5	4	4
Population			
Demographics			
Annual population growth rate (%)	4.5	4	5
Total fertility rate (average births per woman)	4.5	4.5	5
Food Consumption			
Total calories intake (calories per capita per day)	4	4	3
Total fat intake (grammes per capita per day)	4	3.5	3
Sugar consumption (kilos per capita)	4	4	3
Education and Training			
Access to education			
Average school life expectancy – primary to tertiary (years)	3	2	2
Net enrolment rate – secondary all programmes (% corresponding population)	3.5	2	2
Investment and educational quality			
Public expenditure on education (% of GDP)	4	3	2.5
Tertiary students in science, math and engineering (% of all tertiary students)	2	2.5	2.5
Pupil/teacher ratio primary (students per teacher)	1.5	2	2.5
PISA international student assessment (science mean score)	3	3	1
Knowledge Renewal			
Investment and stock of knowledge			
R&D expenditure (% of GDP)	4	4	3
Researchers in R&D (per thousand in total employment)	4	3	3
High-technology exports (% of manufacturing exports)	4	3	5
Codifying knowledge and ideas			
Patents granted by office (per million people)	4	3.5	5
Local scientific and technical publications (per million people)	4	4	4
Net Brain Gain			
Net skilled migration			
Net foreign-born persons tertiary educated (% total resident tertiary attainment)	3	2	1
Highly skilled immigration (% of highly skilled stock)	3	2	1
Net tertiary gain in OECD countries (% of working aged residents)	3	2	1.5

Table 6.1 Quality assessment of RIE variables (continued)

Variable	Match between variable and issue	Variable methodology	Consistent and reliable time series
Natural Resources			
Land and Agricultural Use			
Land management			
Forest area (% of land area)	4	3	2
Agricultural land (% of land area)	4	3	3
Arable land (% of land area)	4	3	3
Irrigated land (% of cropland)	4	2	2
Fertilizer consumption (100 grams per hectare of arable land)	4	3	3.5
Tractor use intensity (hectares per tractor)	4	2	2
Agricultural production efficiency			
Agricultural production per capita index (1999-2001 = 100)	4	3	3
Food production per capita index (1999-2001 = 100)	3	3	3
Energy Production and Use			
Energy efficiency and alternative sources			
GDP per unit of energy use (2000 US$ PPP per kg of oil equivalent)	4	3	3
Renewable energy supply (% total primary energy supply)	4	3	3
Electric power consumption (kilowatt-hours per capita)	4	3	3
Water			
Water availability and quality			
Freshwater availability (thousand cubic metres per capita)	4	2	2
Internal groundwater availability (thousand cubic metres per capita)	4	2	2
Water withdrawal (% of internal resources)	3	2	1
Daily organic water pollutant emissions (kg per 1,000 people)	2	3	5
Fisheries			
Overfishing			
Fish captures – primary product (% world total)	2	2	2
Fish consumption (kg per capita)	2	2	1
Biodiversity			
National biodiversity index	3	2	1
Threatened mammal species (% of mammal species)	3	2	2
Threatened bird species (% of bird species)	3	2	2
Generated Resources			
Financial			
Traditional capital investment funds			
Net domestic credit (per capita current LCU)	3	4	4
Domestic credit provided by banking sector (% of GDP)	3	4	3.5
Foreign direct investment, net inflows (% of GDP)	4	4	3.5
Net lending/net borrowing (per capita US$ PPP current prices)	3	4	3
Quality of funds			
Market capitalisation of listed companies (% of GDP)	4	3	4
Stocks traded – total value (% of GDP)	4	3	4
Costs of funds			
Real interest rate (%)	5	4	4
Real effective exchange rate index (2000 = 100)	4	4	4

Table 6.1 Quality assessment of RIE variables (continued)

Variable	Match between variable and issue	Variable methodology	Consistent and reliable time series
Physical Capital			
Manufacturing and agricultural machinery efficiency			
Machinery and transport equipment (% of value added in manufacturing)	2	3.5	2.5
Gross fixed capital formation – machinery and equipment (% of GDP)	2	3.5	3.5
ICT Infrastructure			
ICT Access			
Telephone mainlines (per 1,000 people)	4	4	4
Personal computers (per 1,000 people)	4	2.5	2
Radio receivers (per 1,000 people)	3	2	2
Television sets (per 1,000 people)	4	3	2
Daily newspapers (per 1,000 people)	2	3	2
ICT expenditure (% of GDP)	3	2.5	2
Transportation Infrastructure			
Transportation Efficiency			
Air transport freight (million tons per km)	4	3	4
Air transport passengers carried (per million people)	4	3	4
Container port traffic (TEU: 20 foot equivalent units per million people)	4	3	2
Railways and roads goods transported (million ton-km)	3	3	2
Railway passengers carried (million passengers-km)	3	3	2.5
Roads goods vehicles in use (per 1,000 people)	3	2	3
Physical Environment			
Air Quality			
Sulphur oxide emissions (kilograms per capita)	3	2.5	3
Nitrogen oxide emissions (kilograms per capita)	3	2.5	3
Carbon monoxide emissions (kilograms per capita)	3	2.5	3
Greenhouse Gas Emissions			
Carbon dioxide emissions (metric tons per capita)	4	4	4.5
Carbon dioxide emissions (% share of world total)	4	4	4.5
Conspicuous Consumption			
Ecological footprint (hectares of biological productive land required per capita)	4	3.5	2
Final consumption expenditure (% gross national disposable income)	3	3	2
Defensive expenditures (US$ million per 1,000 people)	4	2	3
Built Environment			
Roads, paved (% total roads)	3	3	3
Gross fixed capital formation (% of GDP)	3	4	4
Average number of occupants per household	4	3	4
Housing stock (per capita)	4	3	4
Access to Essential Services			
Population with sustainable access to affordable essential drugs (%)	3	2	1
Population with sustainable access to an improved water source (%)	4	2	1
Population with sustainable access to improved sanitation (%)	4	2	1

Table 6.1 Quality assessment of RIE variables (continued)

Variable	Match between variable and issue	Variable methodology	Consistent and reliable time series
Socio-cultural Environment			
Social Connectedness			
Social cohesion			
Group membership (average groups respondent belongs to)	3	2	1
Life satisfaction 18+ (0 to 10 scale)	4	3	1
Household work hours (persons aged 15+ per week)	4	2	1.5
GNI PPP per capita (current international $)	3.5	4	5
Income inequality measure (Gini coefficient)	4	3	1.5
Social fragmentation			
Youth unemployment rate (% labour force ages 15-24)	4	2	4
Divorce rate (per 100 marriages)	4	2	2.5
Prisoners – convicted adults (per 100,000 people)	4	4	2
Suicide rates (per 100,000 people)	4	2	2.5
Institutional quality			
Control of corruption	4	2	2.5
Rule of law	4	2	2.5
Government effectiveness	4	2	2.5
Political stability	4	2	2.5
Voice and accountability	4	2	2.5
Economic Security			
Unemployment			
Civilian employment rates (% of ages 15-64)	4	2	4
Adult unemployment rate (% of labour force ages 25-54)	4	2	4
Long-term unemployment (% of total unemployment)	4.5	2	4
Financial pressures			
Overwork hours (per person in employment)	4	2	3
Jobless households (% of total population)	3	3	1
Relative poverty rate (% of population)	4	3	1
Relative poverty rate among elderly (% of population)	4	3	1

Having completed an assessment of the quality of the selected variables, the current study needs to ensure that an arbitrary selection of variables has not occurred. To prevent this arbitrary selection the statistically correct approach is to do a factor analysis. The present research, however, relies on the theoretical rigour and the consensus in the literature to incorporate variables in a particular combination. This approach is not dissimilar to confirmatory factor analysis.

6.4 Multidimensional Scaling

After establishing a well-defined conceptual framework to capture the progress phenomenon, an assessment regarding the overall structure of the variables and dimensions to limit the possibility of flawed conclusions is required. This will assist in the identification and allocation of an appropriate weighting and aggregation scheme (Nardo et al., 2005a).

Normally at this stage, researchers decide upon one of principal component analysis, factor analysis or cluster analysis (Nardo et al., 2005a). However as mentioned above, the theoretical rigour undertaken enables the present research to employ the principles of multidimensional scaling (MDS). The basic principles of MDS theory necessitate that a researcher accept the following perception doctrine: (i) *variation in dimensionality*, that is, an understanding that not everyone will agree as to what variables constitute the make up of the identified dimension; (ii) *variation in importance*, that individuals will attach different levels of importance to a dimension; and (iii) *variation over time*, that the make up and importance of the dimensions can change over time (Hair et al., 2006).

Specifically, the present research adopts the principles of a confirmatory factor analysis from which to include the variables. This is reflected in the dimensions and characteristics of the RIE framework discussed in Chapter 5 and the variable selection justifications outlined in Section 6.3.1.

From this point onwards, developing a CI requires the completion of six stages. They are: (i) *imputation method*; (ii) *normalisation approach*; (iii) *identifying 'reverse' transformations*; (iv) w*eighting approach*; (v) *aggregation approach*; and (vi) *sensitivity analysis*. The next section reviews the first stage, the imputation of missing values in the data, a common problem in progress measurement.

6.5 Imputation Methods

Dealing with statistical series, particularly on a national and international level, tends to lead to issues regarding missing data. This can lead to potential problems with reliability, as missing data (random or not) can misrepresent information and distort results. The problem of missing data can be dealt with through various imputation methods. The choice of an appropriate imputation method is important since it affects the results of the index. According to imputation literature, an assumption is made regarding missing values. Specifically, it assumes that the probability that a value is missing may be completely at random, or alternatively it may depend on the observed values, otherwise known as missing at random. This section will review the three main methods: (i) *case deletion*; (ii) *single imputation*; and (iii) *multiple imputation*.

(i) *Case deletion*. This method does not treat the data. It simply omits the cases with missing values. This method however results in heavy bias unless the missing values are minimal (Little and Rubin, 2002). However, if the decision is taken to treat the missing data for analysis then two other approaches exist.

(ii) *Single imputation*. Takes the form of either implicit modelling or explicit modelling. Implicit modelling centres on an algorithm, of which three methods stand out. (1) Hot deck imputation where missing values are imputed from comparable responding units. For example, a missing income value may be replaced with an income value from another respondent sharing similar characteristics. (2) Substitution where a non-responding unit is substituted with a unit not initially chosen in the sample, on the proviso that it is still representative of the missing unit, for instance, a person from the same area. (3) Cold deck imputation where an external source, preferably from a similar survey completed previously, replaces the missing data (Nardo et al., 2005a, 2005b).

Explicit modelling derives from formal statistical models, of which there are also three main methods. (1) Unconditional mean/median/mode imputation which is substituting a variable’s mean/median/mode (depending on choice) value from its existing data and apply to the missing data. (b) Regression imputation which uses regression to predict values to replace data gaps. Essentially, the variable with the missing data is the dependent variable, while the independents are made up of those variables that exhibit a strong relationship (via high correlation) with the dependent variable. (3) Expected maximisation imputation which inextricably links the models parameters to the missing values. In fact, the missing values are imputed based on initial estimates of the model parameter values. This process is repeated until the sequence of parameters reaches maximum-likelihood estimates. This ‘convergence’ stage can be quite time consuming (Nardo et al., 2005a, 2005b).

(iii) *Multiple imputation*. This involves using vast chronological regressions with intermediate outcomes, which are performed numerous times and then averaged. This imputation is performed with a random process that reflects uncertainty. This is achieved by imputing numerous values for each missing value (from the predictive distribution of the missing data); these many values help reflect the uncertainty that exists. After numerous tests are completed, the results are then averaged. From here, standard errors and p-values are adjusted on the basis of the variance of the equivalent completed sample point estimates (Nardo et al., 2005a).

The most general multiple imputation model is the Markov Chain Monte Carlo (MCMC) method. The MCMC is a succession of random variables, where the previous element’s value shapes the distribution of the actual element (Nardo et al., 2005a). The MCMC assumes multivariate normality of the data, and imputes data from the observed data using a Bayesian approach, where the missing data is assumed to be missing at random. Although, as Little and Rubin (2002) point out, the MCMC demonstrates enough robustness to even allow for variations from this assumption.

Prior to selecting a preferred method for imputation the words of Dempster and Rubin (1983), which are often quoted in imputation literature, provide a salient reminder as to the consternation that still surrounds this technique. They point out that the idea of imputation is both seductive (due to a belief of data completion) and dangerous (because it serves as a legitimate method, yet can still possess major bias).

The literature suggests that the MCMC method seems the best equipped to account for the uncertainty involved in imputation (Nardo et al., 2005a). However other considerations need to be taken into account such as computational concerns, transparency and lucidity from which a practical and legitimate alternative arises. This trade-off justifies this study’s employment of a single imputation method to impute missing values.

The imputation method was applied on a case-by-case basis assessed by observing scatter plots. For instance, when a linear pattern could be confirmed a decision was made to employ a regression imputation. Conversely, when the data exhibited a non-linear pattern, a uniform (average) imputation, as well as ratio scales imputation was performed.[173] The next stage (Stage 2) in building the RIE index involves the choice of an appropriate normalisation technique.

6.6 Normalisation of Data

The complexities involved in building a comprehensive index means that there is no prevailing methodology regarding the choice and use of normalisation techniques (Bohringer and Jochem, 2007). Given that many different measurement units represent the current data set, the data first needs to be adjusted comparably, via aspects such as size, population, income, etc. Adopting a normalisation technique to transform all these various measurement units into the same unit, prior to aggregation, then follows. This section will review the more established techniques summarised from Saisana and Tarantola (2002), Freudenberg (2003) and Nardo et al. (2005b).

1. *Ranking*. Is the easiest normalisation technique and is insensitive to outliers. It sums country rankings based on ordinal levels, thus not allowing for an evaluation on an absolute level due to a loss of absolute level information. For instance, a nation may improve the following year, yet slip in the ranking as other nations improve at a greater rate. Consequently, it may result in misleading conclusions.

2. *Indicators above or below the mean*. Values become transformed around an arbitrarily defined threshold around the mean. For instance, values close to the mean are assigned 0, whereas those values above or below receive 1 or –1 respectively. Both the assignment of an arbitrary threshold and its loss of interval level information have been criticised. For example, as long as both countries pass the threshold, both are seen as above average even though one country may perform in a vastly superior manner.

[173] The imputed data is in Appendix B.

3. *Percentage of annual differences over consecutive years*. Another simple method where the values are transformed indicating percentage growth compared to the previous year.

4. *Distance to a reference*. A target point (or reference) is employed and the relative position of the variable is measured against it. The target point could take the form of an external benchmark country, or a goal which is to be reached within *X* amount of years.

5. *Standardisation (or z-scores)*. Calculates the average value and the standard deviation across countries. Widely used in CIs, it transforms the value into a common scale (the ratio of the difference between the raw indicator value and the average divided by the standard deviation, with a mean of zero and a standard deviation of one). Although more robust when dealing with outliers, extreme values can still impact on it. For multi-year analyses the CI can be calculated by using the values of the mean and standard deviation for a reference year, usually the initial time point.

6. *Re-scaling*. Calculated as the ratio of the difference between the raw indicator value and the minimum value divided by the range, this method transforms values using standardised scores ensuring that all the indicators have an identical range (0, 1), as opposed to the standard deviation used in z-scores. Although more robust when dealing with outliers than z-scores, rescaling could extend the range of indicators existing inside a small interval escalating the effect on the CI. Table 6.2 below provides the methods for calculating normalisation.

When selecting a suitable normalisation approach, both the data properties and the objectives of the index need to be taken into account (Ebert and Welsch, 2004). The intention of the RIE index is to reward countries that perform well in dimensions considered highly important to progress, rather than reward average scores across all the indicators. Hence, the present research prefers to employ the standardised (z-score) normalisation procedure to transform the data. The bias introduced by this approach will be corrected by adopting a suitable differential weighting scheme and aggregation method (Nardo et al., 2005a). As it is a multi-year analysis, the z-score standardisation is calculated with 1990 as the initial time point.

Table 6.2 Main normalisation methods

Method	Equation
1. Ranking	$CI_c^t = \sum_{i=1}^{N} Rank_{ic}^t$
2. Indicators above or below the mean	$CI_c^t = \sum_{i=1}^{N} \cdot \mathrm{sgn}\left[\frac{x_{ic}^t}{x_{EUi}^t} - (1+p)\right]$
3. Percentage of annual differences over consecutive years	$CI_c^t = \frac{\sum_{i=1}^{N} w_i \cdot y_{ic}^t}{\sum_{i=1}^{N} w_i}$, where $y_{ic}^t = \frac{x_{ic}^t - x_{ic}^{t-1}}{x_{ic}^t}$
4. Distance to a reference	$CI_c^t = \frac{x_{ic}^t}{x_{ic=\bar{c}}^{t_0}}$
5. Standardisation (or z-scores)	$CI_c^t = \frac{\sum_{i=1}^{N} w_i \cdot y_{ic}^t}{\sum_{i=1}^{N} w_i}$, where $y_{ic}^t = \frac{x_{ic}^t - x_{EUi}^t}{\sigma_{EUi}^t}$
6. Re-scaling	$CI_c^t = \frac{\sum_{i=1}^{N} w_i \cdot y_{ic}^t}{\sum_{i=1}^{N} w_i}$, where $y_{ic}^t = \frac{x_{ic}^t - \min(x_i^t)}{range(x_i^t)}$

Notes: x_{ic}^t is the value of indicator *i* for country *c* at time *t*. w_i is the weight given to indicator *i* in the composite index. In method 2, *p* = an arbitrarily chosen threshold above and below the mean. In method 4, $x_{ic=\bar{c}}^{t_0}$ relates to reference country's indicator.

Of course, unlike the GDP, the RIE index does not assume that all its variables automatically increase progress. For instance, an increase in infant mortality cannot be said to increase progress. This acknowledgement requires the introduction of another stage (Stage 3) in the construction of the RIE index. This stage is known as 'reverse' transformation.

6.7 Identifying ‘Reverse’ Transformations

As the name suggests, a reverse transformation applies the opposite standardised z-score technique. That is, the observation must be subtracted from the mean then divided by the standard deviation (WEF, 2005).[174]

Given that different factors are relevant to different countries in their pursuit of progress, identifying ‘negative’ variables is not an easy task since determinations can be quite disputable and culturally dependent (Munda, 2005). Acknowledging this, the current study presents a list of variables chosen to undergo a reverse transformation that is summarised in Box 6.1 below. This is followed by an explanation for their inclusion.

As a measure of the health of both pregnant women and newborns, high values in infant mortality rates reflect poor health status, hence its inclusion. A more difficult scenario is assessing whether total calories intake does in fact lead to lower levels of wellbeing beyond a certain point, as is the source of caloric intake – protein or fat. An optimal calorie level intake therefore is a problematic one. However attempts have been made to estimate this, such as Passmore’s (1962) estimation of food requirements. This claims that the FAO’s ‘*reference man*’ required 3,200 calories a day, while the ‘reference woman’ needed 2,300 calories. Since then, humans have become more sedentary resulting in a lower energy need per day. The present research however, chooses a conservative 3,000 calories as its cut off (average for all persons). Since all three countries’ data exhibit values over 3,000 calories, increases in value are viewed as unhealthy which reduce progress.

A similar stance was taken with fat intake, where the WHO (2003a) decreed minimum and maximum fat levels. The recommended range was that from 15 per cent to 35 per cent of the total energy intake should be sourced from fats. Using 35 per cent as the benchmark the data values suggest that Australia and USA are consistently above this, while Mexico is within range. Hence, the decision was to interpret increases in these high fat intakes as adversely affecting human health and wellbeing.

[174] The RIE standardised values are in Appendix C.

Box 6.1 List of 'reverse' transformation variables

Variable
Infant mortality rate (per 1,000 live births)
Total calories intake (calories per capita per day)
Total fat intake (grammes per capita per day)
Sugar consumption (kilos per capita)
Pupil/teacher ratio primary (students per teacher)
Fertilizer consumption (100 grams per hectare of arable land)
Tractor use intensity (hectares per tractor)
GDP per unit of energy use (2000 US$ PPP per kg of oil equivalent)
Electric power consumption (kilowatt-hours per capita)
Water withdrawal (% of internal water resources)
Fish captures – primary product (% of world total)
Fish consumption (kg per capita)
Threatened mammal species (% of mammal species)
Threatened bird species (% of bird species)
Market capitalisation of listed companies (% of GDP)
Stocks traded – total value (% of GDP)
Real interest rate (%)
Sulphur oxide emissions (kilograms per capita)
Nitrogen oxide emissions (kilograms per capita)
Carbon monoxide emissions (kilograms per capita)
Carbon dioxide emissions (metric tons per capita)
Carbon dioxide emissions (% share of world total)
Daily organic water pollutant emissions (kg per 1,000 people)
Ecological footprint (hectares of biologically productive land required per capita)
Defensive expenditures (US$ million per 1,000 people)
Average number of occupants (per household)
Income inequality measure (Gini coefficient)
Youth unemployment rate (% labour force ages 15-24)
Divorce rate (per 100 marriages)
Prisoners – convicted adults (per 100,000 people)
Suicide rates (per 100,000 people)
Adult unemployment rate (% of 25-54 year olds)
Long-term unemployment (% of total unemployment)
Overwork hours (per person in employment)
Jobless households (% of total population)
Relative poverty rate (% of population)
Relative poverty rate among elderly (% of population aged 66 and above)

According to the WHO (2003a) total sugar consumption, which is considered a major factor in obesity and arteriosclerosis, should make up no more than 10 per cent of total energy intake. Sugar has been linked to behavioural disorders amongst children and causes dental problems. For these reasons, high values will be associated with low levels of wellbeing.

With regard to the variable pupil/teacher ratio, as UNESCO (2005) points out, its interpretation suggests that the higher the ratio the worse it is for pupils. Thus, it is assumed that lower ratios enable individual students more access to their teachers, resulting in better performances.

Although necessary to increase food production, excessive use of fertiliser and high tractor use intensity has a negative impact on soil by altering nutrient levels, and is a source of water eutrophication (WEF, 2005). Determining what constitutes excessive use is problematic; however given that wheat yields have increased little in the US and Mexico since the early 1980s (Brown, 2001), and similarly Australia (Australian Wheat Board, 2006), suggests that genetic limits have been reached. Hence, increases in these variables will more likely approximate lower levels of progress.

As an indicator of energy efficiency, via the ratio of GDP to commercial energy use, increases in the variable GDP per unit of energy use result in inefficient energy production, further taxing natural resources and diminishing environmental sustainability.

The next variable, electric power consumption, encapsulates the complexities involved with progress measurement. On the one hand, a country's development and alleviation of poverty cannot be reached without corresponding increases in energy consumption per capita; conversely, increases also coincide with greater pollutant emissions. Thus, there exist dual pressures of economic development and environmental protection. Unlike the food consumption variables, determining an electrical power consumption optimal figure based on the literature could not be approximated. Hence, the decision taken is that of minimisation.

Water withdrawal assesses the water stress levels of a country. According to the OECD (2003) ratios of <10 per cent indicate water stress is low; 10 to 20 per cent are moderate; while >20 per cent indicates high water stress levels. With the US and Mexico exhibiting relatively high levels (19.1 per cent and 17.1 per cent respectively), and Australia experiencing ongoing water restrictions, the present research will equate increasing values with low sustainability, and reduced progress.

Increases in the variables fish captures and fish consumption are treated as reductions in progress due to the following reasons. Currently, the world's major fisheries either reach or exceed their limits, with an FAO estimate in 2002 suggesting that approximately 75 per cent of the world's fish species are fully exploited, overexploited or depleted (FAO, 2004). Furthermore, corals at the Great Barrier Reef have experienced mass mortality, in part, due to the overfishing of species in the area (Jackson et al., 2001). Thus, although one could argue that increased fish consumption may be beneficial to humans, this needs to be balanced against concerns for depletion of fish stocks, especially given that a significant proportion of fish capture is used to feed industrial livestock (WHO, 2003a).

Similarly, higher percentages of threatened mammal and bird species result in lower levels of environmental sustainability or reduced environmental outcomes (WEF, 2005), hence their inclusion.

When dealing with financial resources, measures such as the GPI (Cobb and Cobb, 1994) have showed that an increasing detachment exists between notions of progress and financial wealth, as measured by national debt and stock market capitalisation levels. Thus, Korten (2000) points out, a schism exists between capitalism and real wealth (progress) creation. This reinforces the present research's belief that excessive stock market activities are in opposition to realising progress. Consequently, increases in the variables market capitalisation of listed companies and stocks traded are viewed as lowering progress.

Regarding real interest rates, increases raise the cost of borrowing money. This limits people's access to money for purchasing a home and businesses from reinvesting in capital, which can lead to diminished progress.

All three variables representing air quality, and the sole variable representing water quality, are included in this section since increases in pollution emissions have adverse effects on both human health and the environment (OECD, 2006a). Similarly, given that current carbon dioxide emission levels contribute to climate change (WEF, 2005), the present levels for the USA (over 20 tons per capita), Australia (from 15-20 tons per capita) and Mexico (around 3.5 tons per capita) are all greater than the amount that the biosphere can currently assimilate: 2 tons per capita (Wackernagel, 2001).[175] Hence, increases in these variables are viewed as detracting from wellbeing. Of course, like electric power consumption before it, the dual pressures of economic development and environmental protection need to be borne in mind; however the nature and breadth of the externalities involved demand their addition.

In the conspicuous consumption dimension, two of the three variables are included. Specifically, a high value in the variable ecological footprint suggests that a country is consuming at an unsustainable rate, while the defensive expenditure variable is included since it involves outlays that are normally a response to the deterioration in national progress. Given that economic theory links consumption, as well as other inputs, to progress (Slesnick, 2001), the other variable in this dimension final consumption expenditure is *not* included. Thus, consumption itself is not detrimental to progress, rather excessive or 'restorative' consumption is.

The variable average occupancy rates can be difficult to interpret. One could argue that depending on culture high numbers may in fact be welcome, whereas other cultures may see this lack of mobility as stagnant progress. The current study will assume that higher economic development results in lower average occupancy rates; therefore high levels of this variable are symptomatic of reduced progress.

The four variables representing social fragmentation as well as the income inequality variable from the social cohesion characteristic are straightforward inclusions. This is also the case with the variables signifying the economic security dimension, with the exception of the civilian employment rate variable.

The selection of variables where increases led to adverse progress were, understandably, not always clear-cut. For example, the variable FDI net inflows is seen as a key driver of economic development, particularly in developing and transitional economies such as Mexico. However the empirical evidence is less certain. In fact, despite much econometric work the results are mixed, depending on minimum thresholds of human capital, and the country's absorptive capability of advanced technology (Borensztein,

[175] According to the Friends of the Earth (2007) website, the 2010 target will be 1.7 tons and no more than 1.1 tons per capita by 2050.

De Gregorio and Lee, 1998). Subsequently, the present research adopted the view that increases in FDI will also increase progress. Furthermore, given that in most cases high relative productivity is associated with real exchange rate appreciations (Alexius and Nillson, 2000), an increase in this variable is also treated positively.

The next section will review Stage 4 in the development of the RIE, which is the weighting technique. This is arguably the most difficult task and one that merits significant attention.

6.8 Weighting Techniques: A Review and Selection

The difficulties of this stage require that the selection process be as transparent as possible, while ensuring that the chosen technique fulfils the current researcher's objective. Presently, there is no single overriding methodology, nor any underlying scientific relationships, or prescribed rules, for weighting and aggregating the data, due to the problem of incommensurability (Ebert and Welsch, 2004). Thus, a multitude of approaches exist, all of which have their inherent strengths and weaknesses.

Not surprisingly, disputes arise around the arbitrariness of the weighting scheme due to the complex nature of the multivariate method it was based on, or its unreliability due to its questionable meaning to society (Cox et al., 1992). In fact, disagreements among experts on the specific weighting scheme used to aggregate sub-indicators are often invoked to undermine the credibility of CIs (Cherchye et al., 2007). However, all this uncertainty does not imply that any selection is therefore arguably the 'right' one.

There are ways to ensure that the disputes regarding an appropriate weighting technique are minimised. For instance, although assigning weights is a subjective task it should still be analytically sound, explicit, and in keeping with the research's objective (Saisana and Tarantola, 2002).

According to Sharpe (2000), co-founder of the index of economic wellbeing (IEWB), weights can come from several sources: the personal views of the researcher(s) who developed the index, e.g. IEWB; societal views estimated through public opinion polls, surveys or focus groups, which Sharpe regards as the preferred approach; and statistical techniques based on factor analysis to determine the significance of each variable for changes in the overall index, e.g. index of social progress. A more common approach is to weight each variable equally. Thus, before deciding upon the appropriate technique, a review is conducted reflecting the current literature in the area.

Equal weights. After data normalisation is completed, equal weights is the most frequent practice employed in assigning weights. Primarily, this is due to the contested nature of alternative solutions that revolve around inadequate statistical or empirical grounds existing for their employment and a lack of understanding of causal relationships in the model (Nardo et al., 2005b).

Another reason for the common employment of equal weights may lay in Babbie's (2004) claims, which state that the use of equal weights should be the rule and that differential weighting techniques are appropriate if there exist convincing reasons to do so. Others favour equal weights due to its neutrality and due to the absence of any objective internationally applicable differential weighting approach, which makes for unreasonable comparisons between countries (WEF, 2005). While some researchers, Saisana and Tarantola (2002) claim, do in fact believe that all dimensions contribute equally. In practice, parsimony remains an important factor in its continued popularity.

However, claims for choosing equal weights based on parsimony grounds are not entirely accurate, given that the normalisation method that precede it helps influence the outcome (Saisana and Tarantola, 2002). Acknowledging this, the current study contends that the principle of parsimony should be accounted for but not necessarily restricted to the option of equal weights.

Two key problems this study encounters with equal weighting lies in the fact that recognised global impacts may be assigned too little weight and can be overpowered by other measures. Additionally, equal weighting is similarly subjective and an arbitrary and an inappropriate technique to gauge society's concerns. Its advantage of neutrality is not enough reason to explicitly ignore society's concerns.

An alternative avenue for assessment lies in the allocation of differential weights, based on their contribution to the part they represent. In decision theory literature, this differential weighting is normally referred to as symmetrical importance (Munda, 2005).

The reason for assigning diverse weights is to improve reliability of the index by placing higher weights to dimensions that possess greater theoretical or evidence based importance to the issue at hand. In fact, Freudenberg (2003) states that when possible, higher weights should be assigned to factors that are more significant in the context of the particular CI.

This method is also open to criticism since the researcher can impose their bias regarding the relative importance of each factor, which can significantly alter research outcomes (Slottje, 1991).

To overcome this one may choose differential weights based on either statistical models or participatory processes (if longitudinally consistent). Statistical models are perceived as being neutral since they rely on the data. There are four main weighting techniques based on statistical models.

Principal component analysis (PCA)*/factor analysis*. This technique groups together indicators that are collinear with the aim of accounting for as much common information as possible. Thus, each factor contains variables that reflect a high association with it. The goal is to capture a wide array of information using a minimum of factors. Consequently, a change in focus occurs away from the dimensionality of the dataset, and instead relies on the statistical dimensions of the data (Jolliffe, 1986). Factor analysis is similar to PCA insofar as only a subset of principal components are retained, those accounting for the largest variance. The main difference is that PCA does not rely on a specific statistical model whereas factor analysis is based on a particular model (Nardo et al., 2005a).

Criticisms of the extraction of principal components to determine weighting centre on two main concerns. Firstly, as with other measures that are based on correlations, the weighting corrects for overlapping information for two or more correlated indicators implying that if no correlations existed then weights for individual factors could not be estimated. Furthermore, there tends to be a general confusion between correlations and causation. Correlations do not necessarily respond to the underlying relationship between the variables and the phenomenon to be analysed. Hence, a correlation-based test normally fails to reflect the actual influence of the dimensions towards the model's objective. Consequently, attempts at estimating the real weights require a dependent variable. The irony is of course, if a reliable dependent variable existed, then there would be no need for a CI (Nilsson, 2000; Saisana and Tarantola, 2002; Nardo et al., 2005a).

Secondly, PCA should not be used when the base indicators perform better in some cycles than others in different cycles, as this method reduces the models reliability. Specifically, it minimises the contribution of indicators that do not move with other indicators (Nilsson, 2000).

Data envelopment analysis. This is a very flexible technique that can be used in a wide range of areas. Through the use of linear programming, an efficiency frontier is produced to act as a benchmark to measure the performance of a given set of countries (Allen et al., 1997).[176] According to Storrie and Bjurek (2000) it is the data, via the set benchmarks that determine the weights. The construction of the benchmark normally follows three assumptions: (i) weights are strictly positive; (ii) no priorities given, thus countries are not discriminated against that perform best in any single dimension thus ranking them equally; and (iii) an assessment of comparative efficiency (convexity of the frontier) through the use of linear programming is feasible (Allen et al., 1997; Nardo et al., 2005a).

Therefore, the set of weights of each country depends on their position or distance, with respect to the benchmark (efficiency frontier), a benchmark that normally corresponds to an ideal point. Thus, different distances result in different weights.

Critics of this approach argue that the overwhelming empirical nature of this technique means that outcomes will not be able to provide a suitable policy direction for a country to be able to improve its situation (Saisana and Tarantola, 2002). Furthermore, the benchmarking technique allows different countries to identify unique benchmarks making cross-country comparison impossible (Melyn and Moesen, 1991). Hence, the method is undesirable for the present research.

[176] As Allen et al. (1997) point out, that the use of linear programming to assess comparative efficiency was originally proposed by Farrell, but operationalised and popularised by Charnes, Cooper and Rhodes (1978).

Distance to targets. The HDI employs this technique as part of its international development strategy, it is seen as an alternative to a cost-benefit approach. Here, global or universal targets based on performance criteria are set for all countries to achieve. The weighting in this technique is realised by dividing the variables values by the corresponding target values, which are expressed in the same units. The goal of the HDI is to minimise the cost of attaining the target. The targets are easy to understand and can also reflect political necessity, such as mobilising political support or use for policy goals (Griffin and McKinley, 1992). However, given the comprehensive nature of the RIE index, the task of establishing numerous international target goals is unfeasible. Hence, this approach is not considered appropriate.

Aside from statistical techniques, another avenue to determining different weights is based on participatory approaches involving public or expert judgement. Unlike statistical weights, participatory approaches can reflect policymaking concerns and/or budget constraints (WEF, 2005). The current study will review the two most commonly used approaches.[177]

Expert judgement via budget allocation. Under this scenario, experts are gathered to attribute weight to the indicators that are placed before them. Experts are each given *X* amount of points to distribute across the indicators. The indicators they believe to be more important are allocated a larger share of the points, however agreement amongst experts is not common, especially regarding progress measurement. This technique is best suited for models that possess relatively low number of indicators, roughly 10-12, and is normally conducted with priory knowledge of national goals. The downside to this is that the weighting scheme will not necessarily reflect the importance of each variable, but rather the need for political intervention (Saisana and Tarantola, 2002; Nardo et al., 2005a).

Public opinion. This method seeks feedback from the public, as opposed to the experts, via public opinion polls. The polls focus on levels of concern rather than the allocation of *X* amount of points. This technique is low cost and easy to use, and has been extensively employed over many years over a range of matters, including weight

[177] Another two participatory approaches, although less popular, are the analytic hierarchy process and conjoint analysis.

allocation (Parker, 1991). It also gives due consideration to the very people who will be affected by resultant policies. In fact, the idea of incorporating the general public into the policy processes has been more and more recognised by the multi-criteria community (Munda, 2005). As mentioned earlier, claims of bias resulting from personal judgement can be overcome if public opinion polls are longitudinally consistent.

However, not everyone is convinced by this approach. In fact, the ABS (2006) states that the use of public opinion is appropriate for other investigators to determine what to measure for national progress but not for a national statistical agency. Many consider the use of public opinion to be unworthy due to a preconception that the public evaluates issues, particularly environmental, on an irrational basis. However as Parker (1991) claims, such accusations are baseless given that many case studies dealing with environmental threats, a topic which is supposed to exhibit the most inconsistency, have shown that weights based upon public opinion are fairly consistent across both time and space. In fact, Parker concludes, using public opinion as a technique to weight diverse environmental indicators is feasible.

Other criticisms, such as those from Munda (2005) consider participatory processes as a necessary but not sufficient condition. His main concerns include how some participants may exert undue pressure on the others. Furthermore, focus groups are not a representative sample of the population and thus ethically social preferences should not be derived from it. Instead, a plurality of ethical principles seems the only dependable way to obtain weights in a social framework.

6.8.1 Choosing the Appropriate Weighting Technique

The contentious nature of a weighting scheme means that no weighting system is above criticism (Booysen, 2002). As Bohringer and Jochem (2007) declare, when discussing the appropriateness of weights for sustainability indices, participatory approaches are rather subjective while weights derived from statistical methods might even be less acceptable for policy-making purposes since politically insignificant variables may be assigned a higher value and more pertinent issues may not be considered at all.

The present research argues that the principle of assigning weights based on their contribution to the areas they represent, means that a differential weighting technique must be employed. Ideally, as Munda and Nardo (2005a) point out, weights must be context-dependent, reflecting the political, social and economic priorities, as well as the development strategies a country has chosen to pursue.

The approach of the current study is to adopt a differential weighting scheme based on opinion polls. As Cox et al. (1992) state, given the lack of a pre-eminent weighting scheme the use of a simple weighting scheme within dimensions is recommended. They do add however, that applying analytical techniques to investigate patterns of variation, together with sensitivity analyses, should follow this.

In sum, given both the highly contentious nature of weighting schemes and the fact that no weighting method can claim superiority over any other, the choice to employ a differential weighting allocation based on opinion polls can be justified. Firstly, this method ensures that all dimensions *are not* treated equally, due to the fact that some components contribute more to the context of a particular index than others (Freudenberg, 2003). Secondly, this approach explicitly incorporates the concerns of the citizens, the party affected by public policies. The present researcher believes this is best achieved via a citizen participation survey.

Specifically, this present research will apply the survey developed by the Canadian Policy Research Network (CPRN), which involves extensive citizen participation in identifying priorities for quality of life indicators. Although Canada does not form part of the current study, an assumption is made that since the country shares enough characteristics with Australia, Mexico and the US, the view reflected by this sample of citizens is also reflective of the concerns felt in the aforementioned countries. As Gurria (2007) asserts with regards to measuring progress, all nations face common challenges that transcend national boundaries, economic sectors and institutional divides.

Since 1995, CPRN has played a leading role in public policy in Canada. In 2001, Michalski reported on the individual questionnaire responses on the importance of factors contributing to quality of life in Canada ($n = 342$). Twenty-two factors were ranked on a scale from 1 (not important) to 7 (extremely important). Rankings were made prior to and following a public dialogue process (Michalski, 2001). The results of this are given in Table 6.3 below.

Table 6.3 Importance of factors contributing to quality of life in Canada

Factors	Pre-Dialogue Mean Scores (S.D.)	Post-Dialogue Mean Scores (S.D.)
Clean environment	6.44 (0.83)	6.37 (0.85)
Health programs	6.41 (0.94)	6.42 (0.87)
Schools/colleges/universities	6.38 (0.92)	6.34 (0.87)
Low poverty rates	6.27 (0.99)	6.06 (1.10)
Secure employment	6.22 (1.03)	6.19 (1.00)
Low crime rates	6.14 (1.05)	5.94 (1.07)
Low unemployment rates	6.06 (1.05)	5.99 (1.09)
Social programs	6.02 (1.17)	6.01 (1.03)
Economic growth	5.85 (1.22)	5.80 (1.21)
Parks and recreational facilities	5.75 (1.15)	5.58 (1.20)
Housing programs	5.73 (1.26)	5.71 (1.25)
Non-profit and voluntary programs	5.70 (1.24)	5.67 (1.32)
Childcare or day-care programs	5.67 (1.39)	5.64 (1.26)
Welfare programs	5.65 (1.34)	5.74 (1.19)
Governments	5.62 (1.27)	5.65 (1.25)
Cultural diversity	5.55 (1.35)	5.32 (1.43)
Lower personal income tax rates	5.27 (1.71)	5.10 (1.75)
Arts and music programs	5.18 (1.41)	5.02 (1.50)
Private companies	5.07 (1.25)	4.82 (1.35)
The media	4.79 (1.38)	4.69 (1.50)
Religious organisations	4.42 (1.69)	4.33 (1.68)
Lower corporate tax rates	4.20 (1.93)	4.24 (1.92)

Source: Michalski (2001, p. 52).

Using figures from the pre-dialogue column, the results showed that the participants consistently rated health programs, a clean environment, and the education system as the most important universal factors for quality of life. Not only did these dimensions attain popular support, but they also exhibited smaller variation as shown by their standard deviation figures. Other factors, such as secure employment, low poverty, unemployment rates and low crime rates were rated a level below, whereas the economy, as indicated by economic growth, was another level below this (Michalski, 2001). The health, education and environment factors have historically been the prevalent and universal view as to what constitutes quality of life (as reviewed in Chapter 2).

In fact, Michalski (2001) asserts that there was a significant overlap regarding the dominant factors for quality of life, specifically: health, quality education, healthy environment with clean air and water, public safety and security, job security, employment opportunities, a living wage, responsible taxation, and social programs for income maintenance and to ensure basic needs are met. So much so that there was no need to distinguish results between different demographics.

From this, a weighting allocation scheme was devised. Primarily, certain factors in the survey were matched to the relevant dimensions in the RIE index (see Table 6.4 below).

Table 6.4 Assigning CPRN quality of life factors to RIE dimensions

RIE dimension	Relevant CPRN Quality of Life Factor(s)
Health	Health programs
Population	Economic growth
Food consumption	Health programs
Education and training	Schools/colleges/universities
Knowledge renewal	Economic growth
Net brain gain	Schools/colleges/universities
Land and agricultural use	Clean environment
Energy production and use	Clean environment
Water	Clean environment
Fisheries	Clean environment
Biodiversity	Clean environment
Financial	Economic growth
Physical capital	Economic growth
ICT access	Economic growth
Transportation efficiency	Economic growth
Air quality	Clean environment
Greenhouse gas emissions	Clean environment
Conspicuous consumption	Clean environment
Built environment	Parks and recreational facilities & housing programs
Access to essential services	Health programs
Social connectedness	Low crime rates & social programs
Institutional quality	Governments
Economic security	Low poverty rates, secure employment & low unemployment rates

Most of the linkages between the dimensions of the RIE and the CPRN factors are self-explanatory. For example, the factor *health program* was assigned to: health, food consumption and access to essential services dimensions. The factor *clean environment* was assigned to the dimensions: land and agricultural use, energy production and use, water, fisheries, biodiversity, air quality, greenhouse gas emissions and conspicuous consumption. While the factor *economic growth* was assigned to the dimensions: financial, physical capital, ICT, transportation and population.

Hence the justification will be limited to two RIE dimensions: knowledge renewal and social connectedness. Knowledge renewal has been linked to economic growth and not schools/colleges/universities. As mentioned in Section 4.2, Romer and Lucas proposed the inclusion of technology and knowledge as an essential feature of economic growth, but did not class it as an independent factor of production. However, as Thurow (1999) argues, the application of knowledge via innovation is now the predominant part of progress creation. Bontsis (2004) takes a more restrained point of view, but nonetheless insists that there exists a significant link between investment in renewal capital and sustained economic growth. Furthermore, as stated in Section 5.5.1, given that this dimension represents a shift in knowledge from *use-value* to *exchange-value* (hence the focus on investment in R&D and high technology exports), the present research is justified in aligning the dimension with *economic growth*.

Regarding social connectedness, one could argue that the CPRN factor voluntary organisations should have been added to *low crime rates* and *social programs* to represent the dimension. However, *social programs* already incorporate day care accessibility and social assistance and support, which were deemed sufficient.

The next phase involved assigning scores to the factors that reflected the proportional differences. Under this, the factor with the lowest proportion (g*overnments* with 5.62) was assigned 1 and the factor with the highest proportion (*clean environment* with 6.44) was assigned 10. The entire rankings are shown in Table 6.5 below.

Table 6.5 Proportional scores of CPRN factors

Original factor score	Proportional score
5.620	1
5.711	2
5.802	3
5.893	4
5.984	5
6.075	6
6.166	7
6.257	8
6.348	9
6.440	10

The scores of the dimensions were then computed from the scores assigned to the factors. The weights of the dimension were standardised to fit a [1, 10] scale. For example, the dimension health had an initial CPRN factor score of 6.41, when converted this became 9.681 out of 10.

To arrive at each dimensions weight the total RIE score, obtained by adding the proportional scores of the twenty-three dimensions of the RIE index, was 164.437. From here, the individual dimension scores were taken as a percentage of the RIE score. The results of the weighting scheme are summarised in Table 6.6 below.

Although this is a relatively straightforward and simple approach to assign weights, it is the contention of the present research that it is also the most appropriate as it directly reflects the concerns of citizens. For the analysis, the idea is to keep weights unchanged over the time period (1990-2004) as this will assist in analysing the evolution of a certain number of dimensions, rather than setting priorities that would see weights change over time (Nardo et al., 2005b).

Having settled on a weighting allocation scheme, the next stage (Stage 5) is to choose an appropriate aggregation technique. Here, the goal is to assure that the rankings obtained are consistent with the information and the assumptions used along the structuring process (Munda, 2005).

Table 6.6 RIE dimension weights

RIE dimension	Allocated weight
Health	0.0589
Population	0.0214
Food consumption	0.0589
Education and training	0.0569
Knowledge renewal	0.0214
Net brain gain	0.0569
Land and agricultural use	0.0608
Energy production and use	0.0608
Water	0.0608
Fisheries	0.0608
Biodiversity	0.0608
Financial	0.0214
Physical capital	0.0214
ICT access	0.0214
Transportation efficiency	0.0214
Air quality	0.0608
Greenhouse gas emissions	0.0608
Conspicuous consumption	0.0608
Built environment	0.0080
Access to essential services	0.0589
Social connectedness	0.0368
Institutional quality	0.0061
Economic security	0.0435

6.9 Aggregation Techniques: A Review and Selection

Many major international organisations such as the OECD, European Union, WEF and the International Monetary Fund, are increasingly employing CIs in many areas (Nardo et al., 2005b). As Cherchye (2001) states, the main reason for this is to facilitate the benchmarking and ranking of countries according to some aggregated dimensions. There are three main aggregation techniques to accomplish this: (i) *additive methods*; (ii) *geometric aggregations*; and (iii) *non-compensatory multi-criteria analysis*.

(i) *Additive methods*. These can be a simple additive aggregation which merely sum the country's rank in each of the indicators, based on ordinal information. Similarly, one can use nominal scores to calculate how many indicators lie above and below a designated threshold, and obtain the difference. Both approaches are simple to use and insensitive to outliers, however they make no absolute value or interval level analysis respectively (Nardo et al., 2005b; Munda and Nardo, 2005a).

The most used additive approach is the linear aggregation method. It is however a restrictive technique with regard to the form of the variables, specifically this surrounds the quality of the variable and the measurement unit – which should be the same. An additive aggregation function is said to exist only when indicators are preferentially independent. This requirement of independence, which is of itself a difficult condition to achieve, suggests that assessments are made at the variable's marginal levels which are then added to determine a total value. It also implies full compensability, allowing poor performances to be offset by good performances in other indicators (Nardo et al., 2005b; Munda and Nardo, 2005b). This technique exacerbates full compensability, which is in contrast to the present research's stated intention for the weighting and aggregation section which was to correct for skewed results arising from the rewarding of exceptional behaviour.

Furthermore, when the concept of importance is attached to the variable *rather* than its quantification, following the conceptual framework outlined in Chapter 5, the linear aggregation method is inadequate. For example, if protected species are perceived as more, equal or less important than GDP, this perception is a function of the quality of variable that is independent of any measurement scale one may use (Munda and Nardo, 2005b). Thus interpreting weights based on importance, when depending on a range of variable scores as the linear aggregation method does, is completely inappropriate (Anderson and Zalinski, 1988). Given its full compensability nature, the current study views this as an inappropriate aggregation technique.

(ii) *Geometric aggregations*. Like linear aggregation, weights are expressed as trade offs, however the variables need not possess the same measurement unit. In fact weighted geometric aggregation is ideal for data that is strictly positive with different ratio-scales, which include many environmental variables (Ebert and Welsch, 2004). Although less compensatory than linear aggregation, an absence of conflict amongst the variables is still preferred.

Normally when assigning weights, more weight is given to an indicator considered being of more significance to the index, an approach which is also adopted by the present research. Crucially, as Munda and Nardo (2005b) claim, this approach is not reflected with either the linear or geometric application. This is due to the use of substitution rates. For example, when variables are expressed as intensities, substitution rates are employed that are equal to the weights of the indicators up to a multiplicative coefficient. Consequently, weights reflect the substitution rate as opposed to the variable's importance. This leads to a compensatory logic. Thus a poor result in one dimension can be counterbalanced by an above average result in another dimension.[178] This trade-off is theoretically inconsistent to the notion of assigning weight based on their importance to the model's objective.

According to Podinovskii (1994), a CI that intends to employ differential weights to variables based on their importance *needs* to adopt a non-compensatory aggregation procedure. This not only avoids complete compensability but also implies a theoretical guarantee that weights are used with the meaning of symmetrical importance, where variables are used with an ordinal meaning (Munda, 2005; Bouyssou, 1986).

[178] This substitution rate dilemma is found in most environmental impact assessment studies where most aggregations follow the linear rule and weights are attached according to their relative importance idea. Thus the ecosystem is viewed as not being in conflict, which appears to be quite an unrealistic assumption for a study to make (Funtowicz, Munda and Paruccini, 1990).

Furthermore, given that the data being assessed is ratio scale non-comparability, the options available are quite limited. If all the variables possess a natural origin and the corresponding observations are strictly positive, then a weighted geometric mean of the crude (i.e., unnormalised) data can yield a meaningful index (Ebert and Welsch, 2004).[179] However, if this does not apply and the symmetrical importance of variables interpretation needs to be retained, then a non-compensatory aggregation procedure must be used. This can be achieved using a non-compensatory multi-criteria analysis.

(iii) *Non-compensatory multi-criteria analysis*. This approach acknowledges the conflict existent between variables and tries to resolve them. It does this by employing a discrete multi-criteria approach that incorporates the lack of preference independence (Munda, 1995; Roy, 1996). Here, a pair-wise comparison of countries across all indicators is performed. This is then ranked from best to worst in a complete pre-order by a mathematical formulation (Condorcet-type of ranking procedure).

Under the Condorcet approach, weights are never combined with intensity of preferences (such as distance to leader), which preserves the theoretical importance of the coefficients. Since intensities of preference are not used, the degree of compensability connected with the aggregation model is at the minimum possible level. Given that summation of weights equal one, the pair-wise comparisons can be synthesised in an outranking matrix which can be interpreted as a voting matrix (Munda and Nardo, 2005a).

In addition to overcoming preference dependence and trade-offs, this method also allows the joint use of both qualitative and quantitative information, and does not require any normalisation procedure, as it can handle incomparability of data, something that normalisation cannot overcome (Nardo et al., 2005a).

Thus, as Munda (2005) points out, a linear or geometric aggregation is not suitable if an increase in economic performance cannot compensate a loss in social cohesion, or a worsening in environmental sustainability. Instead a non-compensatory multi-criteria

[179] Interestingly, according to Bohringer and Jochem (2007), of the eleven indices they reviewed that possessed ratio scale non-comparability scaled variables – some of which included the HDI, ISEW and ESI – all but one failed to use the geometric aggregation procedure set out in Ebert and Welsch’s (2004) article.

approach, due to its ability to find compromises between two or more legitimate goals could assure non-compensability. Furthermore from a social choice point of view employing non-compensatory rules (which are always Condorcet consistent rules) can be clearly corroborated via social choice literature. This states that desirable ranking procedures using ordinal information are always of a Condorcet type (Arrow and Raynaud, 1986; Moulin, 1988; Munda and Nardo, 2005b).[180]

According to Munda (2005), the main drawback to this method is that when many countries are involved in the analysis, the number of permutation calculations rises exponentially, making it computationally costly.

Having established that assigning weights based on importance coefficients (differential weighting) will more accurately portray the various levels of importance of the RIE dimensions, a non-compensatory technique is preferred.

Hence, employing non-compensability aggregation rules to construct this RIE index is necessary and desirable due to its theoretical consistency. Surprisingly, this technique has almost never been explored in the framework of a CI (Munda, 2005). Unlike linear aggregation, Condorcet aggregation has no limitation on the measurement scale of the variable scores that exist, all of which reduces uncertainty and imprecision in developing the RIE index (Munda and Nardo, 2005a). The Condorcet technique is detailed below.

6.9.1 An Axiomatic Setting for the RIE Index

When evaluating countries against each other one finds that some variables favour one country, while other variables favour another. Overcoming these conflicting variables in a non-compensatory manner will enable the present research to appropriately rank the three countries. When rankings are based on ordinal information, the Condorcet approach should always be used (Arrow and Raynaud, 1986).[181] However, one

[180] In fact, Arrow and Raynaud (1986, p. 77) state that for aggregating an algorithm, the highest feasible multi-criterion ranking must be Condorcet.
[181] The Condorcet method is based on his work in 1785 titled, *Essai sur l'application de l'analyse a la probabilite des decisions rendues a la probabilitie des voix*. This citation appears in the reference section of Munda (2005) and Munda and Nardo (2005a).

drawback to this approach is the algorithm's inherent problem with the presence of cycles.[182]

Specifically, the probability $\pi(N,M)$ of obtaining a cycle with N countries and M individual indicators rises with N as well as the number of indicators. Cycles can occur quite regularly with macroeconomic data, necessitating a process that can handle this issue, a problem that Condorcet himself was aware of (Munda, 2005).

Although Kemeny (1959) worked mostly on clarifying this, it was Young and Levenglick (1978) who provided a complete axiomatisation. Hence the approach is known as the Condorcet-Kemeny-Young-Levenglick (CKYL) ranking procedure.

Arrow and Raynaud (1986) abandon the Kemeny method on the basis that preference reversal phenomena can happen within this method. According to Munda (2005) and Munda and Nardo (2005a), the most appropriate approach to deal with cycles is to employ the CKYL ranking procedure, all the while accepting that rank reversals may occur.

By accepting rank reversal, some suggest that Arrow's axiom of independence of irrelevant alternatives is not respected. More importantly, as Young (1988) asserts, the CKYL ranking procedure is the only *conceivable* ranking procedure that is locally stable. This stability refers to how the ranking of alternatives will not change if only an interval of the full ranking is measured.

As Munda (2005) states, adapting the CKYL ranking procedure for a CI is straightforward. The maximum likelihood ranking of countries is the ranking supported by the maximum number of individual indicators for each pair-wise comparison, summed over all pairs of countries involved. A simple, yet formal, ranking algorithm derived on these concepts follows.

[182] The formulas and summary are derived from Munda (2005, pp. 962-964) and Munda and Nardo (2005a, pp. 6-7).

Given a set of individual indicators $G = \{g_m\}, m = 1,2,...,M$, and a finite set $A = \{a_n\}, n = 1,2,...,N$ of countries, let's assume that the evaluation of each country a_n with respect to an individual indicator g_m (i.e., the indicator score or variable) is based on an *ordinal, interval* or *ratio* scale of measurement. A higher value of an individual indicator is preferred to a lower one (the higher, the better), that is:

$$\begin{cases} a_j P a_k \Leftrightarrow g_m(a_j) > g_m(a_k) \\ a_j I a_k \Leftrightarrow g_m(a_j) = g_m(a_k) \end{cases} \tag{1}$$

where P and I indicate a preference and an indifference relation respectively, both fulfilling the transitive property.

Another assumption is made regarding the existence of a set of individual indicator weights $W = \{w_m\}, m = 1,2...,M$, with $\sum_{m=1}^{M} w_m = 1$, derived as importance coefficients. Mathematically, the problem is how to rank in a complete pre-order (i.e., without any incomparability relation) the selected countries from best to worst, given the information available. This can best be achieved by a mathematical aggregation convention which is divided into two steps:

i) pair-wise comparison of countries according to the whole set of individual indicators used; and.

ii) ranking of countries in a complete pre-order.

To perform a pair-wise comparison of countries the following axiomatic system, which is adapted from Arrow and Raynaud (1986, pp. 81-82) is required.

Axiom 1: Diversity

Each individual indicator is a total order on the finite set A of countries to be ranked, and there is no restriction on these indicators; they can be any total order on A.[183]

[183] In the original, Arrow and Raynaud (1986) talk about a finite set X of alternatives, with no restriction condition on the criteria that can be any total order on X.

Axiom 2: Symmetry

The individual indicators possess non-comparable scales, therefore the only information they provide is the ordinal pair-wise preferences they contain. This is an essential axiom, given that intensity of preferences and compensability are bypassed, and that weights need to be symmetrical importance coefficients. Furthermore, this axiom helps reduce uncertainty and imprecision since a normalisation step is not required.

Axiom 3: Positive Responsiveness

The degree of preference between two countries a and b is a strictly increasing function of the number and weights of individual indicators that rank a before b.[184] According to Munda (2005) and Munda and Nardo (2005a) in social choice terms the equal treatment of all individual indicators (anonymity) is broken. Thus according to Arrow's impossibility theorem a trade-off occurs between decisiveness, where a ranking or alternative has to be chosen, and anonymity. In such instances, decisiveness is preferred.[185]

The three axioms therefore allow a $N \times N$ matrix E, called an *outranking matrix* to be constructed, which supposes that all available information is contained within (Arrow and Raynaud, 1986; Roy, 1996). Any generic element of $E : e_{jk}, j \neq k$ is the result of the pair-wise comparison, according to all the M individual indicators, between countries j and k. The following equation facilitates the attainment of a global pair-wise comparison:

$$e_{jk} = \sum_{m=1}^{M} \left(w_m \left(P_{jk} \right) + \frac{1}{2} w_m \left(I_{jk} \right) \right) \tag{2}$$

where $w_m\left(P_{jk}\right)$ and $w_m\left(I_{jk}\right)$ are the weights of individual indicators representing a preference and an indifference relation respectively. It clearly holds that:

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[184] Once again, in the original, Arrow and Raynaud (1986) talk about the intensity of preferences between two alternatives x_i and x_j.

[185] Furthermore, as Munda (2005) states, it is essential that no individual indicator weighs more than 50 per cent of the total weight; otherwise the aggregation procedure would become lexicographic in nature, and the indicator would become a dictator in Arrow's term. To comply with this, all dimensions in the RIE index contain at least two variables.

$$e_{jk} + e_{kj} = 1 \qquad (3)$$

All the $N(N-1)$ pair-wise comparisons compose the outranking matrix E. Call R the set of all $N!$ possible complete rankings of alternatives, $R = \{r_s\}, s = 1,2,..., N!$. For each r_s compute the corresponding score φ_s as the summation of e_{jk} over all the $\binom{N}{2}$ pairs j,k of alternatives, i.e., $\varphi_s = \sum e_{jk}$, where $j \neq k, s = 1,2,...N!$ and $e_{jk} \in r_s$.

The final ranking (r^*) is the one that maximises the equation below, which is:

$$r^* \Leftrightarrow \varphi_* = \max \sum e_{jk} \text{ where } e_{jk} \in R. \qquad (4)$$

Of course these are not the only formal properties of the CKYL, others are (Young and Levenglick, 1978; Munda, 2005):

- *Neutrality:* all countries are treated equally.
- *Unanimity:* if country *a* is preferred to country *b* by all the individual indicators than *b* should not be chosen (sometimes called Pareto optimality).
- *Monotonicity:* if country *a* is preferred in any pair-wise comparison and *only their* individual indicator scores (i.e., the variables) are improved, then *a* should continue to be the winning country.
- *Reinforcement:* if the set *A* of countries is ranked by two subsets G_1 and G_2 of the individual indicator set *G*, such that the ranking is the same for both G_1 and G_2, then $G_1 \cup G_2 = G$ should still supply the same ranking. This general consistency requirement is very important in the framework of a CI; since one may wish to apply the individual indicators belonging to each single dimension first and then pool them in the general model.

Given the importance of the reinforcement property stated above the maximum likelihood ranking procedure, employed by the present research, is the only Condorcet consistent rule that holds the reinforcement property. As Arrow and Raynaud (1986) state, this property is highly relevant to welfare economics and political science due to its definite ethical content.

In any aggregation techniques, practical compromises need to take place. For instance, under a Condorcet approach anonymity is lost as is the information on the intensity of preferences of the variables. The latter however can be made up by complementing the Condorcet approach with a benchmarking approach, as has been performed in the present study, to form as a comparison with the Condorcet only approach. These practical compromises are a necessary price to ensure that compensability is reduced and that weights can be considered as symmetrical importance coefficients (Munda and Nardo, 2005a).

The employment of the Condorcet approach enables the present research to reduce one of the main sources of uncertainty and imprecision (Munda and Nardo, 2005a). To help further reduce this, a sensitivity analysis (SA) will be performed. Apart from being good analytical practice, conducting a SA adds further information on the applicability of the results. It also increases the defensibility of the chosen method by reducing some of the uncertainties involved in building the RIE index.

6.10 Sensitivity Analysis Tests

Employing a SA is also in line with the sentiments expressed by Cox et al. (1992) in Section 6.8.1, which declared that a SA should follow the use of a simple weighting scheme. Hence, this study claims that it is methodologically appropriate to conduct one.

Sensitivity analysis is quite similar to uncertainty analysis insofar as it examines the variation existent in country rankings. It is also seen as a key to building and improving models (Saisana and Tarantola, 2002).[186] This variance-based technique (also known as importance measures or sensitivity indices) is considered the most appropriate technique when dealing with non-linear models (Saltelli, Tarantola and Campolongo, 2000; Saisana, Saltelli and Tarantola, 2005). Furthermore, as Saltelli (2002) adds, not only does the variance-based method offer a factor-based breakdown of the output variance, it does so by implicitly assuming that this moment is adequate to explain output variability.

[186] It must be noted that Saltelli et al. (2004), stress that all uncertainties need to be explored (sub-indicator choice, data normalisation, weighting scheme, etc.). However, the difference that applies to the present research is that those claims were referring to scientific models, whereas the approach proposed here is a heuristic one.

Under a variance-based approach, a few summary variables are chosen to provide a succinct, yet extensive, meaning of the model's objective. These variables are then subjected to variation within prescribed ranges (Saltelli, Tarantola and Campolongo, 2000; Saisana, Saltelli and Tarantola, 2005).

For an effective variance-based SA, the importance of a given input factor X_i can be measured via the 'sensitivity' index. This index is the fractional contribution to the model output variance due to the uncertainty in X_i. For k independent input factors, the sensitivity indices can be determined by using the following decomposition formula for the total output variance $V(Y)$ of the output Y:

$$V(Y) = \sum_i V_i + \sum_i \sum_{j>i} V_{ij} + \ldots + V_{12\ldots k}, \qquad (5)$$

where:

$$\begin{aligned} V_i &= V_{Xi}\{E_{X-i}(Y|X_i)\}, \\ V_{ij} &= V_{XiXj}\{E_{X-ij}(Y|X_i, X_j)\} - V_{Xi}\{E_{X-i}(Y|X_i)\} - V_{Xj}\{E_{X-j}(Y|X_j)\}, \end{aligned}$$

and so on. In computing $V_{Xi}\{E_{X-i}(Y|X_i)\}$, the expectation E_{X-i} would call for an integral over X_{-i}, i.e., over all factors except X_i, including the marginal distributions for these factors, whereas the variance V_{Xi} would imply a further integral over X_i and its marginal distribution. A first measure of the fraction of the unconditional output variance $V(Y)$ that is accounted for by the uncertainty in X_i is the first-order sensitivity index for the factor X_i defined as:

$$S_i = V_i / V. \qquad (6)$$

When a model does not have any interactions among its input factors, it is said to be additive. In this case, $\sum_{i=1}^{k} S_i = 1$ and the first-order conditional variables of equation (5) are all that one is required to know to decompose the model output variance. For a non-additive model, higher order sensitivity indices, which are responsible for interaction effects among sets of input factors, need to be computed. However, higher order sensitivity indices are not normally estimated. For example, in a model with k factors, the total number of indices (including the S_{iS}) that should be estimated is as high as $2^k - 1$. Consequently, a more compact sensitivity measure is employed. This is the total effect sensitivity index, which has the ability to concentrate in one single term, all the interactions involving a given factor X_i. To illustrate, for a model of $k = 3$ independent factors, the three total sensitivity indices would be:

$$S_{T1} = \frac{V(Y) - V_{X2X3}\{E_{X1}(Y|X_2, X_3)\}}{V(Y)} = S_1 + S_{12} + S_{13} + S_{123}. \tag{7}$$

Analogously:

$$\begin{aligned} S_{T2} &= S_2 + S_{12} + S_{23} + S_{123}, \\ S_{T3} &= S_3 + S_{13} + S_{23} + S_{123}. \end{aligned} \tag{8}$$

The conditional variance in equation (7) is normally written as $V_{X-1}\{E_{Xi}(Y|X_{-i})\}$ (Homma and Saltelli, 1996). It represents the entire contribution to the variance of Y due to non-X_i, i.e. to the $k-1$ remaining factors, so that $V(Y) - V_{X-1}\{E_{Xi}(Y|X_{-i})\}$ includes all terms, i.e., a first-order term as well as interactions in equation (5), that involve factor X_i. In general, $\sum_{i=1}^{k} S_{Ti} \geq 1$, with equality if there are no interactions. For a given factor X_i a notable difference between S_{Ti} and S_i flags an important role of interactions for that factor in Y.

This ability to draw attention to interactions amongst input factors enables researchers to improve understanding of the model structure. Estimators for both S_i and S_{Ti} are provided by a variety of methods, and are reviewed in Chan et al. (2000).

Hence, the advantage of the extended variance-based techniques applied to scientific models include model independence, the ability to explore a wide variety of variation in the input factors as opposed to a few, and the ability to consider interaction effects (Saisana, Saltelli and Tarantola, 2005).

When the uncertain input factors X_i are dependent, the output variance cannot be decomposed as in equation (6). The S_i and S_{Ti} indices are still valid sensitivity measures for X_i, though their interpretation changes as, for example, S_i also carries over the effects of other factors that can be positively or negatively correlated to X_i.[187]

Although the SA outlined above has been presented as a prerequisite for scientific model building and improvement, this present research takes a slightly different view, espoused by Oreskes, Shrader-frechette and Belitz (1994), as its basis for employing a SA.

According to Oreskes et al. (1994), SA is seen as merely one of many possible uses to which a model can be put. In what they term the 'problem of truth' Oreskes et al. add that unless one is studying a closed system, it is impossible to demonstrate the truth of any proposition.[188] Thus, models that do not deal with a closed system can neither be verified nor validated – a notion that deals more with legitimacy than truth. Instead, models are confirmed or corroborated by offering evidence to support what may be already partly established through other means. Confirmation therefore becomes inherently partial.

The end result is that models are qualified by a heuristic value (which is their primary value) that take on the property of making representations useful for guiding further study, but not susceptible to proof.[189] Therefore Oreskes et al. (1994) add, models can use SA, but for exploring "what-if" scenarios. This enables it to highlight parts that may be most in need of additional analysis or greater empirical data.

In keeping with this approach to SA, the current study will conduct a SA based on various "what-if" scenarios to specifically determine up to what point can *X* variable change without affecting the ordering of the RIE index. The selection of *X* variables was determined through the application of three distinct and separate methods: (i) *dynamic changes*, (ii) *empirical* and (iii) *policy based*. All the selected variables are subject to

[187] For a more detailed analysis please refer to Saisana and Taranatola (2002).
[188] This conclusion, Oreskes et al. (1994) claim, derives directly from the laws of symbolic logic.
[189] Herein also lies the crux of the RIE index and its inherently contested nature.

changes in variation from -10 per cent to +30 per cent, performed in 4 per cent increments.

(i) *Dynamic changes*: A coefficient of variation (CV) = $\frac{\sigma}{\overline{X}}$ test was conducted on all the variables in the RIE index over the specified time period (1990-2004). The four variables possessing the highest CV, indicating high variability, were chosen. For Australia the variables selected were (a) *overwork hours*, (b) *foreign direct investment*, (c) *stocks traded* and (d) *personal computers*. With regards to Mexico the variables selected were (a) *overwork hours*, (b) *voice and accountability index*, (c) *personal computers* and (d) *real interest rate*. And finally, the selected variables for the US were (a) *overwork hours*, (b) *foreign direct investment*, (c) *stocks traded* and (d) *net lending/net borrowing*.[190]

(ii) *Empirical*: Here four variables that are generally considered to be key variables to achieving progress, were selected to apply to all three countries based on readings and observations undertaken throughout the course of the present research. The four selected variables were (a) *life expectancy*, (b) *carbon dioxide emissions*, (c) *life satisfaction* and (d) *gross national income*. Naturally, agreement on the make-up of the variables is up to conjecture.

(iii) *Policy based*: Four variables were chosen to reflect possible policy aspects of each country regarding progress. Common to the three countries chosen are policies in the key areas of education and employment, hence the variables *net enrolment rate* and *civilian employment rates* were selected. The other two variables selected for each country are more specific.

A traditional area of policy concern for Australia has been *long-term unemployment*. According to Dixon and Lim (2004), this is a major contributor to poverty and is an issue the government is aware of, and has tried to alleviate; thus it is included. The other variable, *high technology exports* reflects Australia's more than decade long aspiration to become the 'clever country'. This can assess whether targeted policies are placing Australia at the forefront of the knowledge economy. For Mexico, the variables *infant*

[190] The results of the CV tests are in Appendix F.

mortality rate and *access to essential drugs* were chosen. According to the OECD (2005c), the Mexican health system is facing major challenges; where continued high rates of mortality are a concern, while the availability of most drugs in the state health services is extremely poor. The link between health and progress make these a straightforward choice. The two additional variables for the USA were *renewable energy supply* and *convicted adult prisoners*. The former variable can help elucidate the impact government policy can have on improving the environment and progress, while the latter reflects the USA's continual major commitment to crime. It is also an issue that reflects the social aspect of progress.

All the variables subject to a SA will provide an indication as to what the potential impact could be to national progress should either an increase or decrease occur. It adds a further layer to the current research by providing scope for additional inquiry. These three approaches will be subjected to two options. The first option examines changes to selected variables only within the selected country, whereas the second option assesses changes to that country's selected variables in conjunction with changes to the selected variables of the other two countries.[191]

Having established the methods employed to assess the RIE index, the following section is intended to answer the present research's final objective which is to demonstrate how this measure can be applied to different situations and countries, specifically Australia, Mexico and the USA. The most constructive way of achieving this is, with the help of some important underlying assumptions, to apply monetary values to the RIE dimensions.

6.11 Emerging Thinking and Potential Variables

Progress measurement has been undergoing unprecedented rejuvenation. In response, the OECD's recent World Forum on Statistics, Knowledge and Policy on 'Measuring and Fostering the Progress of Societies' was an attempt to coordinate the work in this field.[192] From this conference, came a general agreement that there is a need to develop a more comprehensive view of progress, one that takes into account social, economic

[191] The percentage changes for the 'other countries' in option 2 vary from 10 per cent to 30 per cent.
[192] This conference took place in Istanbul, Turkey on June 27-30, 2007. One of its objectives was to convene and promote research and information sharing among countries.

and environmental concerns. Leading the way in this endeavour are civil society initiatives such as those reviewed in Chapter 3, the GPI, the HPI and the GNH to name but a few.[193] All these measures reflect the view within economics to broaden the scope of economics to incorporate non-material aspects.

From this comprehensive view (economic, environmental and social) of measuring progress however, a complementary issue arises. That is, while variables assessing the economic flows of progress are commonplace, the non-economic flows are not so. This was also reflected in the data collection of the RIE index.

In fact, as the shortcomings in the data collection illustrated, further development of variables are needed to assess what remains some of the least understood or measured impacts. Hence, this study research will list some potential variables unimpeded by the restrictions of data or measurement design, which could be contemplated for further work and ultimately inclusion in future progress measures (Robeyns, 2003).

Similar to the advent of the general HALE measure which assesses the number of years spent in good health, indicators are required that assess more specific concerns. For instance, an index for 'lifestyle' diseases, degenerative diseases, as well as 'social advantage/disadvantage' should be made available on a worldwide basis. This would enable future progress measures to more accurately identify problems with *health*.

With *education*, a measure of functional literacy is required to assess educational quality, similar to the one provided by the International Adult Literacy Service. It measures a person's ability to comprehend and employ information necessary to function effectively in a knowledge-dependent society, however it only applies to twelve countries (Prescott-Allen, 2001). This needs to be expanded further. Additionally, high-quality training data is only available on a limited national level. Hence, more work is needed on acquiring data that will incorporate both national and industry specific rates of training and development participation, apprenticeship intakes, etc.

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[193] Other examples are the ESI and the Calvert-Henderson quality of life indicators (Henderson, Lickerman and Flynn, 2000).

The dimension *net brain gain* is perhaps in most need of variable development and refinement. Ideally an index is needed that encompasses the issues of net migration flow, diasporas, estimated tax losses as well as international remittances.

Land and agricultural use variables that could be used in future progress measures might include measures relating to the quality of forests, in particular, genetic stock and resistance to disease. Additionally, measures of soil degradation, salinisation and desertification, are also currently not available on an inter-country basis. The dimension *water* lacks consistent data since very few countries report water quality data to an international body, while the *fisheries* dimension would be best served if comparable international data could be obtained that measured the size, health and array of fishery stocks (WEF, 2005).

Although a measure regarding *biodiversity* is included in the RIE index, there still exists no universally accepted measure in this area. Ideally, the measure should reflect the genetic and organism variety of the ecosystem, as well as document the conservation of critical habitat (WEF, 2005).

The *physical capital* dimension would benefit from a measure assessing the average productive lifetime of capital. If accessible across nations one would be able to compare the different rates of national efficiency in certain sectors. Furthermore the GPI variable, cost of industrial accidents would be a welcome inclusion if accurate cross-national data existed for a number of countries. Whereas the *ICT* dimension would be improved by the variables computer literacy rates, digital storage per capita and the availability and extent of software usage (Malhotra, 2000; Bontsis, 2004; Hervas-Oliver and Dalmau-Porta, 2007).

For *air quality*, a measure that captures indoor particulates from solid fuel combustion in the home, considered one of the most prevalent forms of air pollution, is needed. Furthermore, measures assessing cross-national environmental pressures need to be incorporated. Currently, some measures regarding flows of pollution are available in Europe, but not elsewhere (WEF, 2005).

The dimension *conspicuous consumption* needs comparable international measures dealing with solid and hazardous waste generation, while the built environment would benefit from the inclusion of cross-national data on the percentage of people disturbed by noise. Although data does exist for this, it is not very widely available.

With *social connectedness*, a variable that assesses perceptions of crime rates could provide valuable insight to future progress models. Institutional quality, on the other hand, would benefit from the inclusion of the variable, % of GDP going to graft and corruption. And finally, variables that can depict local moneylenders (loans from family and friends) and also trade credit, which is highly dependent on good social relations (Van Bastelaer, 1999), would be ideal.

6.12 Conclusion

This chapter explained in detail the variables selected and the methods used in the study. The variables chosen for the RIE index were explained and the reasons for their inclusion were justified. The country selection criteria was also discussed. The imputation techniques were reviewed and the method chosen justified. The normalisation procedure was discussed, where the standardisation procedure will be employed. A variety of weighting and aggregation techniques were discussed with the weighting technique (public opinion) and the aggregation technique (CKYL ranking procedure) chosen for the study justified. A sensitivity analysis was explained and its employment to the present research was made clear. This was followed by a discussion on potential variables needed for improved progress measurement. The next chapter will present and discuss the results from the methods outlined above.

Not everything that counts can be counted, ant not everything that can be counted counts. (Usherwood, 2002, p. 117) [Notice on Einstein's office wall]

Chapter 7: Qualitative Impacts

7.1 Introduction

Having outlined the methods and data to be employed for the analysis in the previous chapter, the focus for this chapter is to assess the possible qualitative impacts of the RIE index's dimensions and themes. Analyses of possible impacts usually manifest themselves in one of two ways: trade-off or reinforcement. A trade-off occurs when one dimension improves at the expense of another, while reinforcement occurs when an improvement in a dimension strengthens another dimension (ABS, 2002, 2004a, 2006).

Initially, the chapter will conduct an analysis for each dimension that will for the most part focus on any resultant impacts on the other dimensions within its theme. A summary table is then presented which will assess the impact the seven themes have on each other, and ultimately, on progress. When discussing the impacts of dimension and theme interaction, the assumption of *ceteris paribus* is made.

7.2 Qualitative Impacts for the RIE

The first dimension for qualitative impact assessment is health. Although an undoubted link exists between health and food consumption, the impact of an increase in the health dimension on the food consumption dimension is uncertain, especially in the short-term. This is reflected by the high life expectancy figures for nations which is in stark contrast to the eating habits of its people who increasingly are substituting a healthier plant-based diet to a less healthy high-fat, energy-dense diet (WHO, 2006). This anomaly may be due to the fact that people in 'advanced' countries are leading longer lives due to breakthroughs and advancements in technology (WHO, 2000). On a thematic level, the stock of human resources will improve as the health dimension increases. The next dimension, population, assesses the renewal of the stock of human resources. With no discernible impact on its fellow dimensions, increases in population will positively affect the human resource theme by increasing its overall stock.

According to ongoing results of the *World Health Report*, a long established direct impact can be demonstrated between high levels of education with high levels of health (WHO, 2006). The effect of education should also be reflected in increases in the knowledge renewal dimension (Bontsis, 2004). The effect on the net brain gain dimension however, is more circumspect. Any impact will depend on other factors such as wages and employment opportunities. Increases in net brain gain will positively impact the human resource theme.

The knowledge renewal dimension deals with manageability comprising of the investment and codification of knowledge, which transfers knowledge from *use-value* to *exchange-value* (see Section 5.5.1). Increases in this dimension have the potential to dictate the flow of the net brain gain dimension and also impact on education. Given that knowledge contributes positively to progress (Weizsacker et al., 1997), an increase in this dimension will also increase the human resource theme.

In theory, when a nation experiences a decrease in net brain gain the result is a net outflow of highly skilled people (UN, 2004). The potential impacts arising from this are contentious. For instance, a decrease in the net brain gain dimension may act as an enticement for locals to become more educated due to the potential economic benefits such as increased capital flows through networks (diasporas), remittances, etc. (Boucher, Stark and Taylor, 2005; Adams, 2003). Yet this needs to be juxtaposed with the reality that as net brain gain decreases, more experienced and skilled people head overseas to utilise their intellectual capabilities. Hence, the source country is deprived of opportunities to exploit this vital human resource which undervalues the national benefits from investments in education (Kapur and McHale, 2005). Despite this contentious nature, the present research posits that decreases in the net brain gain dimension will decrease the human resource theme.

The next dimension, land and agricultural use, is a part of the natural resource theme. From the RIE index standpoint an increase in this dimension may also result in an increase in the biodiversity dimension. The theme itself will also increase.

The next dimension, energy and production use has a dual scope. It assists in production, manufacturing and everyday life, while also being a prime source of pollutant emissions (Hawken, Lovins and Lovins, 1999). Reflecting the RIE index, an increase in this dimension implies high levels of non-renewable energy production and use. This should impact negatively on biodiversity and reduce water availability. It also affects the air quality and greenhouse gas emissions dimensions as well as the health dimension (Cobb, Halstead and Rowe, 1995). On a thematic level, the natural resource theme should decrease.

An increase in the water dimension results in greater water quality and availability, which supports a rich and varied community of organisms and protects public health (WHO, 2003b). Consequently, increases in this dimension will lead to increases in the land and agricultural use dimension as well as the health dimension and the natural resource theme. An increase in the next dimension, fisheries, has the capacity to lower both the overall natural resource theme and the biodiversity dimension. This is in keeping with the RIE standpoint which views fisheries as a vital element of the marine ecosystem (Gordon, 1954) and also due to the fact that in 1995, two-thirds of the world’s recognised marine fisheries were either over-exploited or at their limit of exploitation (Vitousek and Mooney, 1997).

An increase in the biodiversity dimension should result in an increase in the fisheries dimension. The impact on the land and agricultural use dimension is less certain. However, the natural resource theme will increase.

The financial resource dimension makes up one half of the RIE’s generated resources theme. Usually, as the financial resource dimension increases so does the nation’s ability to acquire funds to invest in capital or machinery (Mankiw, 2004). Hence, under this definition, the physical capital dimension theme should also experience an increase. However, the RIE approach to financial resources also takes into account the amount of funds that are diverted into areas that the present research considers divergent to progress, such as high levels of stock market trading. Consequently, a decrease in financial resources can still lead to an increase in the physical capital dimension. From a theme perspective, after accounting for quality of funds, increases in financial resources will also increase the generated resource theme.

More straightforward is the physical capital dimension, which is considered an essential requirement for the production of goods and services. Here, an increase in this will lead to a positive result for the generated resource theme.

Given that inadequate ICT infrastructure has the effect of severely hindering knowledge-induced creation (Bontsis, 2004), an increase in the ICT access dimension should simultaneously increase both the infrastructure theme and the knowledge renewal dimension. The other infrastructure dimension, transportation efficiency, represents the more traditional form of a nation’s infrastructure, and as the WB (1996) point out, is central to development. Thus, increases in this dimension will not only increase the infrastructure theme, but also the built environment dimension due to the areas of overlap that exist between the two.

An increase in the air quality dimension should also increase the biodiversity, water and health dimensions. The latter is due to the fact that improvements in air quality reduce the chance of respiratory illness and lung damage (UNEP, 2006). Furthermore, the physical environment theme would also increase as a result. Conversely, an increase in the greenhouse gas emissions dimension would lead to deterioration in the physical environment theme, and negatively impact the water, biodiversity and health dimensions.

An increase in the conspicuous consumption dimension results in countries producing excess goods to satisfy non-essential demand. The by-product of this increase can result in a decrease in the air quality dimension while increasing the greenhouse gas emissions dimension, and thus lowering the physical environment theme.

Increases in the built environment dimension will be reflected by a greater number of roads, buildings, hospitals, parklands, etc. This dimension however also has the capacity to detract from progress via alterations to the natural environment. Under the RIE index however, increases in the dimension will increase the physical environment theme and the transportation dimension, while potentially adversely affecting the air quality dimension. An increase in the access to essential services dimension will result in an improved health dimension (WHO, 2006) and also increase the overall physical environment theme.

Given the conceptually complex nature of the socio-cultural environment theme, determinations of potential impacts and outcomes are difficult to make. However, an increase in the social connectedness dimension may, as some studies (Ministry of Social Development, 2006) have shown, result in higher levels of individual health outcomes thus potentially increasing the health dimension. On a thematic level, an increase will also occur with the socio-cultural environment theme.

The dimension institutional quality deals with the extent to which a nation can operate effectively. Increases in this dimension will increase the theme and may lead to an increase in the social connectedness dimension due to greater levels of particularised trust (North, 1990).

The effect of an increase in the economic security dimension (the final dimension of the RIE index) on the social connectedness dimension would be difficult to determine. Intuitively, a higher level of social connectedness should occur via lower crime rates, etc. However as Putnam (2000) shows, greater economic security may also result in greater isolation. The theme itself though should experience an increase.

Having briefly reviewed the possible qualitative impacts of the dimensions on their corresponding thematic dimensions (and occasionally other dimensions) and prescribed theme, the next part of this section will review the interactions that exist between the seven themes of the RIE index. Table 7.1 below summarises the impacts that may occur between the proposed RIE themes taken in isolation, and ultimately, on progress.

Table 7.1 Summary of impacts between themes of the RIE index

		Resources			Infrastructure		Environment
		Human	Natural	Generated	ICT	Transportation	Physical
R	Human						
	Natural	? (1)					
	Generated	? (2)	? (3)				
I	ICT	+ (4)	? (5)	? (6)			
	Transportation	+ (7)	? (8)	+ (9)	+(10)		
E	Physical	- (11)	- (12)	- (13)	+(14)	? (15)	
	Socio-cultural	? (16)	? (17)	? (18)	?(19)	? (20)	? (21)

Notes: The numbers in parenthesis indicate theme interaction. For instance, (1) equals interaction between human and natural resources, (2) equals interaction between human and generated resources, etc.
+ Equates to a positive outcome for national progress as a result of theme interaction.
- Equates to a negative outcome for national progress as a result of theme interaction.
? Equates to an uncertain outcome for national progress as a result of theme interaction.

(1) *Human and natural resources*. Although these two themes historically have a close and quite pronounced interaction, assessing their impact on progress is difficult. For instance, as population pressures continue to develop, national natural resources such as land, water and biodiversity face increased usage pressures. However, identifying the potential impact on progress depends on the underlying epistemological standpoint, specifically to what extent the state of the environment is tied to human conditions. For example, the FAO argues that links between population pressures and deforestation are quite strong. However this relationship is negated somewhat by the employment of modern agricultural machinery, where percentage change in forest area depends upon percentage change in population, since it reduces land requirements (Cropper and Griffiths, 1994).

Others however argue that, while improved technology does help, its impact on natural resources is limited. For instance, while superior technology enhances efficient resource management it cannot produce an infinite flow of raw materials necessary for continual agricultural production. Moreover, as Pimentel et al. (1997) point out, technological improvements can actually adversely affect natural resources as it did in the fishing industry, where the greater efficiency of vessels, due to their improved size and speed, diminished the percentage fish population because of overfishing.

Of course, population decreases can negatively impact the natural habitat as well depending on the nation. For example, in Nepal increased erosion was the result of depopulation which meant that terraces could no longer be maintained (Streeten, 1994). Additionally, one needs to consider that dimensions such as land and agricultural use and water have added to life expectancy and improved the general health of its citizens.

It would seem that nations in a traditionally advanced development stage are more likely to experience a decrease in progress than less developed nations.

(2) *Human and generated resources*. Given that generated resources comprise a combination of human and natural resources, it is clear that these two themes will significantly affect each other. As the skill base of humans increase, their ability to then apply these techniques to physical capital (proxied by machinery) results in increased levels of efficiency and capacity. Thus as Prescott-Allen (2001) states, any under-

investment in human resources will result in a limited productive utilisation of physical capital. This suggests that increases in human resources should increase this part of generated resources. However, the interaction between the human resources and financial resources dimension is more circumspect given that an improvement in the latter dimension is based not only on whether a nation experiences an increase in the availability and use of funds, but also the extent to which areas such funds are diverted to. This then has the capacity to counter any positive effect that may occur with the physical capital dimension. Hence, the interaction of these themes may also lead to an uncertain progress outcome.

(3) *Generated and natural resources*. As physical capital become more efficient, the end result for natural resources is not necessarily positive. As demonstrated with the fisheries dimension, greater efficiency can sometimes contribute to higher per capita consumption, and ultimately lead to stock depletion (Pimentel et al., 1997). A more obvious example is how strong industrialised nations improve their energy efficiency production; yet simultaneously lower the levels of natural habitat due to the associated externalities (Daly and Cobb, 1994). The interaction between financial resources and natural resources is less obvious, although trade policies have the capacity to either hinder or protect the environment (Hawken, Lovins and Lovins, 1999). This results in an uncertain outcome arising from the interaction between these two themes.

(4) *ICT and human resources*. The characteristics of the ICT theme make it highly dependent on the effective utilisation of human resources. In fact, the interaction of these two themes is critical in exploiting the advances in the knowledge sector. An effective ICT structure will advance the knowledge systems that can harness development, by sustaining and externalising the output of human resources (Bontsis, 2004). Consequently, the outcome of this particular interaction is positive for progress.

(5) *ICT and natural* resources. As nations utilise ICT in an endeavour to provide significant revenue streams, the reliance on natural resources diminishes somewhat. Theoretically, this should place less pressure on nations to over-exploit their natural resources for monetary gain. The transition brought about by ICT can already be witnessed albeit on a small but still noteworthy scale. For example, ICT availability has resulted in a reduction of growth of print form of newspapers, letters, etc. to

communicate ideas (Malhotra, 2003). Contrarily, as ICT capacity has increased so has the number of personal computers and laptops used in society. All of which require energy for operation. Thus, the result of this interaction is uncertain since it is subject to the levels of ICT energy consumption.

(6) *ICT and generated resources*. The utilisation of ICT infrastructure enables a nation to access greater financial resources by opening up the possibility of new avenues to accumulate financial assets. As a result, constraints of time, distance, volume and increasingly cost are diminished as the way business is conducted is transformed (Bontsis, 2004). The only caveat associated with this deals with the aspect of monetary accumulation, which will depend on the quality of these funds. In keeping with the RIE standpoint, increases in paper wealth and greater trade movements via the stock exchange do not necessarily constitute advances in progress. Thus, any impact on progress requires an examination of the net impacts.

(7) *Transportation and human resources*. Transportation infrastructure has the capacity to either improve or detract from progress due to its size and efficiency. Hence, inappropriately designed transport strategies result in progress deterioration (WB, 1996). The extent of this efficiency will vary from country to country, depending on the skills, knowledge and financial capacity of the nation. A major externality associated with the transportation theme is pollutants omitted which negatively impacts human resources via the health status dimension. Although the overall effect will depend on the size and efficiency, in the main the contribution should be a positive one.

(8) *Transportation and natural resources*. Although infrastructure is necessary for the functioning of a community or society (see sections 1.3 and 5.6), it is also one of the major sources of pollutants via road and air traffic which is harmful to natural resources. As the WB (1996) posited, unsuitable transport designs can actually harm the environment. Given this qualification the net effect is uncertain.

(9) *Transportation and generated resources*. Economic and progress literature suggests that interactions between transportation infrastructure and generated resources will

result in higher levels of progress.[194] Its role is to provide support for national resources, and can provide major benefits, and facilitate sustained progress, provided they are adequate and efficient. Hence, a positive progress outcome should occur.

(10) *Transportation and ICT*. Similar to the association between the health and education dimensions, results of IC national studies (Bontsis, 2004; Andriesson and Stam, 2005) suggest that high levels of ICT coincide with high levels of transportation infrastructure. The interaction of these two themes therefore should result in a positive contribution to progress.

(11) *Physical environment and human resources*. The increasing demands from population growth can place undue stress on the assimilative capacity of the physical environment. This is considered a major cause of air, water and solid-waste pollution (Cropper and Griffiths, 1994). Of course, as stated earlier, these externalities can be tempered somewhat by advancements in modern technology. However as the climate crisis demonstrates, advancements have not countered the externalities which have currently moved beyond a level from which the earth can sustain. Hence the interaction between these themes should decrease progress.

(12) *Physical environment and natural resources*. Conspicuous consumption, which is part of physical environment theme, has contributed to some nations living beyond their natural resource capacity. This type of over consumption results in, but is not exclusive to, soil erosion, loss of croplands and biodiversity. From the natural resource theme, the dimension energy production and use can lead to harmful effects for the physical environment manifesting in worsening air quality and greenhouse gases (Daly and Cobb, 1994). The resultant outcome of this interaction is that progress deteriorates.

(13) *Physical environment and generated resources*. As stated previously, greater efficiencies in generated resources is not necessarily an optimal outcome for the environment. Fisheries have been over-exploited (Pimentel et al., 1997) and greater energy efficiency production has coincided with higher levels of carbon dioxide

[194] Although Banister and Berechman (2000) do not use the term generated resources, they are referring to financial assets and tangible investment goods, such as plant and equipment as well as buildings and machinery.

emissions (Daly and Cobb, 1994). However, the difference in impact that generated resources has on the physical environment theme as opposed to the natural resource theme is that the former deals mainly with the outcomes while the latter incorporates efficiency gains. With this in mind, the interaction of these two themes will result in a negative outcome for progress.

(14) *Physical environment and ICT*. The interaction between these two themes should result in a positive outcome for progress. The development of ICT infrastructure according to Bontsis (2004), is the key to not only changing production techniques but also in undertaking possible shifts in industry emphasis, for instance, the change from an agriculturally based economy to knowledge based economy. Such a shift would result in fewer environmental externalities leading to a healthier physical environment and higher levels of progress.

(15) *Physical environment and transportation*. The transportation infrastructure theme assists in accentuating externalities like worsening air quality. However it also provides its citizens access to essential services critical for progress. Hence, the key to this outcome may depend on the design quality and efficiency of the related infrastructure (WB, 1996). Thus, the net effect on progress is ambiguous.

(16) *Socio-cultural environment and human resources*. According to the OECD (2001) a correlation exists between increased levels of education and reduced crime rates, greater community participation and increased social cohesion. This is reiterated by Helliwell and Putnam's (1999) findings which demonstrated that increases in average education levels increased levels of trust and volunteer rates. As Wolfe and Haveman (2001) point out, the social benefits of education are large. However, this is juxtaposed with Putnam's (2000) findings where US levels of SC have been decreasing despite educational attainment increasing. Hence, the result of this interaction is uncertain.

(17) *Socio-cultural environment and natural resources*. Hardin (1968) illustrated that a lack of property rights can lead to the degradation of natural resources (see Section 5.7.2). This is what Hardin called the tragedy of the commons (Berkes and Folke, 1998). Hence, without established rules individuals tend to overuse and under invest in natural resources. This doesn't always apply. For instance, if the socio-cultural

dimension is well developed such as the establishment of local water use groups like those in the Philippines and Sri Lanka, natural resources are less likely to be over-exploited (Pretty and Ward, 2001).

The empirical evidence regarding Hardin's assertions are inconclusive. There are many examples of nations with strong property rights where natural resources continue to be depleted at an unsustainable rate. Ideally, what is required is a combination of enforcing property rights and the establishment of local institutional arrangements for cooperative solutions. The enforcement of property rights alone may, in fact restrict access by poor people to natural resources which is likely to increase poverty levels (Ostrom, 1990). Any interaction between these themes would, therefore, seem to result in an uncertain outcome.

(18) *Socio-cultural environment and generated resources*. Generated resources or more specifically, financial resources (via access and availability of domestic credit) coincide with one of the key aspects of the socio-cultural environment which is access to resources. Some studies suggest that access to resources whether via per capita income or availability and access to domestic credit, increase individual and national progress (UNDP, 2005; Osberg and Sharpe, 2005). However, this needs to be evaluated against the empirical evidence stated in Section 1.4, which advocated that the positive effects of extra income on quality of life are comparatively small (Easterlin, 1974, 1995, 2001; Oswald, 1997; Blanchflower and Oswald, 2004; Frey and Stutzer, 2000). The net result for progress, therefore, remains uncertain.

(19) *Socio-cultural environment and ICT*. The socio-cultural environment, in particular the institutional environment, is an important determinant of whether investment is undertaken in vital economic infrastructure. For instance, a study conducted assessing 147 countries showed that variances in political structures and party systems affected basic telecommunications infrastructure deployment (Henisz and Zelner, 2001). This is especially so with ICT infrastructure given that it is at a relative infant stage and is dependent on direct government assistance.

The benefits of ICT to progress have been made clear in the present research (see Section 5.6.1), however its specific effect on the socio-cultural environment has not. In relation to social connectedness, Putnam (1993, 2000) demonstrates a clear link between the sources of ICT infrastructure (such as television) and lower levels of social connectedness, citing it as one of the major contributors. Conversely though, the onset of phones enables families to remain connected regardless of spatial separation. The resultant final outcome on progress, therefore, remains uncertain.

(20) *Socio-cultural environment and transportation*. The institutional quality of a nation (part of socio-cultural environment) plays a key role in determining infrastructure investment and ensuring that infrastructure decisions are beneficial (Henisz, 2002). This is important since inappropriately designed transport strategies can result in networks that make the poor worse off (WB, 1996) and also increase the time spent commuting (Hamilton, 1998). Both of which detract from progress. Therefore, depending on the level and adequacy of transport infrastructure, which relate to issues of accessibility and mobility, the effects can either help or hinder access to resources. Once again, the net outcome for progress is uncertain.

(21) *Socio-cultural and physical environment*. Hardin's Tragedy of the Commons (see Section 5.7.2) established that poor institutional quality (property rights) led to the over-exploitation of finite resources. As mentioned previously though, strong institutional quality is not a guarantee of preventing over-exploitation.

With access to resources a focus for the socio-cultural theme, one also needs to consider the potential impact arising from Kuznets' environmental curve. Here, environmental quality, which is measured by ambient concentrations of SO_2 (particulates) gets progressively worse until per capita income reaches US$5000 PPP, and improves thereafter (Summers and Heston, 1991). In this context, increased wages is seen to benefit the physical environment. Interestingly though, other studies have shown that the environmental Kusnetz curve is significant when dealing only with local air pollutants. Global or indirect impacts, on the other hand, show that air pollution can increase consistently with income (Cole, Rayner and Bates, 1997).

Additionally, rises in income have led to greater volumes of conspicuous consumption resulting in environmental stresses that harm the physical environment (Daly and Cobb, 1994). Consequently, the net outcome for progress seems to be uncertain.

7.3 Conclusion

Many themes illustrated trade-offs, where both positive and negative outcomes within interactions of the themes were identified suggesting that a final outcome was uncertain. The ambiguous nature of a number of the thematic links further reinforces the uncertain nature of progress. This implies that the final outcome will, as one would expect, vary from country to country depending on their relative resource, infrastructure and environment endowments. The chapter also highlighted potential dimensional impacts of the RIE index. The next chapter will present a number of summary tables from the RIE index followed by a discussion of the results. A correlation analysis will also be conducted on some of the hypothesised outcomes mentioned in this chapter to determine whether those outcomes eventuated.

Complete “realism” is clearly unattainable, and the question whether a theory is realistic “enough” can be settled only by seeing whether it yields predictions that are good enough for the purpose in hand or that are better than predictions from alternative theories. (Friedman, 1953, p. 41) [emphasis in original]

Chapter 8: Results and Discussion

8.1 Introduction

This chapter presents the results of the various analyses of the study centred on the final objective which was to detect the meaningful underlying dimensions contributing to national progress. This objective was achieved in collaboration with Chapter 6. This chapter will begin with a statistical summary and explanation of the Condorcet voting matrix order. The results of this order will then be compared to the GDP, PPP, HDI and the GS every five years and also during periods where changes to the Condorcet voting matrix order occur. This is followed by a comparison between the Condorcet method and an oft-used alternative, distance to leader, to test the extent to which the Condorcet results differ.

The chapter will then focus on the key part of the analysis which is the detection of trends and links resulting from the dimensions and themes of the standardised RIE index. Trends will be assessed over five periods (1990, 1993, 1996, 2000 and 2004). The results of the sensitivity analysis will then be explained to determine the degree to which changes can occur to specific variables without affecting the ordering of the RIE index from both a Condorcet and standardised standpoint. The last section of this chapter will test selected dimension and theme qualitative impacts.

8.2 Comparing the RIE, the GDP, the HDI and the GS

Although the main intention of the RIE index is to identify and highlight the underlying dimensions contributing to national progress, it would be remiss of the present research not to assess the single summary index order results it obtained. These RIE index ranking results illustrate the preferred ordering of the countries based on a pair-wise comparison of countries according to the whole set of individual indicators used. This ordering is then compared to the resulting order of the GDP PPP per capita, the HDI and the GS. The full results of the RIE Condorcet ranking are in Appendix D.

The results of the comparison between the four measures are given in Table 8.1 below.[195] The Condorcet ranking used for the RIE was presented and justified in Chapter 6 of the present research.

Table 8.1 Comparing the order of the RIE, the GDP and the HDI

	1990	1992	1995	1997	2000	2004
RIE	AMU	MAU	AMU	MAU	AMU	AMU
GDP	UAM	UAM	UAM	UAM	UAM	UAM
HDI	UAM	AUM	AUM	UAM	AUM	AUM
GS	UAM	UAM	UAM	UAM	UAM	AUM

Notes: A = Australia, M = Mexico and U = United States.
The GDP results are based on the GDP PPP per capita US dollar current prices obtained from OECD (2006a). For the HDI, the 1990, 1995, 2000, and 2004 figures were obtained from the UNDP (2006). The 1997 figure was obtained from the UNDP (1999), and the 1992 figure was obtained from the UNDP (1994). The GS results were obtained from the WB (2007). The present research selected the GS results that include PM10 damage (which is an air pollutant that causes damage to human health) as % of GNI PPP current international dollars and then obtained the GNI PPP per capita figures and applied it.

A valid interpretation of the RIE results indicate that for the majority of the specified time period (1990-2004), Australia is the country with the highest level of progress, followed by Mexico and the US. There are however two notable exceptions occurring in 1992 and 1997, where Mexico outperforms Australia and the US respectively. In comparison, the ordering of the GDP PPP measure offers different results to that of the RIE. Here, the US outperforms both Australia and Mexico respectively over the trend period. The HDI results differ again. Overall Australia finishes on top; however it swaps places with the US on two occasions with Mexico placed last throughout. The results of the GS are strikingly similar to the GDP with the exception of 2004, where Australia finishes higher than the US. Following is some general discussion of the order results.

Given that all four indicators adopt diverse frameworks reflective of their respective epistemological standpoints, the differing results are not altogether surprising. For instance, according to the GDP PPP figures obtained from the OECD (2006a), the US and Australia outperformed Mexico on average by a ratio of 3.80:1 and 2.90:1, respectively. The HDI results, on average, show that Australia is ranked in the top 5 of all nations, whereas the US is ranked between 5 and 10. A sizeable disparity then emerges to Mexico whose results tend to range from 45 to 53. The results of the GS

[195] The GPI was not included as no results for Mexico are available.

show that the US and Australia outperform Mexico on average by a ratio of 4.70:1 and 2.24:1 respectively.

The only consistency between the three other measures is that Mexico is placed last for all observations over the time period. Interestingly, these outcomes add support to the criticism aimed towards the HDI and the GS (see sections 3.6.2 and 3.5.3), which claimed that both measures are heavily GDP dependent. Furthermore, if one considers the GDP as an unreliable indicator of progress, an assertion the current study has consistently held, then the results of the HDI and the GS are unreliable.

The conflicting results reinforce the present research’s contention that: (i) a monetary measure is an ill-conceived and inefficient approach to valuing progress; and (ii) that a non-monetary measure like the HDI needs to adopt a comprehensive approach, via framework and variables, to more accurately value progress and to avoid its ordering being usurped by one or two variables.

The resultant discrepancies between the RIE and the other three measures set up the premise for a large part of this chapter, which is the analysis of the dimensions and themes of the standardised RIE index. The aim is to illustrate that the results obtained from the RIE not only more accurately represent progress (demonstrated through the comprehensive framework employed in Chapter 5) but more specifically, explain why this is preferable for understanding and influencing progress. However prior to this, the current research needs to test whether the improved mathematical aggregation adopted via the Condorcet approach fundamentally changes the results.

8.3 Testing the Condorcet Approach

According to Munda (2005), the results of the significant improvement in problem modelling arising from the Condorcet aggregation approach should still produce fairly similar results to a more established approach such as distance to leader. Hence, the current study conducted a comparison between the two. The trend results are shown in Table 8.2 below. The full results are in Appendix D.

Table 8.2 Comparing the Condorcet with the Distance to Leader approach

	1990	1992	1995	1997	2000	2004
Condorcet	AMU	MAU	AMU	MAU	AMU	AMU
Distance to Leader	AMU	AMU	AMU	AMU	AMU	AMU

Note: A = Australia, M = Mexico and U = United States.

Over the 15-year period the results are alike except for 2 periods (1992 and 1997) where the Condorcet produces a MAU ordering. This slight variation should reflect changes in certain variables; however it may be due to the presence of rank reversals (see Section 6.9.1). Importantly for the present research, the similarity of the results suggests that there is not anything evidently unacceptable with the applied Condorcet aggregation approach. In fact even the magnitude of results are similar, as the distance to leader approach shows Australia (70.7-74.2) and Mexico (69.1-73.2) with close outcomes. A dramatic drop occurs for the US (60.3-62.2). The yearly results are in Appendix D.

Analysis from a single index viewpoint is concluded with an assessment of the overall RIE standardised results.

8.4 An Overview of the RIE Standardised Results

The data for the three countries was normalised using the standardisation (z-score) approach which was presented and justified in Chapter 6 of this study. Given the multi-year status of the analysis, the initial time point (1990) was used as a reference point. Consequently, the value zero signifies the average 1990 score of the three countries combined. The results of the standardised RIE index for Australia, Mexico and the US are presented in Figure 8.1 as well as one for the GDP (Figure 8.2). The standardised score (y-axis) signifies a country's movement from the 1990 combined average score.

As with the Condorcet approach, for the majority of the observation period, Australia outperforms Mexico, with the US a distant third. The general trend for Australia is upward (rising from 0.133 in 1990 to 0.179 in 2004) however it is not monotonic. There are noticeable changes in direction over the period, for instance it seems that progress reaches its peak in 2000.

Figure 8.1 RIE standardised index 1990-2004

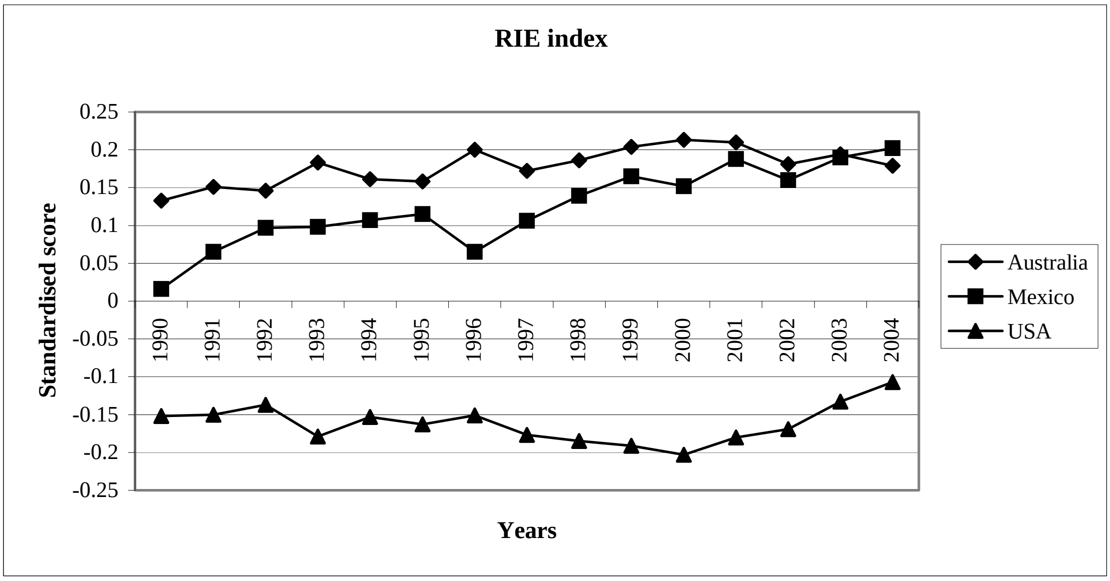
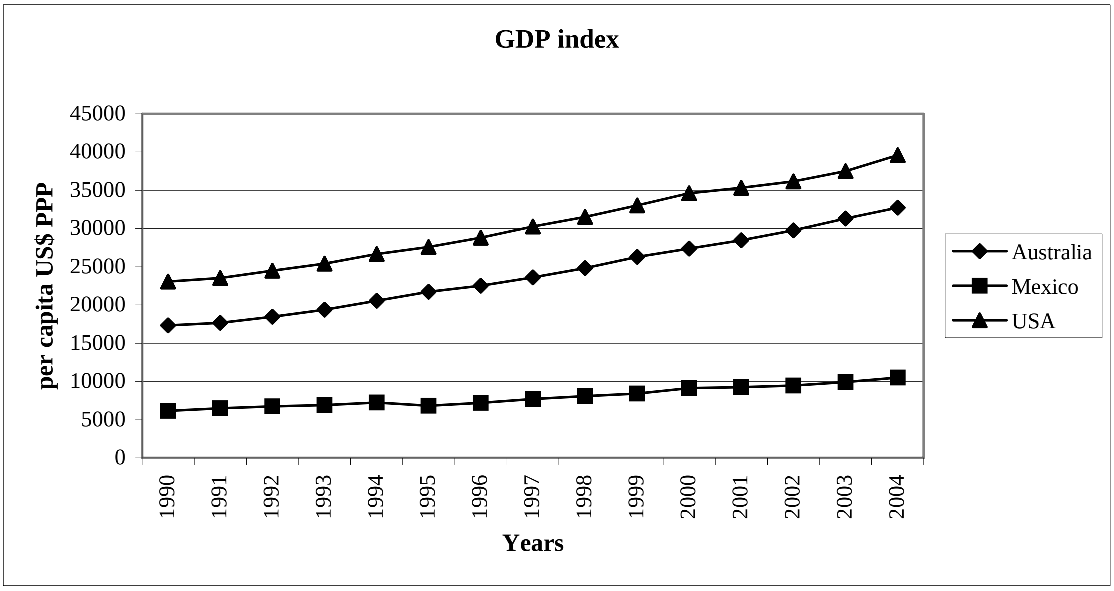


Figure 8.2 GDP index 1990-2004



Furthermore, the periods 1992-1994 and 1995-1997 exhibit a similar spike pattern. That is, sharp increases followed by a sharp decrease to the point where the overall gain during these two periods are only slight. This is followed by gradual increases until the year 2000. Overall, the period 2001-2004 has progress decreasing with a particular sharp drop for the year 2002.

The general trend for Mexico is distinctly upward (rising from 0.016 in 1990 to 0.202 in 2004). It experiences the largest improvement in progress. In 2004 (the final observation) it actually surpasses Australia. A further breakdown of the results shows a sharp rise occurring in the years 1990-1992 before a steadier pattern emerges. There is however a marked decrease that occurs in 1996, reducing progress back to its 1991 level. This is followed by quite sizeable annual increases from 1997-1999. For the next 3 years a spike pattern (sharp increase followed by a sharp decrease) emerges resulting in a slight overall increase. The final two years show fairly strong growth resulting in Mexico recording its highest level of progress.[196]

The general trend for the US is upward (rising from -0.150 in 1990 to -0.107 in 2004) however this statement, although factual, hides the true nature of US progress over this period which can be categorised into 3 distinct phases. Between the years 1990-1996 the overall progress change is minimal, with a noticeable drop that occurs in 1993 countering the small yearly increases. The next distinct period 1996-2000 shows progress decreasing at a constant rate which is contrary to the trends for Australia and Mexico. The final phase 2000-2004 illustrates a marked turnaround in the US fortunes, with progress rising sharply. Following are some general discussion of these standardised results of the RIE index.

The results presented above, specifically that of the US and Mexico, illustrate that the standardised RIE index does not appear to be strongly correlated with levels of income and production. In fact, it demonstrates that progress is not necessarily associated with high levels of income and production. By breaking the nexus between income, production and progress the RIE index is able to distinguish itself from measures such as the GDP, GS and the HDI.

This 'breaking of the nexus' is important since it reflects the current progress literature. Furthermore, it supports the empirical evidence first established in Section 1.4 regarding the effects of the link between income and subjective measures of wellbeing (Easterlin, 1974, 1995, 2001; Oswald, 1997; Frey and Stutzer, 2000; Blanchflower and Oswald,

[196] A supposed paradox is said to occur with the trend of Mexicans fleeing their home country to the US. The present research claims that this is due to a fixation on notions of *perceived* progress, or material wealth, as opposed to an adherence to a comprehensive conception of progress.

2004). That is, that the positive effects of extra income on quality of life are relatively small.

Having distinguished itself from the three aforementioned measures, the next comparison involves the GPI. Interestingly, the RIE index results for Australia exhibit a similar pattern to the Australian GPI measure. Both portray overall increases but at a far slower rate than the GDP. However, this is where the similarities end. Given that the RIE index incorporates human resources while HC estimations are absent from the GPI, the present research argues that the two measures are distinctly different in capturing progress. This viewpoint is reinforced by the ABS experimental estimates (2004d) pertaining to the stock of HC in 2001. The estimates, which were obtained using a lifetime labour income approach, showed that had the GPI allowed for HC estimation it would have dwarfed the costs imposed by the negative columns of the GPI. Ultimately, this would have revealed markedly different results to the RIE index.

The current study would like to make a final general comparison with the HPI, which like the RIE index, is an attempt at a comprehensive non-monetary measure of progress. Although only a single observation of the HPI exists (with data mostly from 2004), a one-off comparison is still considered useful for the purpose of evaluation. Of the 178 countries assessed, the HPI had Mexico ranked 38, Australia 139, and the US at 150. The HPI ordering therefore is the same as the standardised RIE index result for 2004 (MAU), however there is a sizeable chasm in the magnitude of the results. The reasons for this vast difference can be attributable to the shortcomings of the HPI mentioned in Section 3.8, and bear repeating here, albeit briefly.

The HPI consists of three variables, making it quite a crude index to capture something as complex as progress. This narrow nature provides a limited scope for policy initiatives. Additionally, the HPI is not analytically sound given that two of the three variables it employs, ecological footprint and life satisfaction, are contested.

A discussion point arising from the Mexican results centres on the sizeable dip in progress that occurred in 1996. A potential reason for this may be the economic crisis that occurred in 1994. Unlike the RIE index, the GDP PPP figures show a decline occurring in the 1995 data. One reason for this could be that financial data movements can be assessed readily, whereas socio-economic data has a longer time lag effect. The potential impact of the economic crisis will be further explored in the dimension analysis. With the US, the most interesting aspects relate to identifying reasons for the poor results as well as the upsurge in progress from 2000 onwards. This will be explored in the next section.

The next section assesses the dimensions in the RIE index and makes up the major part of this analysis. The analysis coincides with one of the aims of the comprehensive RIE framework, which is its ability to communicate information about specific dimensions (individual components). The Condorcet aggregation approach was favoured for an analysis from a single index viewpoint based on its pair-wise comparison of countries according to the whole set of individual indicators used. The many similarities between the Condorcet and standardised results of the RIE as well as the Condorcet's emphasis on individual indicators rather than dimensions, enables this study to employ the findings obtained from the standardised RIE index to conduct an analysis based on its dimensions and themes.

8.5 Assessing the RIE Dimensions

The major trends emerging from the analysis of the standardised data in the previous section guides the present research to select the periods 1990, 1993, 1996, 2000 and 2004 for assessment. Tables 8.3 through to 8.9 will enable the present research to explain trends within and between countries and also to identify and discuss any counter-intuitive results arising from the twenty-three dimensions of the RIE index.[197]

8.5.1 Human Resource Theme Dimensions

The trends for the human resource dimensions are presented in Table 8.3 below. The health dimension results for Australia show it to be a consistent strong contributor to the human resource theme. In fact, from 2000 onwards it surpasses the net brain gain dimension as the largest contributor to the human resource theme and also on average over the study period (0.066 to 0.062). The relative improvement over the entire period doubles (0.044 to 0.089) with improvements experienced across all five periods. The results of the population dimension portray low regeneration (-0.008 to -0.018) of

[197] Some of the figures in the tables from this chapter vary slightly from the figures in Appendix E due to errors in rounding. This in no way distorts or biases the results.

Australia's human resource stock. It also is the only dimension to show a negative study average result (-0.017), which detracts from the human resource theme. The food consumption results on the other hand are varied although always positive, with the period 1993 to 2000 producing quite strong results.

Table 8.3 Standardised scores for the human resource dimensions

	1990	1993	1996	2000	2004	Study Average
Australia						
Health	0.044	0.059	0.061	0.074	0.089	0.066
Population	-0.008	-0.023	-0.014	-0.018	-0.018	-0.017
Food Consumption	0.006	0.041	0.037	0.040	0.020	0.032
Education and Training	0.015	0.016	0.017	0.018	0.019	0.017
Knowledge Renewal	0.000	0.002	0.005	0.005	0.006	0.004
Net Brain Gain	0.059	0.060	0.062	0.064	0.066	0.062
Theme Contribution	**0.116**	**0.155**	**0.168**	**0.183**	**0.182**	**0.164**
Mexico						
Health	-0.066	-0.042	-0.033	-0.020	-0.004	-0.030
Population	0.023	0.017	0.006	-0.003	-0.017	0.003
Food Consumption	0.048	0.043	0.046	0.048	0.053	0.049
Education and Training	-0.034	-0.030	-0.027	-0.022	-0.018	-0.026
Knowledge Renewal	-0.020	-0.019	-0.017	-0.015	-0.015	-0.017
Net Brain Gain	-0.055	-0.056	-0.057	-0.058	-0.060	-0.057
Theme Contribution	**-0.104**	**-0.087**	**-0.082**	**-0.070**	**-0.061**	**-0.078**
USA						
Health	0.022	0.027	0.035	0.043	0.053	0.038
Population	-0.015	-0.011	-0.016	-0.016	-0.020	-0.015
Food Consumption	-0.055	-0.075	-0.083	-0.125	-0.110	-0.093
Education and Training	0.019	0.019	0.019	0.019	0.019	0.019
Knowledge Renewal	0.021	0.021	0.023	0.028	0.026	0.024
Net Brain Gain	-0.004	-0.002	-0.001	0.002	0.005	0.000
Theme Contribution	**-0.012**	**-0.021**	**-0.023**	**-0.049**	**-0.027**	**-0.027**

Unfortunately the limitation with the data for the education dimension, due to the break in classification from UIS, has restricted analysis. Although no trend can be detected, the results show that over the study period education in Australia has been a solid contributor to the human resource theme, increasing from 0.015 to 0.019, with an average of 0.017. The results of the next dimension, knowledge renewal (0.000 to 0.006) shows it as a minor yet growing factor for both human resources and progress.

The low results are indicative of what is an emerging field, especially over the time period (1990-2004).

The final dimension of this theme, net brain gain acts as a very strong contributor to Australia's human resources, where up until 2000 it is the biggest contributor. Although the data is limited to within the OECD itself, the results reflect the fact that Australia has benefited greatly from this dimension (0.059 to 0.066). Hence, a net brain gain occurs for Australia.

The health dimension results for Mexico show that at no stage does the dimension, in isolation, contribute positively to progress (-0.066 to -0.004). In absolute terms though, the improvements made by Mexico over the entire period are the largest, and act as a major catalyst for the increase in the human resource theme. From a population perspective, despite decreases for each trend period Mexico experiences the highest regeneration (0.023 to -0.017). By 2004, all three countries exhibit similar index scores, although on average Mexico's contribution is the only positive one (0.003). Mexico's strongest performance in the human resource theme occurs with the food consumption dimension. The results over the period display a consistently high trend (0.048 to 0.053).

As expected, the education results are quite poor for Mexico even though improvement occurs over the study period (-0.034 to -0.018). Likewise the knowledge renewal dimension results which, despite some slight improvement, lags quite a distance behind and contributes negatively to the human resource theme (-0.020 to -0.015). The net brain gain is consistently Mexico's worst performing dimension in this theme and is the only country to be in steady decline (-0.055 to -0.060). The study average is almost double the next worst performing dimension at -0.057. This result, where a negative net brain gain occurs, reiterates Mexico's status as a source country in the brain drain literature.

The US health dimension results comprise its strongest contribution to the human resource theme with solid improvements made over the period (0.022 to 0.053), and a study average of 0.038. The population dimension results reflect low levels of human resource stock regeneration. After an initial improvement, the dimension declines to a point that is lower than the original observation (-0.015 to -0.020). The next dimension, food consumption, is easily the worst performed US human resource dimension (-0.055 to -0.110), with an average score of -0.093 that is reflective of very poor eating habits. The implications of this result will be discussed shortly.

The results of the education dimension show that a consistently strong (uniform 0.019) contribution is recorded. As expected, the US leads the knowledge renewal dimension (0.021 to 0.026). In fact, it is second only to health insofar as being the biggest positive contributor to the human resource theme.

Finally, the US figures for the net brain gain dimension possess a slight increase (-0.004 to 0.005), although on average there is no impact on progress. This result is reflective of the data being confined to OECD transfers only, hence excluding tertiary educated immigrants from South Asia and other areas, as well as the strong results of Australia. Following is some general discussion of the human resource theme results.

The results of the six dimensions indicate that Mexico is clearly the worst performer in the human resource theme, particularly in the health and education dimensions which performed poorly, indicated by their study averages of -0.030 and -0.026 respectively. These dimensions therefore need to be prioritised by policymakers. This conclusion, despite not being able to be ascertained from examining the GDP, or the GPI measure which omits HC, is not overly insightful. A more interesting outcome from the human resource theme involves the food consumption dimension.

Interestingly, given that food consumption is linked with health, the poor performance of the US (-0.093 study average) and the relatively good performance of Mexico (0.049 study average) were not reflected in the health dimension. This apparent contradiction, the present research insists, illustrates the importance of including this dimension in all progress measures. It has become apparent from the results of the health dimension that traditional health status indicators such as the life expectancy variable are not reflecting this crucial area. This oversight is due to the long-term health effects associated with food consumption and the tendency for health measures to reflect death status, rather than quality of life.[198] The life expectancy variable thus does not reflect the growing concern of the 'obesity epidemic' – as it has been termed in Australia and the US. Yet its employment by the HDI as one of its three variables to arrive at an HDI value shows that the RIE index is preferable as it is able to shed more light on issues pertinent to progress and provide guidance in articulating policies for optimal use of resources.

The strong performances of Australia from the net brain gain dimension, with a study average score of 0.062, could be linked to the contribution of migrants to the skills base of Australia. This result further reinforces the usefulness of the RIE index which has the ability for certain dimensions to complement other dimensions. For example, the education dimension on its own shows a strong contribution to Australia's progress. This may lead policymakers to adopt a 'status quo' approach. However, in the light of the net brain gain dimension results, policymakers would be able to identify necessary structural improvements to the education sector by adopting a long-term approach to reduce Australia's reliance on tertiary-educated immigrant workers.

Of course, one may argue that since the RIE index associates a net brain gain with higher levels of progress, what does it matter whether a nation, Australia in this case, continues to rely on skilled immigrant workers given that the end result is still an increase in progress? From the outset, the present research has acknowledged that the proposed RIE index is not the solution, rather a step forward. Therefore, a similar or revised future measure may want to place a cap or limit on the net brain gain dimension, where anything exceeding a critical cut off value starts to detract from progress.

8.5.2 Natural Resource Theme Dimensions

The trends for the natural resource dimensions are presented in Table 8.4.

[198] Although the HALE measure was included to assist with this purpose, it seems that this variable needs to be complemented by additional variables.

Table 8.4 Standardised scores for the natural resource dimensions

	1990	1993	1996	2000	2004	Study Average
Australia						
Land and Agricultural Use	-0.033	-0.026	-0.005	0.003	-0.024	-0.018
Energy and Production Use	-0.007	-0.008	-0.012	-0.025	-0.045	-0.021
Water	0.029	0.043	0.042	0.040	0.037	0.039
Fisheries	0.015	0.012	0.008	0.003	-0.003	0.007
Biodiversity	-0.005	-0.012	-0.020	-0.028	-0.040	-0.022
Theme Contribution	**-0.001**	**0.009**	**0.013**	**-0.007**	**-0.075**	**-0.015**
Mexico						
Land and Agricultural Use	0.020	0.025	0.035	0.043	0.055	0.038
Energy and Production Use	0.023	0.020	0.017	-0.004	0.001	0.009
Water	-0.021	-0.021	-0.026	-0.027	-0.028	-0.025
Fisheries	0.045	0.054	0.060	0.071	0.079	0.063
Biodiversity	0.033	0.027	0.021	0.010	0.003	0.018
Theme Contribution	**0.100**	**0.105**	**0.107**	**0.093**	**0.110**	**0.103**
USA						
Land and Agricultural Use	0.013	0.000	0.022	0.031	0.035	0.022
Energy and Production Use	-0.016	-0.019	-0.025	-0.039	-0.052	-0.031
Water	-0.009	-0.009	-0.010	-0.005	0.004	-0.006
Fisheries	-0.060	-0.057	-0.045	-0.040	-0.033	-0.046
Biodiversity	-0.028	-0.034	-0.038	-0.046	-0.051	-0.041
Theme Contribution	**-0.100**	**-0.119**	**-0.096**	**-0.099**	**-0.097**	**-0.102**

The Australian land and agricultural use (LAU) results lag behind the other two countries and display the lowest study average (-0.018). Up until 2000, Australia experienced consistent improvements followed by a marked deterioration from 2000 onwards (0.003 to -0.024). Another poor performance for Australia comes from the energy and production use (EPU) dimension, with a study average of -0.021. Here, Australia recedes throughout the period signalling continued unsustainable levels of non-renewable energy production and consumption (-0.007 to -0.045). In fact, this deterioration is similar for all three countries. Although the next dimension, water, suffers from limited data with respect to both its coverage and reliability, some general trends can still be identified. The results suggest that Australia's water availability and quality improves over the entire observation period even though a slight deterioration occurs from 1993 onwards (0.043 to 0.037), making it Australia's strongest contributor to the natural resource theme.

The trend for the fisheries dimension indicates a worsening situation over the entire period (0.015 to -0.003) with deterioration in each trend period. However, it does display an average positive contribution (0.007) over the study period. Although contested, the results of the dimension biodiversity seem to reflect expectations with all three countries' performances worsening. Specifically, the Australian biodiversity results (-0.005 to -0.040) act as a significant negative contributor to both the natural resource theme and the RIE index.

The Mexican LAU results are the strongest performing (0.020 to 0.055) of the three countries with consistent increases over the period and a strong positive contribution to the natural resource theme, proved by its 0.038 study average score. The EPU dimension figures however, despite a positive average score (0.009) become progressively worse culminating in a negative contribution in 2000 (0.023 to -0.004), before a marginal improvement for 2004 (0.001). Not surprisingly, Mexico's water situation is its worst performer in the natural resource theme with an overall deterioration (-0.021 to -0.028). This is in contrast to the fisheries dimension which makes up Mexico's strongest contribution to the theme, with a 0.063 average score, and an increase realised in every trend period (0.045 to 0.079). In real terms the final dimension, biodiversity, declines significantly (0.033 to 0.003) even though it is the only country in the study to show a positive average score (0.018).

The US LAU dimension results show an overall increase over the period (0.013 to 0.035) although a one-off decrease does occur in 1993. It is also the only natural resource dimension to exhibit a positive average score (0.022). As expected, the EPU results show the US as the worst performed country (-0.016 to -0.052) with a -0.031 average. Like Australia, this is reflective of high levels of non-renewable energy production and consumption. After a relatively flat period prior to 1996 (-0.009 to -0.010), the water dimension noticeably improves for the remaining period (-0.010 to 0.004).

To a lesser extent this is also true for the fisheries dimension, where improvement occurs over the period (-0.060 to -0.033). However, it remains the poorest performing dimension in the natural resource theme with an average score of -0.046. The biodiversity dimension steadily worsens (-0.028 to -0.051) and its average score of -0.041 is second only to fisheries. Both dimensions represent a considerable negative contribution to the US's natural resource theme. Following are some general discussion of the natural resource theme results.

Given that the LAU dimension results seem to reflect expected results, this helps justify the decision taken by the present research to include irrigated land as a positive contribution to progress. Although consideration was given regarding the water intensive nature of this practice, irrigated land was viewed as a conduit to food access. Additionally, any negative aspects pertaining to this would be reflected in the water and biodiversity dimensions.

The EPU results reflect a desire to reward sustainable practices, such as an increased reliance on renewable energy and lower energy consumption levels rather than efficiency alone. Thus, policies need to limit their damage to the environment (see Section 9.4.1). As illustrated in the previous chapter, focusing on increased efficiency ignores the fact that harm to the environment can continue to escalate. Given this, the results are not unusual. The water dimension results could have worsened because of the recent droughts however.

The biodiversity results, where all three countries experience deterioration, highlight the need for a biodiversity component to be included in progress measures. The GPI, an influential progress measure, omits this dimension due to the incredible difficulties associated with placing a monetary value on the concept. Although this is understandable, it also serves to highlight the limitations of monetary measures of progress. Especially when one considers that many elements of progress, such as the majority of the human resource theme, the physical environment, the socio-cultural environment, and many aspects of natural resources, lack a readily identifiable and convenient price for evaluation purposes; if such a price exists at all.

Hence one could argue, the diminishing outcomes from the biodiversity dimension, one could argue, arise from the lack of an officially recognised measure and its resultant exclusion from policy debates. Therefore, the inclusion of the biodiversity dimension in the RIE index, although unrecognised by official statisticians, at least brings it to the attention of policymakers. To paraphrase Keynes again, ‘it is better to be vaguely right than precisely wrong’.

8.5.3 Generated Resource Theme Dimensions

The trends for the generated resource dimensions are presented in Table 8.5 below.

Table 8.5 Standardised scores for the generated resource dimensions

	1990	1993	1996	2000	2004	Study Average
Australia						
Financial	0.003	-0.004	-0.004	-0.002	-0.008	-0.006
Physical Capital	-0.011	-0.008	0.000	0.000	0.009	-0.001
Theme Contribution	**-0.008**	**-0.012**	**-0.004**	**-0.002**	**0.001**	**-0.007**
Mexico						
Financial	-0.002	-0.005	0.005	0.012	0.016	0.007
Physical Capital	0.009	0.006	0.010	0.031	0.012	0.016
Theme Contribution	**0.007**	**0.001**	**0.015**	**0.043**	**0.028**	**0.023**
USA						
Financial	-0.002	-0.010	-0.020	-0.065	-0.045	-0.028
Physical Capital	0.002	0.002	0.010	0.009	-0.004	0.003
Theme Contribution	**0.000**	**-0.008**	**-0.010**	**-0.056**	**-0.049**	**-0.025**

Australia’s performance in the financial resources dimension shows that initially Australia is the best performer (0.003). However, its -0.006 average study score is reflected by the fact that the following period experiences deterioration before a fairly steady pattern emerges until 2000, followed by another marked deterioration (-0.002 to -0.008). This result is contrary to the GDP which suggests that the Australian economy is performing strongly. This apparent counter-intuitive result will be discussed below. The physical capital dimension for Australia undergoes dramatic improvement over the observation period (-0.011 to 0.009) with an average score of -0.001.

Another seemingly counter-intuitive result arises with Mexico’s performance from 1996 onwards in the financial resource dimension. Over the period Mexico improves from

(-0.002 to 0.016) finishing with a 0.007 average score, the highest of the three countries. Although the implications of this result will be discussed shortly, the present chapter would like to reiterate that the RIE index was established to reward financial resources in relation to progress rather than accumulation of financial resources *per se*. The physical capital dimension results show Mexico outperforming the other two countries on average (0.016), with a consistent positive result over the period (0.009 to 0.012) with the exception of 2000 which rises to 0.031.

Apart from 1990, the US performance in the financial resource dimension lags quite a distance behind the other two countries (-0.002 to -0.045), with its worst result arriving in 2000 (-0.065) for an average study score of -0.028. The physical capital dimension produces consistent positive contributions up until 2000 (0.002 to 0.009). However, a noticeable decline occurs in the final period (0.009 to -0.004), even though the average contribution is still positive (0.003). Following are some general discussion of the generated resource theme results.

Although the results for the financial resources may seem counter-intuitive at first glance, a critical factor needs to be borne in mind. As stated in Section 1.4, and throughout the present research, empirical studies (Easterlin, 1974, 1995, 2001; Oswald, 1997; Frey and Stutzer, 2000; Blanchflower and Oswald, 2004) have concluded that the positive effects of extra income on progress are relatively small. The current study insists therefore, that it is not unreasonable to extend this finding to financial resources in general. Employing this as a benchmark, a strong distinction can then be made between finance that assists with progress and finance which contributes negligibly to the definition of progress. Consequently, financial resources attributable to *high* levels of stock market trading and market capitalisation are incongruous to progress.

This is another example where the RIE index distinguishes itself from most other measures. The comparative measures assessed earlier in the chapter (GDP, HDI and GS) do not deduct for any form of finance, thus viewing all forms of finance as beneficial to progress. The GPI on the other hand, alludes to issues of illusory progress versus real progress and discounts certain types of consumption as a result. The RIE index takes this a step further through its use of an allocated weighting system based on public opinion, which requires a paradigm shift, where the concept of value becomes disconnected from *exchange-value* or money.

One possible explanation for the physical capital dimension results, which had Mexico gaining the most from a progress standpoint, could be reflective of the historical place of their economic system. For instance nations in the maturity phase, such as Australia and the US, are less likely to experience gains in progress from physical capital proxied by machinery and equipment as opposed to emerging economies such as Mexico. This is partly reflected in the 2000 result for Mexico which experiences a vast increase due to a significant jump in gross fixed capital formation expenditure. A factor less likely to occur in established economies.

8.5.4 ICT Infrastructure Theme Dimension

The trend for the ICT infrastructure dimension is presented in Table 8.6 below.

Table 8.6 Standardised scores for information and communication technology (ICT) access

	1990	1993	1996	2000	2004	Study Average
Australia	0.005	0.008	0.012	0.020	0.027	0.015
Mexico	-0.023	-0.022	-0.021	-0.019	-0.017	-0.021
USA	0.018	0.021	0.025	0.033	0.039	0.028

Note: There is no theme contribution row since the ICT infrastructure theme is represented by only one dimension. Therefore, the standardised score is the theme contribution.

The results for the ICT theme appear to be relatively straightforward and quite unambiguous. Australia posts positive results which increases over the entire period (0.005 to 0.027), averaging 0.015. The Mexican results however, which averages -0.021 over the study period, place it a clear and distant last. In fact, Mexico does not seem to be making any advancement in this dimension despite a gradual increase over the period (-0.023 to -0.017). The US, as expected, is a clear leader, experiencing strong increases over the entire period (0.018 to 0.039), with the highest average contribution (0.028).

8.5.5 Transport Infrastructure Theme Dimension

The trend for the transportation infrastructure dimension is presented in Table 8.7.

Table 8.7 Standardised scores for transport efficiency

	1990	1993	1996	2000	2004	Study Average
Australia	0.003	0.005	0.006	0.006	0.008	0.006
Mexico	-0.016	-0.015	-0.016	-0.015	-0.014	-0.015
USA	0.013	0.014	0.018	0.023	0.027	0.019

Note: There is no theme contribution row since the transportation infrastructure theme is represented by only one dimension. Therefore, the standardised score is the theme contribution.

Similar to the ICT access results, the transportation efficiency results appear to be relatively straightforward. Australia experiences a gradual, but continually positive result (0.003 to 0.008), averaging 0.006. The Mexican results seem to indicate little comparative advancement is being made in this dimension with a trend that is relatively flat (-0.016 to -0.014). The US again performs strongly with an infrastructure-based dimension, averaging 0.019 with steady increases over the period (0.013 to 0.027).

The results for Mexico in both the ICT access and transport efficiency dimensions indicate that policymakers should target the infrastructure area. Although this revelation may seem obvious, it nevertheless demonstrates that: (i) the RIE index is capable of identifying such a glaring structural weakness, and (ii) this type of observation, although seemingly apparent, is not capable of being highlighted by measures such as the GDP, GS, HDI and the HPI.

8.5.6 Physical Environment Theme Dimension

The trends for the physical environment dimensions are presented in Table 8.8. The table shows that Australia's performance in the air quality dimension deteriorates over the period (-0.025 to -0.045). It also signifies the largest negative contributor to the physical environment theme and the only negative study average result (-0.028). The result of greenhouse gas emissions is also not encouraging, with every period signalling a deterioration (0.009 to -0.006), although it does register a slight positive average score (0.002). From 1993 onwards, Australia experiences higher levels of conspicuous consumption, specifically from post-1993 (0.028 to -0.007), which mirrors the deterioration in the first two dimensions.

Table 8.8 Standardised scores for the physical environment dimensions

	1990	1993	1996	2000	2004	Study Average
Australia						
Air quality	-0.025	-0.024	-0.022	-0.034	-0.045	-0.028
Greenhouse Gas Emissions	0.009	0.007	0.006	-0.002	-0.006	0.002
Conspicuous Consumption	0.001	0.028	-0.008	-0.004	-0.007	0.000
Built environment	0.003	0.003	0.004	0.004	0.004	0.004
Access to Essential Services	0.034	0.034	0.034	0.034	0.034	0.034
Theme Contribution	**0.022**	**0.048**	**0.014**	**-0.002**	**-0.020**	**0.012**
Mexico						
Air quality	0.067	0.069	0.071	0.073	0.075	0.071
Greenhouse Gas Emissions	0.051	0.051	0.051	0.050	0.051	0.051
Conspicuous Consumption	0.018	0.057	0.000	0.016	0.016	0.026
Built environment	-0.007	-0.006	-0.007	-0.005	-0.005	-0.006
Access to Essential Services	-0.068	-0.058	-0.049	-0.036	-0.023	-0.045
Theme Contribution	**0.061**	**0.113**	**0.066**	**0.098**	**0.114**	**0.097**
USA						
Air quality	-0.042	-0.030	-0.015	0.000	0.016	-0.013
Greenhouse Gas Emissions	-0.060	-0.061	-0.063	-0.065	-0.057	-0.061
Conspicuous Consumption	-0.019	-0.015	-0.036	-0.059	-0.037	-0.036
Built environment	0.005	0.004	0.005	0.006	0.006	0.005
Access to Essential Services	0.034	0.034	0.034	0.034	0.034	0.034
Theme Contribution	**-0.082**	**-0.068**	**-0.075**	**-0.084**	**-0.038**	**-0.071**

The results of the built environment dimension are a positive contributor to Australia's physical environment theme (0.003 to 0.004), where little variation occurs over the time period. The final dimension, access to essential services provides limited analysis on trends given that the data for Australia and the US are capped with 100 per cent coverage. Suffice to say, it is the strongest contributor to the theme averaging 0.034.

Consistent with the literature, Mexico comes out on top in the air quality dimension with a 0.071 average study score. It also represents Mexico's strongest contributor to the physical environment theme with a slight increase over the period (0.067 to 0.075). Additionally, Mexico also performs quite well in the greenhouse gas dimension with a uniform result of (0.051) making it the second highest contributor in this theme. The conspicuous consumption results for Mexico tend to fluctuate with an initial increase (0.018 to 0.057) before a marked decrease in the period 1993 to 1996 (0.057 to 0.000) followed by another increase before steadying for the period 2000 to 2004. Though it is still though a strong contributor to progress with an average score of 0.026.

The built environment dimension however detracts from Mexico's physical environment theme, with consistent negative results for the entire time period (-0.007 to -0.005). The final dimension, access to essential services, is easily the worst performing dimension in the physical environment theme, averaging -0.045. Although advances occur over the period (-0.068 to -0.023), further improvement is still needed.

The air quality dimension, despite its -0.013 study average score, undergoes a marked improvement for the US. In fact, by 1996 it surpasses Australia. Although the results commence negatively, by 2000 neutrality is reached and continues to improve (-0.042 to 0.016). However, the improvement by the US in air quality is not mirrored with the dimension greenhouse gas emissions. This constitutes the US's worst performance in the physical environment theme, demonstrated by its study average score of -0.061, with little if any real improvement occurring (-0.060 to -0.057). However, there are slightly encouraging signs from the period 2000 to 2004. Nonetheless, strict policies to combat and reduce these emissions are needed. With conspicuous consumption, the US average score is -0.036, the only country to have a negative result. A note of interest arises with the results for the period 1996 to 2004. Here, a spike occurs from 1996 to 2000 (-0.036 to -0.059), which is its peak year before almost returning to the 1996 figure by the final year.

The built environment dimension results make it a positive contributor to this theme, although little variation in trend over the time period exists (0.005 to 0.006). And finally, as with the reasons outlined for Australia, the US results for the access to essential services dimension are a uniform 0.034. This marks its strongest positive contribution to the natural resource theme. Following are some general discussion of the physical environment theme results.

The results obtained from the dimensions were as expected. The decrease in US conspicuous consumption from 2000 to 2004 seems to be one of the reasons for the upward direction in the RIE standardised index graph (see Section 8.4) during that period.

The increased level in ‘defensive expenditures’, part of conspicuous consumption, for the same period (2000 to 2004) is reflective of increased US government expenditure post-September 11. However, the results suggest that no significant overall effect occurred. In fact, the overall improvement reflects the approach taken by the present research to assign positive values to the final consumption expenditure variable. Therefore, the rates of increase in the final consumption expenditure variable seemingly outstripped defensive expenditure rates.

This also occurs with Mexico, which experienced a decrease in conspicuous consumption during the period 1993 to 1996 due to increases in the final consumption expenditure variable. This seems to mirror the financial crisis in Mexico where citizens were spending a greater part of their income on goods and services. Hence, a future revised measure may need to determine a critical cut off value for the final consumption expenditure variable, and treat any breaches as detracting from progress. Despite this possible refinement, the general trend of this dimension is, at a minimum, intuitively meaningful given that the US experienced the highest levels followed by Australia and then Mexico. This suggests that the variables representing conspicuous consumption in the RIE index seem suitable as a basis for further assessment.

As with the previous dimension section, the RIE index is able to capture the growing concerns for progress as opposed to the GDP or the HDI which do not have provision for this. Additionally, the RIE index more accurately captures this concept compared to the GS which undervalues the effect due to its monetary valuation based on a weak sustainability approach.

An interesting side point is the delay from the US, and until recently Australia, to sign the Kyoto Agreement and their poor performances in the greenhouse gas dimension.

8.5.7 Socio-cultural Environment Theme Dimension

The trends for the socio-cultural environment dimensions are presented in Table 8.9 below.

Table 8.9 Standardised scores for the socio-cultural environment dimensions

	1990	1993	1996	2000	2004	Study Average
Australia						
Social Connectedness	-0.004	-0.005	0.001	0.012	0.019	0.004
Institutional Quality	0.004	0.004	0.004	0.004	0.003	0.004
Economic Security	-0.004	-0.031	-0.012	-0.001	0.034	-0.003
Theme Contribution	**-0.004**	**-0.032**	**-0.007**	**0.015**	**0.056**	**0.005**
Mexico						
Social Connectedness	0.007	0.010	0.009	0.019	0.018	0.013
Institutional Quality	-0.007	-0.007	-0.006	-0.006	-0.006	-0.006
Economic Security	-0.009	0.001	-0.008	0.008	0.030	0.008
Theme Contribution	**-0.009**	**0.004**	**-0.005**	**0.021**	**0.042**	**0.015**
USA						
Social Connectedness	-0.003	-0.005	-0.003	0.002	0.000	-0.002
Institutional Quality	0.003	0.003	0.003	0.003	0.003	0.003
Economic Security	0.013	0.005	0.010	0.023	0.035	0.016
Theme Contribution	**0.013**	**0.003**	**0.010**	**0.028**	**0.038**	**0.017**

The social connectedness dimension result for Australia increases over the observation period (-0.004 to 0.019) however its growth is not gradual, as it worsens initially before increasing. The 0.004 average score demonstrate this. The institutional quality dimension results produce a solid and consistent positive increase (0.004 to 0.003), while the results of the final dimension of the RIE index, economic security, are more interesting. The Australian results take a sharp dip by 1993 (-0.004 to -0.031) then slowly recover before increasing for the rest of the period with a significant increase from 2000 to 2004 (-0.001 to 0.034), ending with an average score of -0.003. This possible counter-intuitive result will be discussed below.

Mexico’s social connectedness dimension results show the highest average score of the three countries with 0.013. In fact, Mexico shows an overall increase (0.007 to 0.018) although this stabilises in the last period. The institutional quality results show a steady but negative contribution to the socio-cultural environment theme (-0.007 to -0.006) reflective of their relative poor quality. The economic security dimension results average 0.008, however the periodic outcomes tend to fluctuate. For instance, there is an initial increase, followed by a drop in the period from 1993 to 1996 (0.001 to -0.008), before a recovery for the rest of the period (-0.008 to 0.030).

The US social connectedness results show little variation over the entire period (-0.003 to 0.000), reflected in an average score of -0.002. The negative outcomes for the US do not seem to be counter-intuitive given that the dimension includes aspects such as divorce and prisoner rates, where the latter would seem fit for a policy shift (see Section 9.4.1). Not surprisingly, the institutional quality dimension results for the US are consistently positive (uniform 0.003). And finally, the results of the economic security dimension are the strongest on average, with 0.016. This dimension displays an initial decrease before increasing for the rest of the period to exhibit an overall marked increase (0.013 to 0.035). It also represents the US's most significant contributor to the socio-cultural environment theme. Following is some general discussion of the socio-cultural environment theme results.

Although Mexico produced strong results in the social connectedness dimension, it may have been undervalued given the absence of an indicator which accounts for informal networks. From the US standpoint, the result lends support to Putnam's (2000) findings in *Bowling Alone*, which demonstrated that higher wage levels do not necessarily translate to greater social connectedness, but rather less.[199]

The most interesting aspect arising from the socio-cultural environment theme involves the economic security dimension results for Australia. The sharp deterioration for Australia in 1993 seems to be reflective of the recession in the late 1980s to the early 1990s, which is associated with lower levels of economic security (higher unemployment). Similarly, the deterioration experienced by Mexico in 1996 could be partially explained by the financial crisis of 1994. This is supported by the fact that Australia displays a significant increase from the period 2000 to 2004 at a time when the economy is performing strongly and unemployment is quite low. Additionally, another factor may be the variable overwork hours which fluctuated throughout the observation period.

[199] In the book, Putnam (2000) claims that television is a significant contributing factor to the decline.

Another reason for this seemingly counter-intuitive result where Mexico outperformed Australia, may stem more from the focus of the dimension namely, economic security. The economic security dimension attempts to provide an indication of people's access to or command over resources, as well as acting as a gauge for power relations in the society, reflected by the characteristics unemployment and financial pressures. The Australian social security system, which allows its citizens to remain unemployed for longer periods while still receiving payment, is viewed as a reason for the very high number of long-term unemployed.[200] Thus, a possible explanation for the counter-intuitive result emerges. The policy implications of this are discussed in Section 9.4.1.

Consequently, even though the payments provide a level of economic security (hence the term social security payments), this is not reflective of the RIE framework approach. Rather, individuals who are unemployed and reliant on government payments have limited command over the resources while belonging to a system reliant on the government. Hence, power relations shift further away from the citizen. This more accurately reflects the intent of this dimension and is why the results appear counter-intuitive at first glance. From a policy perspective, the long-term unemployed need a work-based government payment to encourage the unemployed into the workforce, increase their skill base and eventually find work elsewhere. The additional benefits include being able to function at the societal level and a greater subjective feeling of wellbeing.

Aside from the GPI, the variables employed by the GDP, HDI and GS do not account for the social contribution to progress. This represents a sizeable omission for any progress measurement given the increasing recognition this theme has attained. The inclusion of Bourdieu's power relations differentiates this measure from most other SC studies which adopt a Putnam framework. It also, more pertinently, differentiates itself from the GPI's attempt at measuring the social aspects of progress. Although the economic security dimension of the RIE index may seem to adopt an individualistic approach (contrary to the collectivist approach favoured throughout), this is just one of

[200] This is reflected in a South Australian parliamentary report assessing long-term unemployment and income support measures. The report (Social Development Committee, 1995, p. 9) states that there was not enough financial incentive for some unemployed people to leave social security payments for a job.

the many complexities involved in the SC field (which is a combination of individual and collectivist attributes).

8.6 Assessing the RIE Themes

Table 8.10 presents the trends for the RIE themes and enables the present research to explain these trends within and between nations.

Table 8.10 Standardised scores for the RIE themes

	1990	1993	1996	2000	2004	Study Average
Australia						
Human Resource	0.116	0.155	0.168	0.183	0.182	0.164
Natural Resource	-0.001	0.009	0.013	-0.007	-0.075	-0.015
Generated Resource	-0.008	-0.012	-0.004	-0.002	0.001	-0.007
ICT Infrastructure	0.005	0.008	0.012	0.020	0.027	0.015
Transportation Infrastructure	0.003	0.005	0.006	0.006	0.008	0.006
Physical Environment	0.022	0.048	0.014	-0.002	-0.020	0.011
Socio-cultural Environment	-0.004	-0.032	-0.007	0.015	0.056	0.005
RIE Index	**0.133**	**0.181**	**0.202**	**0.213**	**0.179**	**0.179**
Mexico						
Human Resource	-0.104	-0.087	-0.082	-0.070	-0.061	-0.077
Natural Resource	0.100	0.105	0.107	0.093	0.110	0.104
Generated Resource	0.007	0.001	0.015	0.043	0.028	0.023
ICT Infrastructure	-0.023	-0.022	-0.021	-0.019	-0.017	-0.021
Transportation Infrastructure	-0.016	-0.015	-0.016	-0.015	-0.014	-0.015
Physical Environment	0.061	0.113	0.066	0.098	0.114	0.096
Socio-cultural Environment	-0.009	0.004	-0.005	0.021	0.042	0.015
RIE Index	**0.016**	**0.099**	**0.064**	**0.151**	**0.202**	**0.125**
USA						
Human Resource	-0.012	-0.021	-0.023	-0.049	-0.027	-0.028
Natural Resource	-0.100	-0.119	-0.096	-0.099	-0.097	-0.103
Generated Resource	0.000	-0.008	-0.010	-0.056	-0.049	-0.025
ICT Infrastructure	0.018	0.021	0.025	0.033	0.039	0.028
Transportation Infrastructure	0.013	0.014	0.018	0.023	0.027	0.019
Physical Environment	-0.082	-0.068	-0.075	-0.084	-0.038	-0.071
Socio-cultural Environment	0.013	0.003	0.010	0.028	0.038	0.017
RIE Index	**-0.150**	**-0.178**	**-0.151**	**-0.204**	**-0.107**	**-0.163**

Australia displays quite strong results in the human resource theme and far in advance of either Mexico or the US. Australia experiences strong overall growth from 1990 to 2000 (0.116 to 0.183) before stabilising in the period 2000 to 2004 (0.183 to 0.182). This is reflective of the superior results obtained in the health and net brain gain dimensions. Not surprisingly this theme is Australia's biggest positive contributor to progress. The next theme, natural resources shows an improvement for the first half of the period (-0.001 to 0.013). However, it then deteriorates, particularly the period 2000 to 2004 where a significant decline occurs (-0.007 to -0.075). This is due to worsening performances in the land and agricultural use, energy production use and biodiversity dimensions. The final resource theme generated resources experienced an initial decrease that placed it behind the US, however it then experiences steady improvement (-0.008 to 0.001) over the period.

The themes, ICT and transportation each consist of only one dimension. Consequently, the results are identical to their dimension results discussed previously, which show solid positive contributions. The physical environment results for Australia start off with a noticeable improvement (0.022 to 0.048) before experiencing a sizeable drop in the remaining periods (0.048 to -0.020). This decline is strongly linked to the worsening rates of the air quality, greenhouse gas emissions and conspicuous consumption dimensions.

Given that the institutional quality dimension results are fairly stable for all three countries over the specified time period, fluctuations in the socio-cultural environment theme can be narrowed to changes in the social connectedness and economic security dimensions.

The results for Australia initially worsen (-0.004 to -0.032) due to the economic security dimension, before showing marked improvement for the rest of the period (-0.032 to 0.056) due to increases in the aforementioned themes. During the final two periods, the socio-cultural environment is one of the strongest contributors to Australia's overall progress.

For Mexico, although the human resource theme shows improvement over the period (-0.104 to -0.061) it is the worst of the three countries. This reflects the poor, but improving, relative performances obtained in the health and net brain gain dimensions. Conversely, the natural resource theme is Mexico's most consistently strong performer (0.100 to 0.110) and despite a decrease in 1996 it is, along with the physical environment theme, Mexico's strongest contributor to overall progress. The generated resource theme results are quite varied with an initial decrease, then increasing before decreasing again in the final period; however the overall trend is upward (0.007 to 0.028). On average, it constitutes Mexico's third highest contributor to progress. The ICT and transportation infrastructure themes, apart from the human resource theme, contribute most to lowering overall progress. Hence, Mexico's infrastructure is an area that is potentially responsive to government policy initiatives and thus should be high on the agenda of policymakers.

With the physical environment theme, Mexico's results are varied with an increase (0.061 to 0.113), followed by a decrease (0.113 to 0.066), before constant increases (0.066 to 0.114), constituting its second strongest theme and contributor to Mexico's overall progress score. Finally, the results from the socio-cultural environment exhibit some fluctuation, with an initial increase followed by a decrease (which mirrors the economic security dimension) before significant increases for the rest of the period. Overall, a positive trend emerges (-0.009 to 0.042). This is also a strong contributor to progress.

The US performance for human resources poses the most interest as it is the only one that deteriorates over the period (-0.012 to -0.027), albeit slightly. This is reflective of the deteriorating results in the food consumption dimension. The natural resource results are quite poor (-0.100 to -0.097). After initially worsening, outcomes improve, but then remain steady from 1996 onwards. For the next theme, the US results (0.000 to -0.049) suggest that, in comparison to Australia and Mexico, the generated resources theme contributes the least to progress. This seemingly counter-intuitive result has already been discussed and will be briefly reiterated in the next section.

The performances in the ICT and transportation themes are consistent strong contributor to overall progress. Conversely, the physical environment theme detracts from overall progress. Generally, there is an improvement in the theme although marked variations occur from period to period. Specifically, worsening greenhouse gas emissions and higher conspicuous consumption rates offset improvements in air quality. However when all three dimensions improve, as occurred in the period 2000 to 2004, the theme undergoes a significant improvement (-0.084 to -0.038). The US's performance in the socio-cultural theme is a positive one, despite a drop in the initial period, with an overall increase for the period (0.013 to 0.038). It constitutes a solid contributor to progress. Following is some general discussion of the RIE theme results.

The human resource theme generally performed as expected with Australia's average study score of 0.164 leading the US with -0.028 and Mexico last on -0.077. However of these, the US average score of -0.028 is of most interest. The major discussion point centres on the impact that the US food consumption results have on its overall human resource index. It would seem that the large values of this dimension are obscuring the fact that the US performs rather adequately in the rest of the human resource dimensions. However, the food consumption dimension value is commensurate and reflective of the value obtained via a citizen participation survey.

The natural resource theme results suggest that Australia and the US, with average study scores of -0.015 and -0.103 respectively, need to address environmental concerns (see Section 9.4.1). The physical environment theme results show that Australia, with an average study score of 0.011, needs to work more diligently in reducing air pollutants and reducing wasteful consumption. This applies even more to the US, which averages -0.071 despite improvements made in the air quality dimension.

A final point of discussion involves Mexico. Despite Mexico clearly outperforming Australia and the US in the natural resource and physical environment themes, it was not until 2004 that Mexico finished highest in the standardised RIE index. This is noteworthy because this result allows the RIE index to be presented in a different light from other comprehensive approaches to progress, such as the HPI which is centred on the environment.

Although beneficial environmental outcomes are undoubtedly crucial for progress, as this present research acknowledges, it should not necessarily usurp bad, or good, performances by concealing other critical areas. For Mexico, this equates to poor human resource performances, reflected in its average score of -0.077 due to the health, education and net brain gain dimensions; as well as poor study average infrastructure results with ICT (-0.021) and transportation (-0.015).

8.7 Assessing the RIE Areas

Table 8.11 presents the trends for the RIE areas and enables the current study to explain these trends within and between nations.

Table 8.11 Standardised scores for the RIE areas

	1990	1993	1996	2000	2004	Study Average
Australia						
Resources	0.107	0.152	0.177	0.174	0.108	0.142
Infrastructure	0.008	0.013	0.018	0.026	0.035	0.020
Environment	0.018	0.016	0.007	0.013	0.036	0.016
RIE Index	**0.133**	**0.181**	**0.202**	**0.213**	**0.179**	**0.178**
Mexico						
Resources	0.003	0.019	0.040	0.066	0.077	0.050
Infrastructure	-0.039	-0.037	-0.037	-0.034	-0.031	-0.036
Environment	0.052	0.117	0.061	0.119	0.156	0.111
RIE Index	**0.016**	**0.099**	**0.064**	**0.151**	**0.202**	**0.125**
USA						
Resources	-0.112	-0.148	-0.129	-0.204	-0.173	-0.155
Infrastructure	0.031	0.035	0.043	0.056	0.066	0.047
Environment	-0.069	-0.065	-0.065	-0.056	0.000	-0.053
RIE Index	**-0.150**	**-0.178**	**-0.151**	**-0.204**	**-0.107**	**-0.161**

The resource results for Australia are a strong contributor to Australia's progress, averaging 0.142, with a constant increase from 1990 to 2000 (0.107 to 0.174) before a sizeable drop in the final period (0.174 to 0.108). This is mainly attributable to the decrease in the natural resource theme. As expected, the infrastructure results for Australia act as a solid contributor to progress (0.008 to 0.035). The RIE area, environment, exhibits some variations although is consistently positive with an average score of 0.016.

The Mexican resource results display a solid average score of 0.050, with solid increases throughout the entire period (0.003 to 0.077) reflecting constant improvements across all three resource themes. Infrastructure however, constitutes Mexico's worst performing area with an average negative contribution of -0.036, and with little improvement over the time period (-0.039 to -0.031). The environment area represents Mexico's strongest contributor to progress with a 0.111 average, more than double the resource average contribution. In fact, even in 1996 where a sizeable drop occurs (0.061), it still is Mexico's highest contributor to progress in this time period.

The contribution from resources marks the worst performing area towards US progress, with a study average score of -0.155. The resource area declines from an overall perspective (-0.112 to -0.173), although there is an increase in the final period (-0.204 to -0.173). The infrastructure results of the US serve as its biggest contributor to progress, averaging 0.047, with increases over the entire time period (0.031 to 0.066). And finally, the environment results demonstrate a continual improvement in this area. Despite an average score of -0.053, increases in this area were gradual (-0.069 to -0.056) until the final period 2000 to 2004 where a significant increase occurs (-0.056 to 0.000) mainly due to a strong performance in the physical environment theme. Following are some general discussion of the RIE area results.

Despite the US's strong performance in the infrastructure area, its overall poor performance suggests that a shift in outlook is required. Its areas of strength seem to reflect traditional economic policies that focus on tangible progress creation. Although hardly surprising, this realisation can be equated to the stance taken in Section 1.4, where progress could be misguidedly equated to building palaces in the desert.

Interestingly, Australia is the only country that experiences positive rates at all times in all three areas of the RIE index. This outcome suggests an inverse relationship between the level of useful information and the level of aggregation. For example, the positive rates in the environment theme hide the fact that Australia's results for air quality and greenhouse gas dimensions are a major detriment to the health of its citizens and progress. This view is reinforced when assessing Mexico. For instance, the positive results for Mexico's resource area can be viewed as an overall strength, however it is only when one branches out into what a more comprehensive framework can offer, dimension and theme analysis, can one detect specific areas for concern such as those pertaining to human resources.

Hence, although analysis at the RIE areas level is useful, it is more akin to the highly aggregated approaches of the GDP and the HDI. These 'distorted' results highlighted above illustrate the need for a measurement approach that can provide analysis at a comprehensive level, which is what occurred with the dimension and theme level analysis. It also underlines one of the main advantages and aims of the comprehensive RIE framework, which is its ability to communicate information on the overall impact of progress as well as on the individual components of progress.

Although policy implications arising from the RIE index were discussed in the dimension and theme sections, a brief summary bears repeating here. For Australia, policies need to be directed towards the environment, population and long-term unemployment. Mexico, on the other hand, needs to focus on health, education and infrastructure, while the US policies need to be directed more towards *use-value* aspects such as the environment, food consumption, population and social connectedness. The major policy implications are expanded upon in Chapter 9 (see Section 9.4.1).

8.8 Sensitivity Analysis

The sensitivity of the RIE index was analysed with respect to changes in selected variables. The sensitivity rates used in the analysis ranged from 0.90 (a 10 per cent decrease) to 1.30 (a 30 per cent increase). This 40 per cent latitude was chosen to account for possible variable fluctuation in any given year. The variables that underwent a sensitivity analysis (SA) were selected under three different approaches selected from: (i) *dynamic changes*; (ii) *empirical*; and (iii) *policy based*; and subjected to two options. The first option examines changes to selected variables *only* within the selected country, whereas the second option assesses changes to that country's selected variables *in conjunction* with changes to the selected variables of the other two countries (see Section 6.10). Of the two options, the more meaningful results are to be derived from option 1 since it shows how the ranking, or relative positions, could have changed without relying on changes to any other country.

8.8.1 Sensitivity Analysis: Option 1

The results of the SA for option 1 are presented in tables 8.12 through to 8.16 below. Using Table 8.12 as a reference, this study will inform the reader as to how to correctly interpret the SA tables.

The ‘Year’ column in the tables below explains the year in which a change in ranking occurred. The country’s acronym tells the reader which country the SA was performed on. The ‘Initial Order’ column details the original ranking order, for instance AMU infers a ranking of: Australia, Mexico followed by the US. The ‘Limit rank’ column specifies a Lower and Upper limit. The “No change” statement that appears in the ‘Lower’ limit row suggests no change to the initial order. However, to fully understand this it must be read in conjunction with the ‘Upper’ limit row. The figure >1.17 MAU in the ‘Upper’ limit row shows that the SA test changed the ranking order to: Mexico, Australia and the US when the selected variables were increased by a minimum of 18 per cent. Thus, anything below this range had no effect on the initial order.

Table 8.12 SA on dynamic variables option 1 Standardised

Year	Initial order	Limit rank	MEX	USA
2003	AMU	Lower	No change	$\leq$0.94 MAU
		Upper	>1.17 MAU	No change

Note: See text above for notes on interpretation of this table.

Table 8.13 SA on empirical variables option 1 Condorcet

Year	Initial order	Limit rank	AUS	MEX
1992	MAU	Lower	<1.05 MAU	<0.95 AMU
		Upper	>1.10 MAU	No change
1993	AMU	Lower	=0.90 MAU	No change
		Upper	>1.13 MAU	>1.09 MAU
1994	AMU	Lower	=0.90 MAU	No change
		Upper	>1.21 MAU	>1.09 MAU
2001	AMU	Lower	No change	<0.95 MAU
		Upper	>1.05 MAU	No change
2002	AMU	Lower	No change	<0.95 MAU
		Upper	>1.05 MAU	No change
2003	AMU	Lower	No change	<0.95 MAU
		Upper	>1.05 MAU	No change

Note: See Note on Table 8.12.

Table 8.14 SA on empirical variables option 1 Standardised

Year	Initial order	Limit rank	AUS	MEX	USA
1992	AMU	Lower		No change	
		Upper		>1.13 MAU	
1994	AMU	Lower		No change	
		Upper		>1.13 MAU	
1995	AMU	Lower		No change	
		Upper		>1.09 MAU	
1998	AMU	Lower		No change	
		Upper		>1.09 MAU	
1999	AMU	Lower	=0.90 MAU	No change	
		Upper	No change	>1.09 MAU	
2001	AMU	Lower	<0.95 MAU	No change	No change
		Upper	No change	>1.09 MAU	>1.25 MAU
2002	AMU	Lower	<0.95 MAU	No change	No change
		Upper	No change	>1.09 MAU	>1.25 MAU
2003	AMU	Lower	<0.99 MAU	No change	<0.95 MAU
		Upper	No change	>1.05 MAU	>1.05 MAU

Note: See Note on Table 8.12.

Table 8.15 SA on policy related variables option 1 Condorcet

Year	Initial order	Limit rank	AUS	MEX
1992	MAU	Lower	No change	<0.95 AMU
		Upper	>1.05 AMU	No change
1993	AMU	Lower		No change
		Upper		>1.13 MAU
1994	AMU	Lower		No change
		Upper		>1.13 MAU
1997	MAU	Lower	No change	<0.95 AMU
		Upper	>1.05 AMU	No change
2003	AMU	Lower		>1.13 MAU
		Upper		No change
2004	AMU	Lower		>1.13 MAU
		Upper		No change

Note: See Note on Table 8.12.

Table 8.16 SA on policy related variables option 1 Standardised

Year	Initial order	Limit rank	AUS	MEX	USA
1991	AMU	Lower		No change	
		Upper		=1.30 MAU	
1992	AMU	Lower		No change	
		Upper		>1.13 MAU	
1993	AMU	Lower		No change	
		Upper		=1.30 MAU	
1994	AMU	Lower		No change	
		Upper		>1.17 MAU	
1995	AMU	Lower		No change	
		Upper		>1.13 MAU	
1997	AMU	Lower		No change	
		Upper		>1.17 MAU	
1998	AMU	Lower		No change	
		Upper		>1.13 MAU	
1999	AMU	Lower		No change	
		Upper		>1.13 MAU	
2000	AMU	Lower		No change	
		Upper		>1.17 MAU	
2001	AMU	Lower		No change	
		Upper		>1.13 MAU	
2002	AMU	Lower		No change	
		Upper		>1.13 MAU	
2003	AMU	Lower	<0.95 MAU	No change	
		Upper	No change	>1.13 MAU	
2004	MAU	Lower	No change		=0.90 AUM
		Upper	>1.17 AMU		No change

Note: See Note on Table 8.12.

The ranking was least sensitive to the dynamic variables, with zero changes occurring under a Condorcet approach, and only one change in order under a standardised approach (Table 8.12, 2003). The variables selected were mostly from the financial dimension and infrastructure theme. Hence, possible reasons for the lack of responses seem to be due to: (i) the chasm that exists in those sections between the countries (especially from Mexico), which would dilute the impact the sensitivity changes could have; and (ii) the lower weights appropriate to the dimensions these variables belong to.

From the empirical approach, the change in order from 2001 to 2003 (Table 8.13) are reflective of changes in the carbon dioxide emissions variable. A 6 per cent change, either higher from Australia or lower from Mexico, is enough to change the order under the Condorcet approach. Since this variable is open to direct manipulation via government action, it illustrates that the order of the RIE index is responsive to policy action. This could not have occurred had the variable been life satisfaction, as changes to this are difficult to influence. The Condorcet results are supported by the standardised SA where the ordering is also quite sensitive from 2001 to 2003. The changes in Mexico from 1994-1995 and 1998-1999 (Table 8.14) are due to a 10 to 14 per cent increase in the life expectancy variable. Although this type of increase is unlikely to occur for this variable in a given year, this scenario still serves as an important reminder to Mexico that their policy attention needs to be focused to making more rapid improvement in the health dimension.

The policy option approach under the Condorcet method demonstrates that the two years where Australia does not lead the ordering (1992 and 1997) are indeed very sensitive (Table 8.15). The results illustrate that a 6 per cent increase in selected policies, specifically targeting education expenditure (or a 6 per cent decrease in Mexican education expenditure) and high technology exports, would remedy the situation. The changes in favour of Mexico for the periods 1993-1994 and 2003-2004 arise from substantial (14 per cent) increases in population access to drugs and the civilian employment rate. This is reinforced by the standardised results (Table 8.16) where adjustments occur at a similar percentage change although to an even greater extent (almost yearly).

The scenarios for Mexico under option 1 suggest that a greater focus on health outcomes, increased educational expenditure and a focus on carbon dioxide emissions can help ensure that Mexico surpass Australia, and more importantly reach sustained higher levels of progress. Interestingly, conspicuous by its absence in the above discussion is the US, which seems to indicate a deeper problem.

After isolating and increasing the US variables via 3 different approaches, the ordering for the US never changed – always finishing in third position. This seems to reinforce the conclusion in the RIE financial resource dimension and the section regarding the structure of the US economy, which favours *exchange-value* production and finance to the detriment of environmental and social concerns (*use-value*). This sentiment, illustrated in Section 1.4 with the ‘building palaces in the desert’ situation must be replaced via a paradigm shift in values away from production and exchange. The need to account for, and make policies, with respect to factors beyond the obvious consequences has to occur. The Australian situation will be discussed in Section 8.8.3.

8.8.2 Sensitivity Analysis: Option 2

The results of the SA for option 2 are presented in tables 8.17 through to 8.21 below. Unlike option 1, where only a single country's variables were changed, option 2 changes selected variables from all three countries at different rates (see Section 6.10). Changes to the selected country variables range from 0.90 (a 10 per cent decrease) to 1.30 (a 30 per cent increase).

Table 8.17 SA on dynamic variables option 2

			Condorcet	Standardised	
Year	Initial order	Limit rank	AUS	AUS	USA
1997	MAU	Lower	<0.94 AMU		
		Upper	No change		
2003	AMU	Lower		<0.94 MAU	<0.94 MAU
		Upper		No change	No change

Note: See Note on Table 8.12.

Table 8.18 SA on empirical variables option 2 Condorcet

Year	Initial order	Limit rank	AUS	MEX	USA
1992	MAU	Lower	No change	<0.98 MAU	
		Upper	>1.25 AMU	>1.06 MAU	
1993	AMU	Lower	<1.11 MAU	<0.99 MAU	>0.89 MAU
		Upper	No change	>1.21 MAU	
1994	AMU	Lower	<1.11 MAU	=0.90 MAU	>0.89 MAU
		Upper	No change	>1.21 MAU	
2001	AMU	Lower	No change	<1.07 MAU	
		Upper	>1.25 AMU	No change	
2002	AMU	Lower	No change	<1.07 MAU	
		Upper	>1.25 AMU	No change	
2003	AMU	Lower	No change	<1.03 MAU	
		Upper	>1.25 AMU	No change	

Note: See Note on Table 8.12.

Table 8.19 SA on empirical variables option 2 Standardised

Year	Initial order	Limit rank	AUS	MEX	USA
1992	AMU	Lower	<1.07 MAU		=1.14 MAU
		Upper	No change		No change
1994	AMU	Lower	<1.07 MAU		=1.14 MAU
		Upper	No change		No change
1995	AMU	Lower	<1.11 MAU		<1.10 AMU
		Upper	No change		>1.14 AMU
1997	AMU	Lower	=1.06 MAU		
		Upper	No change		
1998	AMU	Lower	<1.11 MAU		<1.10 AMU
		Upper	No change		>1.14 AMU
1999	AMU	Lower	<1.11 MAU		<1.10 AMU
		Upper	No change		>1.14 AMU
2000	AMU	Lower	<1.07 MAU		=1.14 MAU
		Upper	No change		No change
2001	AMU	Lower	<1.11 MAU	No change	>0.89 MAU
		Upper	No change	>1.25 MAU	
2002	AMU	Lower	<1.14 MAU	No change	>0.89 MAU
		Upper	No change	>1.25 MAU	
2003	AMU	Lower	<1.19 MAU	No change	>0.89 MAU
		Upper	No change	>1.13 MAU	

Note: See Note on Table 8.12.

Table 8.20 SA on policy related variables option 2 Condorcet

Year	Initial order	Limit rank	AUS	MEX	USA
1992	MAU	Lower		<1.03 AMU	
		Upper		No change	
1993	AMU	Lower	<1.19 MAU	No change	>0.89 MAU
		Upper	No change	>1.13 MAU	
1994	AMU	Lower	<1.19 MAU	No change	>0.89 MAU
		Upper	No change	>1.13 MAU	
1997	MAU	Lower		<1.03 AMU	
		Upper		No change	
2002	AMU	Lower	<1.03 MAU	No change	
		Upper	No change	>1.25 MAU	
2003	AMU	Lower	<0.99 MAU	No change	
		Upper	No change	>1.25 MAU	
2004	AMU	Lower	<1.03 MAU	No change	
		Upper	No change	>1.25 MAU	

Note: See Note on Table 8.12.

Table 8.21 SA on policy related variables option 2 Standardised

Year	Initial order	Limit rank	AUS	MEX	USA
1991	AMU	Lower		No change	
		Upper		>1.17 MAU	
1992	AMU	Lower	<1.23 MAU	No change	>0.89 MAU
		Upper	No change	>1.13 MAU	
1993	AMU	Lower		No change	
		Upper		>1.17 MAU	
1994	AMU	Lower	<1.11 MAU	No change	>0.89 MAU
		Upper	No change	>1.13 MAU	
1995	AMU	Lower	<1.23 MAU	No change	>0.89 MAU
		Upper	No change	>1.13 MAU	
1997	AMU	Lower	=0.90 MAU	No change	>0.89 MAU
		Upper	No change	>1.13 MAU	
1998	AMU	Lower	<1.15 MAU	No change	>0.89 MAU
		Upper	No change	>1.13 MAU	
1999	AMU	Lower	<1.27 MAU	No change	>0.89 MAU
		Upper	No change	>1.13 MAU	
2000	AMU	Lower	<1.03 MAU	No change	>0.89 MAU
		Upper	No change	>1.13 MAU	
2001	AMU	Lower	>0.89 MAU	No change	>0.89 MAU
		Upper		>1.13 MAU	
2002	AMU	Lower	>0.89 MAU	No change	>0.89 MAU
		Upper		>1.13 MAU	
2003	AMU	Lower	>0.89 MAU	No change	>0.89 MAU
		Upper		>1.13 MAU	

Note: See Note on Table 8.12.

As with option 1, the dynamic variables approach was the least responsive to SA with one change (Table 8.17) under a Condorcet approach (1997), and only one change in order under a standardised approach (for year 2003). This seems to reinforce the points made in option 1 regarding both the chasm and weight allocation involving the selected variables.

Noticeably, from the empirical approach changes in the order for 1993 and 1994 are a combination of Australia experiencing a small decrease to its life expectancy, and an arbitrary increase to Mexico of twenty per cent. This change is a microcosm for most of the other changes insofar as it was brought about by arbitrary changes occurring across two countries simultaneously. Another example is the change in the US column (Table 8.18) for 1993 and 1994, which occurs solely due to the fact that the Australian and Mexican variables increase by 10 and 20 per cent respectively. These results are supported and magnified by the US column in the standardised results (Table 8.19) where changes occur across more years but due to similar reasons.

The policy approach results are similar to those obtained from the empirical approach. The most interesting aspect of these results can be found in the US column in both Tables 8.20 and 8.21. The changes under a Condorcet (1993-1994) and particularly the standardised approach (1992, 1994-1995 and 1997-2003) occur from the initial sensitivity rate of 0.90 onwards. Hence, changes in order arise solely from changes to Australia and Mexico, which are 10 and 15 per cent respectively.

The SA results of the Condorcet and standardised approaches reflect the fact that Australian and Mexican outcomes are close, while the US lags some distance behind. Once again, this result supports the assertion made in the previous section regarding the structure of the US economy and the necessity of a shift in values.

8.8.3 Sensitivity Analysis from an Australian Standpoint

The results impacting Australia were obtained from the SA results emanating from option 1. The overall effects are summarised in Tables 8.22 and 8.23 below.

Table 8.22 Australia's rank under the Condorcet method

Sign	Approach	1992	1993	1994	1997	2001	2002	2003
Improvement	Literature review	1.06 to 1.10						
	Policy related	>1.05			>1.05			
Deterioration	Literature review		0.90 and >1.13	0.90 and >1.21		>1.05	>1.05	>1.05
	Policy related							

The Condorcet approach (Table 8.22) shows that, as mentioned previously, Australia's rank reversal in 1992 and 1997 could be overcome by increases of 6 per cent with certain policy related variables demonstrating the highly sensitive nature of those results. More interesting though is the deterioration row. It would seem that, with the exceptions of 1992 and 1997, up until 2001 the likelihood of Australia 'deteriorating' seemed improbable. However, for the period 2001 to 2003 one notices that a reversal would have occured had one variable (carbon dioxide emissions) increased by 6 per cent. The fact that a change in one of the key variables could cause this shift is not significant, rather the fact this shift could occur where it could not in the past is indicative of a more general deterioration in Australia's recent performance.

Table 8.23 Australia's rank under the Standardised method

Sign	Approach	1999	2001	2002	2003	2004
Improvement	Literature Review					
	Policy related					>1.17
Deterioration	Literature Review	0.90	0.90 to 0.94	0.90 to 0.94	0.90 to 0.98	
	Policy related				0.90 to 0.94	

The standardised approach (Table 8.23) reinforces this point where a minor drop to Australia's key variables can change the order for 1999 and 2001-2003. In 2004, Mexico actually surpasses Australia, which can overturn the ordering position should an 18 per cent increase in a policy related variable occur. Again, this highlights the recent decline in performance of Australia. This recent decline occurs against a backdrop of recent (post-2000) strong GDP figures for Australia. This supports the notion that neither the GDP nor measures heavily reliant on it are appropriate measures of progress.

8.9 A Qualitative Impact Assessment

The previous chapter discussed the possible qualitative impacts between dimensions and themes. This section displays the results of the correlation analysis that was performed on selected dimension and theme impacts to determine whether the correlations support the qualitative findings in Chapter 7. Typically, correlations follow a rule of thumb where correlations of less than 0.30 are interpreted to show little, if any, relationship between the selected variables (Hinkle, Wiersma and Jurs, 2003). The results of selected dimensions and themes are displayed in Tables 8.24 and 8.25.[201]

[201] The results are in Appendix G.

Table 8.24 Correlation results for selected qualitative impacts (1990-2004)

Selected qualitative correlations	Australia	Mexico	USA
1. Energy production use and biodiversity	0.959	0.928	0.967
2. Built environment and transport	0.666	0.826	0.889
3. Human and natural resources	-0.457	0.262	0.278
4. ICT and transport	0.842	0.806	0.975
5. Natural resources and physical environment	0.651	-0.167	-0.137
6. Human resources and socio-cultural environment	0.565	0.806	-0.625

Table 8.25 Standardised score association: health and education

	1990	1993	1996	2000	2004
	Positive high health and education scores				
Australia					
Health	0.044	0.059	0.061	0.074	0.089
Education	0.015	0.016	0.017	0.018	0.019
USA					
Health	0.022	0.027	0.035	0.043	0.053
Education	0.019	0.019	0.019	0.019	0.019
	Negative low health and education scores				
Mexico					
Health	-0.066	-0.042	-0.033	-0.020	-0.004
Education	-0.034	-0.030	-0.027	-0.022	-0.018

Note: Given the data limitations in the education dimensions, due to the break of classification issued by the UIS, a correlation analysis could not be performed. Instead, a qualitative correlation analysis was conducted based on the theoretical framework. Here, the standardised scores of the selected dimensions are grouped together to determine whether any association exists.

1. *Energy production use and* biodiversity. Over the entire observation period, all three countries display high correlation. This reinforces the point that worsening rates of energy production and use (reflecting increases in non-renewable energy production) result in reduced levels of biodiversity. This also reiterates the environmental literature viewpoint where continual increases in energy production such as electrical consumption occur at the expense of biodiversity.

2. *Built environment and transport*. The results for Australia show a marked degree of correlation, while Mexico and the US display high levels of correlation. For Australia and the US, positive levels of the built environment that involve structures, parklands, etc., are correlated to positive levels of the transport dimension. Conversely, the consistent negative levels for Mexico in the built environment correlate with the negative values obtained in the transport dimension. This result reinforces the degree of overlap between the two dimensions and supports the relationship outlined in the previous chapter.

3. *Human and natural resources*. The results show that for Mexico and the US little, if any, relationship exists between these two themes. The Australian result, on the other hand, seems to indicate a moderate negative correlation level reflective of its strong positive results for human resources but low positive and negative results for natural resources. Overall, the correlation analysis performed seems to mirror the conclusion arrived at in the previous chapter, which stated that no discernible relationship could be determined between the themes.

4. *ICT and transport*. Not surprisingly, the correlation results indicate a strong relationship between these two themes, with the US exhibiting the strongest correlation. The results reflect the fact that positive levels of the infrastructure theme led to a positive result in the ICT theme (Australia and US), whereas negative levels of infrastructure coincided with negative ICT levels for Mexico. The results are similar to that of health and education. Consequently, a strong relationship occurs between these two themes.

5. *Natural resources and physical environment*. The correlation results are quite mixed. For Australia there seems to be a marked, but not high, degree of correlation between the two themes. However, the results for both Mexico and the US indicate that little, if any, relationship exists. These results *contradict* the assessment in the qualitative impact chapter, which specified a relationship between the themes. Although counter-intuitive results do not invalidate a framework, there may be a need for future revision.

6. *Human resources and socio-cultural environment*. The results show that a relationship does exist between these two themes. Australia seems to show a moderate positive correlation with strong and increasingly positive results for human resources yet quite spasmodic results for the socio-cultural theme. Mexico displays a strong correlation, while the US results indicate that a moderate inverse relationship exists. These mixed findings support the observation in the previous chapter, which stated that a relationship does exist albeit an uncertain one.

The results in Table 8.25 show that both Australia and the US possess relatively high levels of both health and education with Mexico experiencing appreciably lower levels.

This seems to confirm progress literature, which states that high levels of education are associated with high levels of traditional health status and vice-versa.

8.10 Conclusion

This chapter presented the results of the various analyses of the study. The RIE index reported different results to the GDP, the HDI and the GS. A test was then conducted to assess the Condorcet aggregation results. The findings supported the use of the Condorcet approach. The standardised RIE index results were then analysed. The overview had the US languishing in comparison to both Australia and Mexico who were in close proximity. A brief comparison was made with the GPI, where seemingly similar results proved to be somewhat different. The comprehensive nature of the RIE index enabled the present research to conduct an assessment of the dimensions and themes contributing to progress and possible policy implications arising from it. This assessment was undertaken via the standardised RIE index, which produced similar results to the Condorcet approach.

As demonstrated, the RIE index's adoption of an interdisciplinary approach integrating conceptually distinct theories could be combined intuitively. This enabled it to account for differences between the three countries in a simple manner and provided useful information for policy prescriptions. The results confirmed Australia's strength in the human resource theme and infrastructure area with improvement needed in the following themes: natural resource, generated resource and physical environment. The socio-cultural environment started poorly but by the end of the period became a strong contributor. For Mexico, strong contributions came from the natural and generated resource themes as well as the physical environment theme. Areas of concern include the human resource theme and infrastructure area. The socio-cultural environment followed a similar pattern to Australia with a strong contribution in the later stages. The US results identified the infrastructure area and the socio-cultural environment theme as solid contributors to progress. However, much improvement is required in the resources area (human, natural and generated) and the physical environment theme. The comparative results of the US and Mexico illustrated that it is possible to achieve high levels of progress without an excessive reliance on high levels of production and income.

Furthermore the RIE index, via a brief comparison with the HPI, was able to demonstrate that it cannot be regarded as a measure that is centred on the environment. This is reflected by the fact that despite Mexico's strong performances with environmental issues, Australia still led the progress measure for almost the entire study period.

Sensitivity analysis tests were then conducted which exposed the RIE index to a number of "what-if" scenarios. The changes in order as a result of the SA reinforced the close outcome between Australia and Mexico. It also demonstrated the ability for policy action to influence the outcome, for instance education-oriented policy as well as health. Additionally, it highlighted an inherent weakness of the structure of the US economy. Finally, a correlation analysis was performed on selected dimensions and themes to assess the qualitative impacts and relationships outlined in the previous chapter. Generally, the results were as expected with the more established relationships being confirmed. The next chapter will conclude this study by providing a summary of the present research as well as implications and critical reflections for future research.

> If (economic) growth is intended to give us better lives, and there can be no other purpose, it has failed. (Hamilton, 2003, p.3) [content in parenthesis added]

Chapter 9: Summary, Conclusion and Implications

9.1 Introduction

This chapter summarises the study and its conclusions, and draws relevant implications. The chapter ends with some critical reflections and suggestions for future research, with respect to the study problem and methodology. It will also briefly review the major problems encountered during the research.

9.2 Summary of the Methodology of the Study

The study problem chosen was progress measurement. The problem was identified via the burgeoning progress literature claiming that the current *de facto* progress measure, the GDP, was inappropriate to account for the complexities involved with progress. As argued in Section 1.4, alternative measures that employ market-based valuations (money) for evaluating components of progress are flawed. Hence, a non-monetary measure was deemed appropriate since it allows the information to be presented in a form that is more accurate and understandable while also reducing the hegemony of economic statistics. Based on this, the specific objectives the present research set to achieve were the following:

1. To review current approaches to progress measurement.
2. To identify aspects of income and non-income generating activity not yet included in progress measurements and conversely, to exclude factors generating income but not contributing to the progress of a nation.
3. To propose an alternative approach to progress measurement incorporating the strengths and rectifying the limitations of the reviewed approaches.
4. To detect the meaningful underlying dimensions contributing to national progress to provide guidance in articulating policies for optimal use of resources.

The first objective was achieved with a critical review of progress measures conducted in Chapter 3. The second and third objectives were achieved in Chapter 4, which laid the foundations for an expanded progress measure specifically dealing with aspects of HC, NC and SC, and Chapter 5 which proposed a comprehensive framework to capture progress. The final objective was accomplished via Chapter 6, which established the appropriate methods to complement this task, and Chapters 7 and 8 which enabled the current study to extrapolate it. The methodology of the study is summarised in Table 9.1 below.

Table 9.1 Schematic representation of the methodology of the study

Problem:	Addressing the deficiencies of currently employed progress measures.
Objectives:	1. To review current approaches to progress measurement.
	2. To identify aspects of income and non-income generating activity not yet included in progress measurements and conversely, to exclude factors generating income but not contributing to the progress of a nation.
	3. To propose an alternative approach to progress measurement incorporating the strengths and rectifying the limitations of the reviewed approaches.
	4. To detect the meaningful underlying dimensions contributing to national progress to provide guidance in articulating policies for optimal use of resources.
Methods used:	1. A critical literature review of main progress measures.
	2. An exploration of the literature to identify contributory and non-contributory aspects of progress.
	3. Constructed a comprehensive non-monetary RIE framework, built on the strengths and weakness of past progress measures, to more accurately capture the progress concept.
	4. Appropriate testing of the RIE index comprising: simple imputation of data; z-score standardisation to normalise data; a citizen participation survey weighting scheme (public opinion); Condorcet aggregation; sensitivity analysis testing; and correlation analysis.

9.3 Conclusions

This section will summarise the major conclusions of the present research under respective objectives.

9.3.1 Objective 1

The critical review of the main progress measures showed reluctance from mainstream economists to incorporate the role of values in economics. A complex undertaking such as progress should not be exclusively assessed with measurement tools that are designed for precision. To paraphrase Zadeh, precise measurements used on complex concepts loose meaning, whereas to make a meaningful statement one needs to loose precision. It was concluded therefore that a framework for progress was needed that made appropriate provision for different objectives of human behaviour. The first step to achieving this is to move beyond neoclassical definitions and measurements

9.3.2 Objective 2

The review of the literature identified defensive expenditures and insurance expenditure as areas that needed to be excluded from progress measurements due to their lack of contribution. The next step was to assert that HC, NC and SC contribute to progress and highlight the failure of current progress measurement to appropriately capture this contribution. For example, the use of market prices to capture these areas tended to inaccurately reflect the real costs and benefits they provided, and also had the capacity to ignore indirect costs which would lead to undesirable policy initiatives. Although these concerns cannot totally be rectified, the present research felt that the most appropriate alternative was to establish a comprehensive framework, which adopted an interdisciplinary approach integrating conceptually distinct theories.

9.3.3 Objective 3

Pursuing market valuations ensures that the concept in question (environmental, social, etc.) becomes part of a narrow debate where the economic bottom line is paramount, and where major impacts are omitted. This present research concluded that monetary measures of progress simply reinforce the narrow hegemonic economic discourse and prevents a fundamental shift in value from occurring. Any shift in value away from the market (income, price and production) to a new value where natural and social contributions are appropriately recognised, is best achieved via a non-monetary measure.

Another consideration was the need to design appropriate policies to foster progress. This required the monitoring of key parameters, which must then be transformed into practical information as a basis for considering alternative policy options. This recognition enabled the current study to construct the non-monetary RIE index. This required integrating an interdisciplinary approach that enables interaction amongst progress' many themes and dimensions arising from the relationship of a whole range of determinants and social processes.

9.3.4 Objective 4

An appropriate weighting, aggregation and testing procedure of the RIE index was conducted and justified (see sections 6.8.1 and 6.9.1). The RIE framework enabled a dimension and theme analysis to be undertaken. This facilitated the detection of the more meaningful contributions and detractions to progress which could lead to better policy initiatives from countries. Hence, the present research demonstrates that comprehensive measurements such as the RIE index have the potential to provide more meaningful analyses.

9.4 Implications

The implications of the current study will be discussed with respect to policy implications, the problem studied and with respect to the methodology and methods of the study.

9.4.1 Policy Implications

The results from the RIE index showed that all three countries have specific policy issues that should be considered when formulating policies. For Australia, the greatest potential for policy intervention lies in the area of the environment. Policies need to consider: natural resource protection (instituting a greater number of preservation places); limits on harvesting renewable resources (ensuring farmers adopt less environmentally damaging farming techniques); and strict policies to combat and reduce high pollutant emissions while increasing the use of renewable energy sources. While these policies have been in existence under various frameworks, the present research provides a cohesive and comprehensive framework that links such policies to progress.

Furthermore, the nature of the present framework allows policymakers to prioritise policy initiatives via the allocated weighted scheme employed (public opinion). This ensures that different countries utilise different policies at varying levels. For instance, even though both Mexico and Australia need more effective policies relating to the environment, their priority levels, as adjudged by their respective standardised scores, vary. Consequently, the environment becomes a greater immediate policy priority for Australia than Mexico. This is an important consideration given that available funds are limited. Thus, a framework that links policies to progress ensures that policies are determined on the basis of their degree of contribution to a nation’s overall progress, rather than on any single issue.

Other policy considerations for Australia include a long-term focus on education to reduce the reliance on foreign-born tertiary educated workers filling the current skill shortage. Hence, consideration may be given to improving domestic graduation rates at tertiary level and reducing the rate of school leavers in upper-secondary school prior to graduation. The low population growth rate also needs to be addressed. Currently, policies with a financial incentive (child support scheme) are in place to improve this; however this situation needs to be monitored.

Finally, another policy initiative which could lift Australia's level of progress, involves reducing the barriers to entry in the workforce for the long-term unemployed. Specifically, the social welfare scheme should include strong incentives for the recipients to be productive thereby reducing the disincentive to work. This would promote a sense of empowerment and a greater subjective feeling of wellbeing.

The policy imperatives arising for Mexico are varied. Given the aforementioned limitation of available funds, the RIE index prioritised the following dimensions to allow for better resource management. They are: health (through improved levels of access), education (despite some improvements in retention rates, further efforts are required to raise the standards of the compulsory school system), and access to essential services (ensuring greater access to all citizens). Additionally, due consideration needs to be given to encourage domestic born tertiary workers to stay in Mexico. This may involve increasing the number of tertiary graduates.

Furthermore, improvement is required on the infrastructure dimensions: transportation and ICT, and also the built environment dimension. This may require enhanced technological transfers from abroad (via a reduction in the barriers to foreign ownership) and a general strengthening of investor confidence.

Despite the current consensus regarding the prioritisation of the environment as a key issue to attaining progress, this is not reflected in Mexico's RIE index results where the higher priority lies with health and access to resources. This ability to differentiate the level of policy concern between nations is an important feature of the RIE framework.

The final dimension for policy consideration for Mexico is institutional quality. The current low outcome could be improved via policies that focus on greater protection of political and civil freedoms, and reduction of corruption. While the current climate is one of democracy and relative freedom there is a responsibility to ensure that such a climate continues.

Despite traditional health status indicators suggesting otherwise (see Section 8.5.1), a major policy concern arising from the US, according to the RIE index, centres on the food consumption dimension. Consequently, the government should consider placing tighter regulations on the fast food industry as well as undertaking an educational campaign on dietary habits to ensure that full disclosure of product information occurs.

The environment is also a major policy concern for the US, where policy initiatives need to consider: natural resource protection (instituting a greater number of preservation places), limits on harvesting renewable resources (ensuring farmers adopt less environmentally damaging farming techniques), and tighter controls in the fisheries industry. Additionally, the introduction by California of targeted emission levels by industry needs to be adopted nationally.

The low population growth rates in the US may require similar policy initiatives to Australia (child support scheme) to help increase the growth rate to an appropriate level. The RIE index also identifies the social connectedness dimension as a noteworthy barrier to progress. Specifically, this deals with high divorce rates and abnormally large prisoner numbers. Overcoming this may require greater family support policies by the government to reduce breakdowns (such as improved working conditions and tax breaks). As Cummins et al. (2001) state, feeling connected to one’s family is a vital part of any measure of wellbeing.

In fact, the social connectedness dimension highlights another main feature of the RIE index. Specifically, the ability to challenge the notion that increased expenditure leads to greater notions of progress. The results of the RIE index (regarding convicted adults) suggest that the current US policy practice of continual expenditure increases on the prison system is not producing the desired results. Acknowledging this opens the possibility for alternative solutions such as introducing policies that prioritise rehabilitation over punishment. A similar argument regarding the utility of expenditures can be made regarding security expenditure. For instance, do increases in security expenditure reflect a society that is better or worse off?

The RIE index was intended to reflect the complexity of the progress concept; hence trade-offs became a feature of the index. These trade-offs are also reflected in the policy implications, for instance investment in educational quality. Although most policymakers understand that greater investment in this segment should benefit Australia, this analysis alone is not sufficient. It also needs to monitor the number of skilled migrants, something that the cohesive RIE framework allows. Consequently it can provide guidance in articulating policies for optimal use of resources.

In the policy summary above, two categories have been deliberately omitted: financial resources and conspicuous consumption. This is because changes to these categories require more subtlety rather than direct policy intervention; in fact, more like something akin to a long-term fundamental approach which, as has been mentioned previously, requires a shift in values.

The strength of the RIE index is that it can help facilitate such a necessary change. For too long, governments have implemented policies that have not been measured against their worth to progress but rather their contribution to GDP – a widely held *de facto* measure of progress. If the GDP increased, then policy prescriptions were seen to be working since the GDP assumes that all production is beneficial.

In contrast, the RIE index, via its comprehensive framework which specifies dimensions that add and detract from progress, abandons this misguided practice. Additionally, with the employment of an allocated weighting scheme, policymakers are better able to prioritise policy initiatives based on its contribution to overall progress as opposed to making policy decisions in a vacuum. Consequently, the RIE index can help facilitate a shift in value by refocusing government priorities away from market based economic growth. Thus, the manner in which the RIE index was constructed allows it to account for trade-offs. This provides guidance for an optimal allocation of resources incorporating their shadow prices in terms of their contribution to progress and avoiding any excessive consumption of natural resources or ‘creative destruction’, which Schumpeter (1976) labelled as an essential fact of capitalism.

9.4.2 The Study Problem

It is important to stress what the RIE index is showing and whether this is indeed useful. Generally, the results of the study show that the RIE index does differ markedly to the GDP, HDI, GS and GPI.

The leading implication to arise from the results of the RIE index suggests that it is possible to achieve high levels of progress without excessively high levels of production and income. Furthermore, it shows that government policies (particularly the US) tend *not* to reflect public sentiment, as shown through the public opinion polls employed by the RIE index regarding progress. Rather, policies were initiated and evaluated based on their resultant contribution to GDP. If the GDP increased, then the policies were said to be working.

Thus, by specifying the dimensions which contribute to and detract from progress, the RIE index abandons the misguided practice of the GDP which views all production as beneficial, and helps facilitate a shift in value.

From a country perspective, the results for Australia suggest that the most important contributors to progress are its human resource and infrastructure themes, although improvement is required at the natural resource and physical environment level. A dimensional analysis demonstrated that policy measures should be directed at the environmental and educational sectors, in particular.

The Mexican results show, for the most part, strong contributions in the social and environmental category. However, the policy imperatives arising from the results primarily centre on the health and education sector followed by infrastructure concerns, specifically transportation and ICT, and also the built environment. The results for the US identify infrastructure as a solid contributor to progress, however concerns occur in the environmental and social aspects of progress where policies need to be directed towards curbing emissions, encouraging renewable energy sources and greater social engagement.

Sensitivity analysis tests were then conducted which exposed the RIE index to a number of "what-if" scenarios (see sections 8.8.1 and 8.8.2). This demonstrated the ability for policy action to influence the outcome, for instance in the area of education-oriented policy as well as health. It also helped reveal the inherent weakness of the structure of the US economy, with its concentration on market exchange based activities. This was followed by a correlation analysis that assessed the relationships between selected dimensions and themes. The results indicated that the RIE framework was able to reflect most of the expected qualitative impacts.

9.4.3 Method Used

This study argued that the most appropriate form in which to present progress is via a non-monetary measure. As mentioned previously, the overriding factor for this decision is the inability of market prices to accurately reflect the real costs and benefits of progress leading to undesirable policy initiatives. Although non-monetary measures of progress are not new, the PQLI and the HDI for instance, the RIE index differs due to its adopted framework.

The present research adopted a comprehensive framework which embraced an interdisciplinary approach integrating conceptually distinct theories, reflective of the complex nature of progress. Given that an index needs to be understandable, a dimension and theme level framework was devised due to its greater ability to convey information.

The RIE index acts as a foundation for an alternative approach to progress measurement and helps embrace a shift in value where natural and social contributions are appropriately recognised.

The weighting technique adopted was public opinion. This was preferred due to its ability to overcome the growing chasm between the concerns of public policy and those of its citizens and thus guaranteeing that societal values were a core foundation of this measure. This also ensured that all dimensions were not treated equally. It was preferred to expert weighting due to its ease of availability and its ability to be systematically monitored. The comprehensive framework approach, combined with non-monetary valuation and the explicit use of public opinion, acts as one of the contributions of the present research.

The Condorcet aggregation approach employed by the study to arrive at a single index summary point is a rarely used aggregation approach. Under the Condorcet approach, weights are never combined with intensity of preferences and thus the degree of compensability connected with the aggregation model is at the minimum possible level. This method reflected the current research's commitment that an increase in economic performance cannot compensate a loss in social cohesion, or a worsening in environmental sustainability.

The result for the single index summary suggested that only a slight variation between the Condorcet and established techniques exist. If the study had employed the distance to leader approach the results would have shown an Australia-Mexico-US (AMU) order for the entire period while the Condorcet differed slightly with a Mexico-Australia-US (MAU) result for 1992 and 1997 (see Section 8.3).

9.5 Critical Reflections and Future Directions for Research

To fulfil the intent of the present research as a foundation for an alternative approach to progress measurement, it is important to reflect critically and suggest future directions for study.

9.5.1 The Study Problem

Given the vast nature of progress, a limitation of the study centred on the ability to precisely measure concepts that contribute or detract from progress. Although the current study justified the inclusion of dimensions such as net brain gain and biodiversity, it is apparent that these dimensions still experience a lack of high quality data. In fact, this could also be said for other dimensions as well. In order to give policymakers an idea of the magnitude of the benefit or loss at the national level, greater work is needed from national and international agencies to ensure consistent data collection occurs within and between countries. A review of ideal variables was undertaken in Section 6.11. Furthermore, given that dimensions such as net brain gain and knowledge renewal are in their infancy, it would seem that the structure and variables selected would need to change over time for it to remain relevant.

Future measures of progress must attempt to overcome the ‘anomalies of progress’ inherent in the concept. Specifically, this deals with determining the ideal value for a country to achieve such as what level of carbon dioxide emissions, or calorie intake, etc. An attempt was made with the RIE index, however given that the majority of indicators possess no clear reference point, the task is a formidable one.[202]

In a general sense, a measure like the RIE index is criticised for incorporating variables which have little in common with each other. Although in isolation the variables provide only a partial picture of progress, this is no different to how rates of change in unitary parts of the consumer price index provide a partial picture of inflation, yet their aggregation is accepted.

Further work needs to be conducted to determine in what manner progress indices are best able to influence policy initiatives. For instance, perhaps the release of a progress measure needs to be accompanied by increased public awareness. This may help in understanding the more subtle aspects of the index. Moreover, although an emerging economy (Mexico) was included in the study, further research is needed to assess the viability of constructing a comprehensive framework approach for underdeveloped nations. Currently, it would be very difficult to apply the RIE index to most developing countries due to problems of data availability, making comparisons between countries difficult.

9.5.2 Methods Used

The construction of a progress index is quite controversial due to issues of data quality, selection of variables and an appropriate weighting allocation scheme. This means that attempts to significantly influence policymakers will not occur until agreement is reached on the choice and design of such measures. These obstacles, although complicated, are not enough to invalidate the use of a progress index.

[202] This was reviewed in Section 6.7 as well as in Natoli and Zuhair (2007).

Additionally, the number of the countries chosen was restricted to a small sample (only 3). Although the reason for this – a desire to demonstrate the application and importance of a broad-based measure such as the RIE has been stated previously. Nevertheless, future work needs to incorporate more countries into the index to test the viability of the measure across a range of nations. Also, future work may want to consider using a longer time period than the 15 observations used in this thesis.

Another future project involves the use of country specific values. Currently, the RIE index employed values obtained from a Canadian survey. What needs to occur is for such surveys to be carried out in the countries chosen for measurement.

Although the use of a composite indicator by this study was justified, composite indicators can be subject to direct manipulation; hence all methodologies need to be subjected to public scrutiny. Thus, future research could compare the results obtained from public opinion with those obtained employing a weighting scheme based on expert judgement. This could be achieved using Delphi techniques. Furthermore, a SA based on expert judgement could assist in determining whether results obtained by public opinion are adequate.

Other alternative assumption tests could also be performed as a basis for comparison and rigour, for instance, a SA using additional or fewer variables to determine an optimal number of variables. Additionally, the removal of variables perceived as being 'value-laden' to assess whether this impacts the final result. And finally, the need for greater consensus building is still required to modify and refine progress indices. This is beginning to occur as witnessed by the OECD World Forum on Statistics, Knowledge and Policy, 'Measuring and Fostering the Progress of Societies' (held in Istanbul, Turkey, June 27-30 2007). Particularly, more research is needed to critically appraise CI methodologies.

9.5.3 Problems Encountered

The major problems encountered during the present research centred on developing the RIE index. The main issue concerned data availability, particularly in the environmental and social context as well as knowledge areas, where there was much variation in the quality and quantity. These shortcomings required the use of proxy data to overcome this. Since the data obtained was not ideal the present research presented a set of ideal variables that international data collection agencies should attempt to develop. This would be beneficial for future progress measures (see Section 6.11). The very nature of an ideal variables section also implies that certain desirable properties of progress could not be captured by the RIE. For instance, despite their acknowledged contribution to society, human endeavours to progress such as philosophical or spiritual were not included due to the difficulty of incorporating them into meaningful policies.

Another problem inherent in comprehensive approaches to measuring progress, and thus the RIE index, lies in the fact that some of the variables may be picking up the same thing. To try and counter this as best as possible, a comprehensive literature review was undertaken to identify the relevant variables.

The other major issues are those that are normally associated with any CI construction. Specifically, it concerned the choice of meaningful weights and aggregation method to assign for the RIE index. Ultimately, it was decided to adopt a participatory technique (public opinion) and a Condorcet aggregation method.

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INDICATORS OF ECONOMIC AND SOCIAL PROGRESS: AN ASSESSMENT AND AN ALTERNATIVE

By

RICCARDO NATOLI

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School of Applied Economics

Faculty of Business and Law

Victoria University

Melbourne, Australia

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INDICATORS OF ECONOMIC AND SOCIAL PROGRESS: AN ASSESSMENT AND AN ALTERNATIVE

VOLUME 2: APPENDICES

LIST OF APPENDICES

These appendices are contained in a separate volume to allow reading the text of the research report with each appendix available for consulting alongside.

VOLUME 2
Appendix A: Variable Profiles for the RIE Index

Variable Profiles for RIE Index

Variable #: 1 **Description:** Life expectancy at birth [Lexp]

Units: Years

Source: OECD (2006b), *OECD Health Data 2006: A Comparative Analysis of 30 Countries* (available online from SourceOECD); additional US data for year 2004 from Euromonitor International (2006), *Global Market Information Database* (available online, derived from WHO estimates) (accessed July 2006).

Logic: The most general and best-known measure of health status for the population.

Methodology: Life expectancy at birth is defined as the average number of years that a person could expect to live if he or she experienced the age-specific mortality rates prevalent in a given country in a given year. This is estimated by the OECD Secretariat for all countries using the unweighted average of life expectancy of men and women. The methodologies between the nations differ. For instance, in Australia the data from 1995 onwards represents 3-year averages, whereas in the US there was a break in the time series due to a change in methodology in 1997, however only small differences resulted from the change (OECD, 2006b).

Variable Profiles for RIE Index

Variable #: 2 **Description:** Infant mortality rate [InfMort]

Units: Per 1,000 live births

Source: OECD (2006b), *OECD Health Data 2006: A Comparative Analysis of 30 Countries* (available online from SourceOECD); additional US data for year 2004 from World Bank (WB) (2006b), *World Development Indicators 2006* (available online, derived from WHO estimates) (accessed July 2006).

Logic: It is an important indicator of the health of both pregnant women and newborns, and is a universal measure of the health dimension.

Methodology: It is the rate of probability of a child born in a specific year dying before the age of one, subject to current age-specific mortality rates. Rates vary among countries due to differences in reporting live births. For example, in the US very premature babies (with relatively low odds of survival) are registered as live births, whereas in Mexico the data presented includes a correction of under reported deaths estimated using the National Population Council data of infant deaths and live births for all the period (OECD, 2006b).

Variable Profiles for RIE Index

Variable #: 3 **Description:** Health-adjusted life expectancy [HALE]

Units: Years

Source: World Health Organization (WHO) (2002), *The World Health Report 2002: Reducing Risks, Promoting Healthy Life* (http://www.who.int/whr/2002/annex/topic/en/annex_4_en.pdf) (accessed July 2006); World Health Organization (WHO) (2004), *The World Health Report 2004: Changing History* (http://www.who.int/whr/2004/annex/topic/en/annex_4_en.pdf) (accessed July 2006).

Logic: While life expectancy may be increasing, this variable helps determine whether those extra years are spent in good health or in longer spells of illness. It serves as a good complement to the life expectancy measure.

Methodology: HALE is based on life expectancy at birth with an adjustment made for time spent in poor health. Time spent in poor health combines condition specific estimates with estimates of prevalence of different health status by age and sex, and weighted using health state valuations. Due to its self-report nature, limitations in international comparability exist. However, the HALE methodology has been peer-reviewed by the Scientific Peer Review Group, and the methodology is now considered well advanced, and technical recommendations, which have been followed for calculation, occur for 2002 results (WHO, 2004).

Variable Profiles for RIE Index

Variable #: 4 **Description:** Physicians [Phys]

Units: Per 1,000 people

Source: OECD (2006b), *OECD Health Data 2006: A Comparative Analysis of 30 Countries* (available online from SourceOECD) (accessed October 2006).

Logic: The number of physicians acts as a guide as to the accessibility of this dimension.

Methodology: The number of physicians, general practitioners and specialists (including self-employed) who are actively practicing medicine in public and private institutions. All three countries have a similar make up of what constitutes a physician, general practitioner and a specialist, although the USA estimation method is via census, while Australia and Mexico is annual (OECD, 2006b).

Variable Profiles for RIE Index

Variable #: 5 **Description:** Annual population growth rate [PopnGwt]

Units: %

Source: World Bank (2006b), *World Development Indicators 2006* (available online, derived from Statistics Division's Population and Vital Statistics Report) (accessed October 2006).

Logic: An important part of progress, as rapid population growth can place strain on a country's capacity for dealing with social, environmental and economic concerns.

Methodology: Population is based on the de facto definition of population, which counts all residents regardless of legal status or citizenship, except for refugees not permanently settled in the country of asylum who are generally considered part of the population of the country of origin (WB, 2006b). Information is collected through recent population censuses and surveys, which are used to calculate or estimate these parameters. Australian figures for 1997 and 1998 were adjusted due to acknowledged WDI data input error (for total population figures for 1997), which affects both 1997 and 1998 in this case (WB, 2006b). In keeping with this, please note that all data needing population input from WDI in the *RIE* index has been adjusted accordingly.

Variable Profiles for RIE Index

Variable #: 6 **Description:** Total fertility rate [FertRat]

Units: Average births per woman (aged 15-49)

Source: World Bank (2006b), *World Development Indicators 2006* (available online, derived from the United Nations Statistics Division's Population and Vital Statistics Report) (accessed November 2006).

Logic: Acts as a complement to annual population growth rates, which can assist in the formation of policies.

Methodology: The average number of children a woman will have, assuming that the current age-specific birth rates remain constant throughout her childbearing years, usually considered ages 15-49 (WB, 2006b). Information is collected through national statistical agencies.

<u>Variable Profiles for RIE Index</u>

Variable #: 7 **Description:** Total calories intake [Calorie]

Units: Calories per capita per day

Source: OECD (2006b), *OECD Health Data 2006: A Comparative Analysis of 30 Countries* (available online from SourceOECD) (accessed November 2006).

Logic: Helps provide a more comprehensive assessment of health and ultimately human resources. It acts as a complement to traditional death status variables.

Methodology: Caloric content is derived by applying the appropriate food composition factors to the quantities of the commodities and shown in million units (FAO, 2006).

<u>Variable Profiles for RIE Index</u>

Variable #: 8 **Description:** Total fat intake [FatCons]

Units: Grammes per capita per day

Source: OECD (2006b), *OECD Health Data 2006: A Comparative Analysis of 30 Countries* (available online from SourceOECD) (accessed November 2006).

Logic: Helps provide a more comprehensive assessment of health and ultimately human resources. It acts as a complement to traditional death status variables.

Methodology: The fat content is derived by applying the appropriate food composition factors to the quantities of the commodities and is expressed in grams. The dietary fat consumption per person is the amount of fat in food, in grams per day, for each individual in the total population (FAO, 2006).

<u>Variable Profiles for RIE Index</u>

Variable #: 9 **Description:** Sugar consumption [SugCons]

Units: Kilos per capita

Source: OECD (2006b), *OECD Health Data 2006: A Comparative Analysis of 30 Countries* (available online from SourceOECD) (accessed November 2006).

Logic: Helps provide a more comprehensive assessment of health and ultimately human resources. It acts as a complement to traditional death status variables.

Methodology: All quantities of sugar in its centrifugal, refined state, expressed in kilograms per capita per year (FAO, 2006).

Variable Profiles for RIE Index

Variable #: 10 **Description:** Average school life expectancy – primary to tertiary [SchLexp]

Units: Years

Source: UNESCO Institute for Statistics (UIS) (2005), *World Education Indicators*, Paris, UNESCO (http://www.uis.unesco.org/ev.php?URL_ID=5263&URL_DO=DO_TOPIC&URL_SECTION=201) (accessed July 2006).

Logic: Provides an analysis of educational attainment, which has long been considered a vital aspect of achieving progress.

Methodology: Number of years a child is expected to remain at school, or university, including years spent on repetition. National governments provide UNESCO with enrolment data based on a series of electronic questionnaires. When data from questionnaires is not available or are of inferior quality UNESCO will often estimate enrolment ratios, as was the case with Australia, Mexico and US (WRI, 2006a). The UIS issued a break in the classification system in 1997, making comparisons between pre-1998 and post-1998 unreliable, limiting the data frequency.

Variable Profiles for RIE Index

Variable #: 11 **Description:** Net enrolment rate –secondary all programmes [NetEnrl]

Units: % corresponding population

Source: UNESCO Institute for Statistics (UIS) (2005), *World Education Indicators*, Paris, UNESCO (http://www.uis.unesco.org/ev.php?URL_ID=5263&URL_DO=DO_TOPIC&URL_SECTION=201) (accessed July 2006).

Logic: The inclusion of net secondary enrolment rate is to complement the average school life expectancy variable, which is best interpreted in the light of a complementary indicator.

Methodology: Number of pupils in the official age group enrolled in secondary – all programmes, expressed as a percentage of the total population in that age group. This ratio is multiplied by 100 to produce the final percentage score. National governments provide UNESCO with enrolment data based on a series of electronic questionnaires. When data from questionnaires is not available or are of inferior quality, UNESCO will often estimate enrolment ratios, as was the case with Australia and Mexico (WRI, 2006a). The UIS issued a break in the classification system in 1997, making comparisons between pre-1998 and post-1998 unreliable, limiting the data frequency.

Variable Profiles for RIE Index

Variable #: 12 **Description:** Public expenditure on education [PbExpEd]

Units: % of GDP

Source: UNESCO Institute for Statistics (UIS) (2005), *World Education Indicators*, Paris, UNESCO (http://www.uis.unesco.org/ev.php?URL_ID=5263&URL_DO=DO_TOPIC&URL_SECTION=201) (accessed July 2006).

Logic: Public expenditure provides an indication of the investment levels a country is committing towards the education system.

Methodology: Public expenditure on education consists of current and capital public expenditure on education plus subsidies to private education at the primary, secondary and tertiary levels (UNESCO, 2005). The UIS issued a break in the classification system in 1997, making comparisons between pre-1998 and post-1998 unreliable, limiting the data frequency.

Variable Profiles for RIE Index

Variable #: 13 **Description:** Tertiary students in science, math and engineering [TSSM&E]

Units: % of all tertiary students

Source: UNESCO Institute for Statistics (UIS) (2005), *World Education Indicators*, Paris, UNESCO (http://www.uis.unesco.org/ev.php?URL_ID=5263&URL_DO=DO_TOPIC&URL_SECTION=201) (accessed July 2006).

Logic: With technological knowledge regarded as a key to creating progress, the focus on science, math and engineering can be seen as a proxy for educational quality.

Methodology: The UIS considers *science* to comprise of: life and physical sciences, mathematics, statistics and computer sciences; whereas *engineering*, *manufacturing* and *construction* involves: engineering and engineering trades, manufacturing and processing, and architecture and building. From here, a simple addition of the UNESCO data of the share of tertiary students enrolled in science courses, and also in engineering, manufacturing and construction courses was conducted (UNESCO, 2005). The UIS issued a break in the classification system in 1997, making comparisons between pre-1998 and post-1998 unreliable, limiting the data frequency.

Variable Profiles for RIE Index

Variable #: 14 **Description:** Pupil/teacher ratio [PupilTc]

Units: Number of students per teacher

Source: UNESCO Institute for Statistics (UIS) (2005), *World Education Indicators*, Paris, UNESCO (http://www.uis.unesco.org/ev.php?URL_ID=5263&URL_DO=DO_TOPIC&URL_SECTION=201) (accessed July 2006); Australian data obtained from Australian Bureau of Statistics (ABS) (2005b), *Australian Social Trends*, Education and Training National Summary Table, cat. no. 4102.0, (available online from Ausstats) (accessed July 2006).

Logic: This indicator is used to measure the level of human resources input in terms of number of teachers in relation to the size of the pupil population, and has traditionally been used as a proxy for educational quality.

Methodology: There occurs a break in the series between 1997 and 1998 due to change from International Standard Classification of Education (ISCED76) to ISCED97, with recent data being provisional. To obtain the data, the total number of pupils enrolled at the specified level of education was divided by the number of teachers at the same level (UNESCO, 2005).

Variable Profiles for RIE Index

Variable #: 15 **Description:** OECD Programme for International Student Assessment – science assessment [PISAsci]

Units: Mean score in science

Source: OECD (2006b), *OECD Health Data 2006: A Comparative Analysis of 30 Countries* (available online from SourceOECD) (accessed July 2006).

Logic: The complexity of the educational quality concept has led the present research to focus on educational outcomes, a learning outcome measure, via an international student assessment. It also acts as a part indicator of educational quality.

Methodology: The data is derived from a three-yearly survey (2000, 2003, etc.) of 15-year-olds in the principal industrialised countries. It is a test format that assesses how far students near the end of compulsory education have acquired some of the knowledge and skills that are essential for full participation in society (OECD, 2005a).

Variable Profiles for RIE Index

Variable #: 16 **Description:** R&D expenditure [R&Dexp]

Units: % of GDP

Source: OECD (2006a), *OECD Factbook 2006: Economic, Environmental and Social Statistics* (available online from SourceOECD, derived from Main Science and Technology Indicators 2005-2 database) (accessed November 2006); World Bank (2006b), *World Development Indicators 2006* (available online, derived from UIS) (accessed November 2006).

Logic: Gross research and development expenditure provides an indication of the expenditure patterns relating to fostering knowledge.

Methodology: The expenditure for research and development consists of current and capital expenditures (both public and private) on creative work undertaken systematically to increase knowledge, including knowledge of humanity, culture and society, and the use of knowledge for new applications. R&D covers basic research, applied research and experimental development. For the US, capital expenditure is not covered and R&D conducted by state and local governments is excluded (OECD, 2006a).

Variable Profiles for RIE Index

Variable #: 17 **Description:** Researchers in R&D [R&Drsrc]

Units: Per thousand in total employment

Source: OECD (2006a), *OECD Factbook 2006: Economic, Environmental and Social Statistics* (available online from SourceOECD, derived from Main Science and Technology Indicators 2005-2 database) (accessed November 2006).

Logic: An indication of the extent of the commitment to fostering knowledge. It acts as a complement to the research expenditure variable.

Methodology: Researchers consist of those working in both civil and military research in government, universities, research institutes as well as in the business sector. For the United States, the total researchers figure for 2000-2002 is an OECD estimate, and data since 1985 excludes military personnel. The data have been compiled on the basis of the methodology of the *Frascati Manual,* but comparability over time is affected to some extent by improvements in the coverage of national R&D surveys and efforts by countries to improve the international comparability of their data (OECD, 2005d).

Variable Profiles for RIE Index

Variable #: 18 **Description:** High-technology exports [HiTechX]

Units: % of manufactured exports

Source: World Bank (2006b), *World Development Indicators 2006* (available online, derived from United Nations, COMTRADE database) (accessed July 2006).

Logic: To see whether a nation is embracing the future by moving towards intellectually intensive products, which act as a gauge of a country's adaptability to the knowledge economy.

Methodology: High-technology exports are products with high R&D intensity, such as in aerospace, computers, pharmaceuticals, scientific instruments and electrical machinery (WB, 2006b). The variable high technology exports was divided by the total manufactured exports then multiplied by 100.

<u>Variable Profiles for RIE Index</u>

Variable #: 19 **Description:** Patents granted by office [Patents]

Units: Per million people (residents and PCT residents)

Source: World Intellectual Property Organisation (2006), *Patents Granted*, (http://www.wipo.int/ipstats/en/statistics/patents/source/granted_national_table.csv) (accessed June 2006).

Logic: This is one of the most common used devices for transferring knowledge. Hence, it acts as an indication of the progress of a nation's research and development.

Methodology: These statistics are based on information provided to World Intellectual Property Organisation by national and regional patent offices via annual statistical questionnaires. Patent granted to residents occurs where the first applicant or assignee is a resident of the relevant state or territory (World Intellectual Property Organisation, 2006). The data was then transformed on a comparable basis (per million people) using population data obtained from WDI.

<u>Variable Profiles for RIE Index</u>

Variable #: 20 **Description:** Local scientific and technical journal articles [Sci&TAr]

Units: Per million people

Source: World Bank (2006b), *World Development Indicators 2006* (available online, derived from National Science Foundation, Science and Engineering Indicators) (accessed July 2006).

Logic: Published journal articles provide an opportunity for everyone to share in knowledge. This enhances knowledge renewal.

Methodology: Scientific and technical journal articles refer to the number of scientific and engineering articles published in the following fields: physics, biology, chemistry, mathematics, clinical medicine, biomedical research, engineering and technology, and earth and space sciences (WB, 2006b). The data was then transformed on a comparable basis (per million people) using population data obtained from WDI.

<u>Variable Profiles for RIE Index</u>

Variable #: 21 **Description:** Net foreign-born persons - tertiary educated [NFBtert]

Units: % of total residents with tertiary attainment

Source: OECD (2006a), *OECD Factbook 2006: Economic, Environmental and Social Statistics* (available online from SourceOECD, derived from OECD International Migration Outlook) (accessed October 2006).

Logic: Given that brain drain can result in progress deterioration, this variable gives an insight to the extent of this occurrence.

Methodology: According to ISCED classification, and using census data, foreign-born tertiary educated persons (immigrants) are subtracted from tertiary educated emigrants to arrive at a net total for the respective nations. The data concerns movement strictly within the OECD area and is collected from national census in 2000, and for Australia 2001. The tertiary attainment reached by the migrant was not necessarily obtained in his/her country of birth and therefore the excess of tertiary level immigrants cannot straightforwardly be interpreted as a gain to the host country (OECD, 2006a).

Variable Profiles for RIE Index

Variable #: 22 **Description:** Highly skilled immigration [HskImm]

Units: % of total highly skilled stock

Source: Dumont, JC & Lemaitre, G (2005), 'Counting Immigrants and Expatriates in OECD Countries: A New Perspective', DELSA/ELSA/WD/SEM(2005)4, OECD Social, Employment and Migration Working Paper No. 25, p. 37.

Logic: This acts as a complement to the net foreign-born persons tertiary educated variable by proving further information on the presence of a possible brain drain.

Methodology: According to ISCED classification, and using census data, the stock of highly skilled immigrants is taken as a percentage of foreign-born tertiary educated as a percentage of total tertiary educated persons - both foreign-born and native-born (Dumont and Lemaitre, 2005).

Variable Profiles for RIE Index

Variable #: 23 **Description:** Net Tertiary Gain [NtTyGn]

Units: % of working aged residents

Source: Docquier, F & Marfouk, A (2005), 'International Migration by Educational Attainment (1990-2000)', World Bank Policy Research Working Paper No. 3382, Tables 5-1 and 5-2.

Logic: Not only does this variable help assess the extent of any possible brain gain; it also provides the present research with a trend analysis over a 10-year time period.

Methodology: Migrants are seen as all working-aged (25 and over) foreign-born individuals living in an OECD country. Skilled migrants are those with at least tertiary educational attainment. Migration is defined on the basis of the country of birth rather than citizenship. The inflow number is subtracted from the outflow to determine the net final figure (Docquier and Marfouk, 2005).

Variable Profiles for RIE Index

Variable #: 24 **Description:** Forest area [FstArea]

Units: % of land area

Source: World Bank (2006b), *World Development Indicators 2006* (available online, derived from Food and Agricultural Organization, Global Forest Resources Assessment) (accessed November 2006).

Logic: A measure of sustainable forestry practice and reflects the comprehensive conception of progress.

Methodology: A forest area is land under natural or planted stands of trees, whether productive or not. Country governments, in surveys distributed by the FAO, report the forest area data. Definitions between nations may vary from year to year, but comparisons can still be made as the FAO attempt to ensure the quality of the data (FAO, 2006).

<u>Variable Profiles for RIE Index</u>

Variable #: 25 **Description:** Agricultural land [AgLand]

Units: % of land area

Source: World Bank (2006b), *World Development Indicators 2006* (available online, derived from Food and Agricultural Organization, Production Yearbook and data files) (accessed November 2006).

Logic: Acts as an indicator of the sustainable environment practices reflecting a comprehensive conception of progress.

Methodology: Agricultural land refers to the share of land area that is arable, under permanent crops and under permanent pastures. Country governments, in surveys distributed by the FAO, report the agricultural land data, with nations possessing different levels of capacity for accurate data collection. Definitions between nations may vary from year to year, but comparisons can still be made as the FAO attempt to ensure the quality of the data (FAO, 2006).

<u>Variable Profiles for RIE Index</u>

Variable #: 26 **Description:** Arable land [ArblLan]

Units: % of land area

Source: World Bank (2006b), *World Development Indicators 2006* (available online, derived from Food and Agricultural Organization, Production Yearbook and data files) (accessed November 2006).

Logic: It complements the agricultural variable by also acting as an indicator of the sustainable environment practices.

Methodology: Arable land includes land defined by the FAO as land under temporary crops (double-cropped areas are counted once), temporary meadows for mowing or for pasture, land under market or kitchen gardens, and land temporarily fallow. Land abandoned as a result of shifting cultivation is excluded. Country governments, in surveys distributed by the FAO, report the arable land data, with nations possessing different levels of capacity for accurate data collection. Definitions between nations may vary from year to year, but comparisons can still be made as the FAO attempt to ensure the quality of the data (FAO, 2006).

<u>Variable Profiles for RIE Index</u>

Variable #: 27 **Description:** Irrigated land [IrrigLn]

Units: % of cropland

Source: World Bank (2006b), *World Development Indicators 2006* (available online, derived from Food and Agricultural Organization, Production Yearbook and data files) (accessed November 2006).

Logic: This variable is seen as vital to increasing agricultural productivity and acts as a gauge for efficient use and sustainable practices.

Methodology: Irrigated land refers to areas purposely provided with water, including land irrigated by controlled flooding. Cropland refers to arable land and permanent cropland. Country governments, in surveys distributed by the FAO, report the irrigated land data, with nations possessing different levels of capacity for accurate data collection. Definitions between nations may vary from year to year, but comparisons can still be made as the FAO attempt to ensure the quality of the data. Data on irrigation are especially difficult to measure. Often, these data are a rough estimate. Users should exercise appropriate caution (FAO, 2006).

Variable Profiles for RIE Index

Variable #: 28 **Description:** Fertilizer consumption per hectare of arable land [FertCon]

Units: 100 grams fertilizer per hectare of arable land

Source: World Bank (2006b), *World Development Indicators 2006* (available online, derived from Food and Agricultural Organization, Production Yearbook and data files) (accessed November 2006).

Logic: Acts as an indicator of the sustainable environment practices, particularly farming techniques. High use of fertilizer can have negative consequences on the soil, water, humans and wildlife.

Methodology: Fertilizer consumption (100 grams per hectare of arable land) measures the quantity of plant nutrients used per unit of arable land. Fertilizer products cover nitrogenous, potash and phosphate fertilizers (including ground rock phosphate). Traditional nutrients, animal and plant manures, are not included. The time reference for fertilizer consumption is the crop year (July through June). Data are collected through the FAO fertilizer questionnaire, with hectares of land determined through self-reporting through governments and FAO estimation methods. Most fertilizer data comes from official government estimates, collected by FAO surveys (FAO, 2006).

Variable Profiles for RIE Index

Variable #: 29 **Description:** Tractor use intensity [TractUs]

Units: Hectares per tractor

Source: World Resources Institute (WRI) (2006b), *Statistical Online Database: Agricultural Inputs* (http://earthtrends.wri.org/searchable_db/index.cfm?theme=8, derived from FAOSTAT database) (accessed October 2006).

Logic: Acts as an indicator of the sustainable environment practices, particularly farming techniques. High tractor intensity use can have negative consequences on the soil, water and wildlife.

Methodology: This variable is calculated by WRIE. A country's total hectares of arable and permanent cropland is divided by the total number of tractors in use. Country governments, through FAO surveys, report data on land use and agricultural machinery. However, many of the values are estimates made by FAO. Individual countries have different methods of data collection, resulting in varying degrees of reliability. Hence, some caution needs to be taken in interpreting these figures, because no distinction is made between types of tractors in terms of size and horsepower (FAO, 2006).

Variable Profiles for RIE Index

Variable #: 30 **Description:** Agricultural production index 1999-2001 = 100 [AgPdnIn]

Units: Per capita index where years 1999 to 2001 are base years with assigned number of 100

Source: World Resources Institute (WRI) (2006b), *Statistical Online Database: Agricultural Inputs* (http://earthtrends.wri.org/searchable_db/index.cfm?theme=8, derived from FAOSTAT database) (accessed October 2006).

Logic: This variable helps assess the sustainable environmental practices of a nation.

Methodology: It includes all crop and livestock products originating in each country. Intermediate agricultural products, including fodder crops, are not counted. However, agricultural production indices are not directly measured; they are derived from a set of formulas and algorithms, limiting its reliability. The total production index represents a price-weighted aggregate of the total volume of agricultural production calculated using the Laspeyres formula divided by population. The calculation therefore contains an unavoidable amount of subjectivity. Reliability is limited by the accuracy and precision of agricultural production and price data. While these data can illustrate rough comparisons and trends over time, rigid score comparisons and rankings are discouraged. The aggregate for a given year is divided by the average aggregate for 1999-2001 to produce the final index (FAO, 2006).

Variable Profiles for RIE Index

Variable #: 31 **Description:** Food production index 1999–2001 = 100 [FdPdnIn]

Units: Per capita index where years 1999 to 2001 are base years with assigned number of 100

Source: World Resources Institute (WRI) (2006b), *Statistical Online Database: Agricultural Inputs* (http://earthtrends.wri.org/searchable_db/index.cfm?theme=8, derived from FAOSTAT database) (accessed October 2006).

Logic: This variable helps assess the efficiency of the agricultural sector, which is an important component of land use for many nations.

Methodology: The food production per capita index covers all edible agricultural products that contain nutrients; coffee and tea are excluded. However, food production is not directly measured but arises from a set of algorithms, which involve subjectivity, limiting its reliability. The food production per capita index represents a price-weighted aggregate of the total volume of food production calculated using the Laspeyres formula divided by population. The calculation therefore contains an unavoidable amount of subjectivity. Reliability is limited by the accuracy and precision of agricultural production and price data. While these data can illustrate rough comparisons and trends over time, rigid score comparisons and rankings are discouraged (FAO, 2006).

Variable Profiles for RIE Index

Variable #: 32 **Description:** GDP per unit of energy use [GDPEgUs]

Units: Constant 2000 PPP US$ per kg of oil equivalent

Source: World Bank (2006b), *World Development Indicators 2006* (available online, derived from International Energy Agency, and World Bank PPP data) (accessed November 2006).

Logic: Assesses the efficiency of the nation in its use of energy. This is an important consideration but does not override the amount of energy employed.

Methodology: The ratio of GDP (in 2000 PPP US$) to commercial energy use, measured in kilograms of oil equivalent. This ratio provides a measure of energy efficiency by showing comparable and consistent estimates of real GDP across countries relative to physical inputs - units of energy use (WB, 2006b).

Variable Profiles for RIE Index

Variable #: 33 **Description:** Renewable energy supply [RbleEgS]

Units: % total primary energy supply

Source: OECD (2006a), *OECD Factbook 2006: Economic, Environmental and Social Statistics* (available online from SourceOECD, derived from OECD Renewable Information) (accessed November 2006).

Logic: The more a country proportionally uses hydroelectric and other renewable energy sources, the less reliant it is on fossil fuels and nuclear energy. Thus, the harm to the environment is reduced.

Methodology: The data refers to the contribution of renewable energy to total primary energy supply. Renewable energy includes the primary energy equivalent of hydro (excluding pumped storage), geothermal, solar, wind, tide and wave. It also includes solid biomass, liquid biomass, biogas, industrial waste and municipal waste. Biomass and waste data are often based on small sample surveys or other incomplete information. Thus, the data gives only a broad impression of developments and are not strictly comparable between countries (OECD, 2006a).

Variable Profiles for RIE Index

Variable #: 34 **Description:** Electric power consumption per capita [ElecCon]

Units: Kilowatt-hours

Source: World Bank (2006b), *World Development Indicators 2006* (available online, derived from International Energy Agency, Energy Statistics and Balances of Non-OECD Countries and Energy Statistics of OECD Countries) (accessed November 2006).

Logic: The higher the reliance on electric power consumption, the less reliant it is on hydroelectric and other renewable energy sources. Thus, the more harm to the environment occurs.

Methodology: Electric power consumption measures the production of power plants and combined heat and power plants less transmission, distribution and transformation losses, and own use by heat and power plants (WB, 2006b). These figures were divided by the population figures – and specifically adjusted for the anomaly with Australia’s 1997 figure.

Variable Profiles for RIE Index

Variable #: 35 **Description:** Freshwater availability [FwaterA]

Units: Thousand cubic metres per capita

Source: Food and Agriculture Organization (FAO) Land and Water Development Division (2005), *FAO’s Information System on Water and Agriculture*, (http://www.fao.org/waicent/faoinfo/agricult/agl/aglw/aquastat/dbase/index.stm.) (accessed September 2006); population data obtained from the World Bank (2006b), *World Development Indicators 2006* (available online, derived from the UNSD's Population and Vital Statistics Report, country statistical offices, and Demographic and Health Surveys from national sources and Macro International) (accessed September 2006).

Logic: The per capita volume of available water resources gauges whether a nation has the ability to fulfil its environmental services and the capacity to sustain the needs of its citizens.

Methodology: Freshwater availability per capita is measured by adding the sum of internal renewable water – which takes into account the surface water produced internally, as well as the overlap) and the sum of external renewable water (water inflows from other countries). Thus water availability minus internal groundwater availability resulted in a total for freshwater availability; hence no double counting is applied. This was then divided with the population totals found in the World Development Indicators, and specifically adjusted for the anomaly with Australia's 1997 figure. Although AQUASTAT attempts to ensure data is comparable, individual countries have different definitions and estimation methods resulting in varying degrees of reliability. Hence, some caution needs to be taken in interpreting these figures (FAO, 2006).

Variable Profiles for RIE Index

Variable #: 36 **Description:** Internal groundwater availability per capita [InGdWtA]

Units: Thousand cubic metres per capita

Source: Food and Agriculture Organization (FAO) Land and Water Development Division (2005), *FAO's Information System on Water and Agriculture* (http://www.fao.org/waicent/faoinfo/agricult/agl/aglw/aquastat/dbase/index.stm.) (accessed September 2006); population data obtained from the World Bank (2006b), *World Development Indicators 2006* (available online, derived from the UNSD's Population and Vital Statistics Report, country statistical offices, and Demographic and Health Surveys from national sources and Macro International) (accessed September 2006).

Logic: Groundwater provides a valuable indication of a country's water resources and its ability to manage its groundwater resources, which is important from an overall environmental and human perspective.

Methodology: The groundwater data was divided by 1000, which was then divided by the population total for the corresponding year. This was then divided with the population totals found in the World Development Indicators, and specifically adjusted for the anomaly with Australia's 1997 figure. This result was multiplied by 1000 so it could be expressed as thousand cubic metres per capita. Although AQUASTAT attempts to ensure data is comparable, individual countries have different definitions and estimation methods resulting in varying degrees of reliability. Hence, some caution needs to be taken in interpreting these figures (FAO, 2006).

Variable Profiles for RIE Index

Variable #: 37 **Description:** Water withdrawal [WtrWdl]

Units: % of internal water resources

Source: Food and Agriculture Organization (FAO) Land and Water Development Division (2005), *FAO's Information System on Water and Agriculture* (http://www.fao.org/waicent/faoinfo/agricult/agl/aglw/aquastat/dbase/index.stm.) (accessed September 2006).

Logic: It helps provide an assessment of the stresses on ecosystem functions.

Methodology: Withdrawals as a percent of internal water resources is calculated by dividing Total Water Withdrawals by Total Internal Renewable Water Resources. Total water withdrawals are the sum of estimated water use by the agricultural, domestic and industrial sectors. Special care has been taken to avoid double counting resources that are common to both surface and groundwater called overlap. AQUASTAT collects its information from a number of sources - national water resources and irrigation master plans; national yearbooks, statistics and reports; reports from FAO; international surveys; and, results from surveys made by national or international research centres. In most cases, the information was analysed to ensure consistency between the different data collected for a given country. While AQUASTAT represents the most complete and careful compilations of water resources statistics to date, individual countries have different methods of data collection, resulting in varying degrees of reliability. Hence, some caution needs to be taken in interpreting these figures (FAO, 2006).

Variable Profiles for RIE Index

Variable #: 38 **Description:** Daily organic water pollutant emissions [OrgWtPt]

Units: Kg per 1,000 people

Source: Euromonitor International (2006), *Global Market Information Database* (available online, derived from the World Bank) (accessed October 2006).

Logic: This has an important impact on the health of the ecosystem as well as human health.

Methodology: Emissions of organic water pollutants are measured by biochemical oxygen demand, which refers to the amount of oxygen that bacteria in water will consume in breaking down waste (Euromonitor International, 2006).

Variable Profiles for RIE Index

Variable #: 39 **Description:** Fish captures [FishCap]

Units: % of world total

Source: Food and Agriculture Organization (FAO) Land and Water Development Division (2005), *FAO's Information System on Water and Agriculture*, (http://faostat.fao.org/faostat/form?collection=Fishery.Primary&Domain=Fishery&servlet=1&hasbulk=0&version=ext&language=EN) (accessed July 2006).

Logic: It provides a vital gauge of marine ecosystems, which if not sustainable can erode biodiversity.

Methodology: The total fish caught for production for individual countries as reported to the FAOSTAT is then divided by the world total. Relying on national agencies reporting means that the data collection and definitions may vary according to countries. Hence, some caution needs to be taken in interpreting these figures (FAO, 2006).

Variable Profiles for RIE Index

Variable #: 40 **Description:** Fish consumption [FishCon]

Units: Per capita kg

Source: OECD (2005b), *OECD Environmental Data Compendium 2004,* Paris.

Logic: It complements the fish captures variable and also provides a vital gauge of marine ecosystems, which if not sustainable can erode biodiversity.

Methodology: Fish consumption is derived from fish production less non-food use plus imports less exports plus stock variations. The data collection and definitions may vary according to countries. Hence, some caution needs to be taken in interpreting these figures (OECD, 2005b).

Variable Profiles for RIE Index

Variable #: 41 **Description:** National Biodiversity Index [NBI]

Units: Score between 0 and 1, where a higher number reflects a higher level of species abundance

Source: United Nations Environment Programme (2001), *Global Biodiversity Outlook*, (http://www.biodiv.org/doc/publications/gbo/gbo-anx-01-en.pdf) (accessed June 2006).

Logic: It provides an assessment of the extent to which biodiversity occurs by measuring the richness of species.

Methodology: The index measures four terrestrial vertebrate classes and vascular plants; vertebrates and plants are ranked equally. The values of the index range between 0, which is the minimum and 1 which is the maximum. The index does allow for an adjustment based on the size of a country (WEF, 2005).

Variable Profiles for RIE Index

Variable #: 42 **Description:** Threatened mammal species as percentage of known mammal species [ThtMamm]

Units: Threatened mammal species as percentage of known mammal species (accessed July 2006).

Source: Baillie, EM, Hilton-Taylor, C & Stuart, SN (eds) (2004), *The 2004 IUCN Red List of Threatened Species*; additional data was located in the 1996, 2000 and 2002 reports.

Logic: An oft-used measure for biodiversity, this variable measures how a nation is faring insofar as maintaining appropriate biodiversity levels.

Methodology: Estimates based on number of threatened mammal species as detailed in the IUCN Red List of Threatened Animals 1996, 2000, 2002 and 2004 reports divided by the total number of known species from the 1996 report. Where possible, standard world checklists have been used in order to promote nomenclatural stability. The compilation of available data derives from a large variety of sources, collected over the last decade. Figures are not necessarily comparable among countries, although mammal numbers are well known (WRI, 2006a)

Variable Profiles for RIE Index

Variable #: 43 **Description:** Threatened bird species as percentage of known bird species [ThtBird]

Units: Threatened bird species as percentage of known bird species (accessed July 2006).

Source: Baillie, EM, Hilton-Taylor, C & Stuart, SN (eds) (2004), *The 2004 IUCN Red List of Threatened Species*; additional data was located in the 1996, 2000 and 2002 reports.

Logic: An oft-used measure for biodiversity, this variable measures how a nation is faring insofar as maintaining appropriate biodiversity levels.

Methodology: Estimates based on number of threatened bird species as detailed in the IUCN Red List of Threatened Animals 1996, 2000, 2002 and 2004 reports divided by the total number of known species from the 1996 report. Where possible, standard world checklists have been used in order to promote nomenclatural stability. The compilation of available data derives from a large variety of sources, collected over the last decade. Figures are not necessarily comparable among countries although in general, bird numbers are well known (WRI, 2006a)

Variable Profiles for RIE Index

Variable #: 44 **Description:** Net domestic credit [NtDmCdt]

Units: Per capita current LCU

Source: World Bank (2006b), *World Development Indicators 2006* (available online, derived from International Monetary Fund, International Financial Statistics and data files) (accessed November 2006).

Logic: Provides an assessment of the availability and allocation of traditional investment funds important for progress.

Methodology: Net domestic credit is the sum of net credit to the non-financial public sector, credit to the private sector and other accounts. Data are in current local currency. The data was then transformed on a comparable basis, per capita, using population data obtained from World Development Indicators, adjusted for Australia in 1997 (WB, 2006b).

Variable Profiles for RIE Index

Variable #: 45 **Description:** Domestic credit provided by banking sector [DmCdtBn]

Units: % GDP

Source: World Bank (2006b), *World Development Indicators 2006* (available online, derived from International Monetary Fund, International Financial Statistics and data files, and World Bank and OECD GDP estimates) (accessed November 2006).

Logic: Provides an assessment of the availability and allocation of traditional investment funds important for progress.

Methodology: Domestic credit provided by the banking sector includes all credit to various sectors on a gross basis, with the exception of credit to the central government, which is net. The banking sector includes monetary authorities and deposit money banks, as well as other banking institutions where data are available (including institutions that do not accept transferable deposits but do incur such liabilities as time and savings deposits). Examples of other banking institutions are savings and mortgage loan institutions and building and loan associations. This series shows net inflows in the reporting economy and is divided by GDP (WB, 2006b).

Variable Profiles for RIE Index

Variable #: 46 **Description:** Net foreign direct investment inflows [FDINInf]

Units: % GDP

Source: World Bank (2006b), *World Development Indicators 2006* (available online, derived from International Monetary Fund, International Financial Statistics and Balance of Payments databases, World Bank, Global Development Finance, and World Bank and OECD GDP estimates) (accessed November 2006).

Logic: Assesses the sum of equity capital, reinvestment of earnings, and other long-term and short-term capital important for progress.

Methodology: Foreign direct investment are the net inflows of investment to acquire a lasting management interest (10 percent or more of voting stock) in an enterprise operating in an economy other than that of the investor. It is the sum of equity capital, reinvestment of earnings, other long-term capital, and short-term capital as shown in the balance of payments. This series shows net inflows in the reporting economy and is divided by GDP (WB, 2006b).

Variable Profiles for RIE Index

Variable #: 47 **Description:** Net lending/Net borrowing [NetLnd]

Units: Per capita US$PPP current prices

Source: OECD (2006d), *OECD Statistics Portal: National Accounts: Disposable income, saving and net lending / borrowing for OECD member countries: Dataset 2: Net lending / net borrowing*, (http://stats.oecd.org/wbos/default.aspx?datasetcode=SNA_TABLE2) (accessed September 2006).

Logic: Assesses the extent to which a country borrows money from overseas, which has the ability to impact on national progress. Here, negative net lending equals net borrowing.

Methodology: Net lending is the balancing item in the capital account and is defined as: net saving plus capital transfers receivable minus capital transfers payable minus the value of acquisitions less disposals of non-financial assets, less consumption of fixed capital (OECD, 2004). The data was then transformed on a comparable basis, per capita, using population data obtained from World Development Indicators, adjusted for 1997 for Australia.

Variable Profiles for RIE Index

Variable #: 48 **Description:** Market capitalisation of listed companies [MktCpt]

Units: % GDP

Source: World Bank (2006b), *World Development Indicators 2006* (available online, derived from Standard & Poor's, Emerging Stock Markets Factbook and supplemental S&P data, and World Bank and OECD GDP estimates) (accessed November 2006).

Logic: An assessment of the quality of funds, that is, whether funds are being utilised in an efficient and suitable manner. This is due to the growing concern of increased paper wealth.
Methodology: Market capitalisation (also known as market value) is the share price times the number of shares outstanding. Listed domestic companies are the domestically incorporated companies listed on the country's stock exchanges at the end of the year. Listed companies do not include investment companies, mutual funds or other collective investment vehicles (WB, 2006b).

Variable Profiles for RIE Index

Variable #: 49 **Description:** Stocks traded – total value [StksTd]

Units: % GDP

Source: World Bank (2006b), *World Development Indicators 2006* (available online, derived from Standard & Poor's, Emerging Stock Markets Factbook and supplemental S&P data, and World Bank and OECD GDP estimates) (accessed November 2006).

Logic: This complements the market capitalisation variable by measuring whether any excessive share market activity has occurred, or whether funds are being utilised in an efficient and suitable manner. This is due to the growing concern of increased paper wealth

Methodology: Stocks traded refers to the total value of shares traded during the period (WB, 2006b).

Variable Profiles for RIE Index

Variable #: 50 **Description:** Real interest rate [Real_IR]

Units: %

Source: World Bank (2006b), *World Development Indicators 2006* (available online, derived from International Monetary Fund, International Financial Statistics and data files using World Bank data on the GDP deflator) (accessed November 2006).

Logic: This represents a one of the major costs of borrowing money. Hence, one can gauge the extent of impediments to members in accessing funds.

Methodology: Real interest rate is the lending interest rate adjusted for inflation as measured by the GDP deflator (WB, 2006b).

Variable Profiles for RIE Index

Variable #: 51 **Description:** Real effective annual exchange rate (2000 = 100) [RealXRt]

Units: Index with 2000 as base year with assigned value of 100

Source: dxEconData (derived from OECD Main Economic Indicators) (accessed November 2006).

Logic: This complements interest rates by also acting as a summary for the costs of borrowing money. Hence, one can gauge the extent of impediments to members in accessing funds.

Methodology: The calculation of real effective exchange rates uses a system of weights based on a double-weighting principle which, for each country, takes into account relative market shares held by its competitors on the common markets, including the home market, as well as the importance of these markets for the country in question. The real effective exchange rate index is a chain-linked index with base period 2000. Percentage changes in the index are calculated by comparing the change in the index based on consumer prices for the country concerned (expressed in US dollars at market exchange rates) to a weighted average of changes in its competitors' indices (also expressed in US dollars), using the weighting matrix of the current year. The indices of real effective exchange rates are then calculated from a starting period by cumulating percentage changes. This gives a set of real effective exchange rates based on moving weights (OECD, 2004).

Variable Profiles for RIE Index

Variable #: 52 **Description:** Machinery and transport equipment [M&Teqp]

Units: % of value added in manufacturing

Source: World Bank (2006b), *World Development Indicators 2006* (available online, derived from United Nations Industrial Development Organization, International Yearbook of Industrial Statistics) (accessed November 2006).

Logic: Assesses the efficiency of machinery (proxy for physical capital), which helps determine the sustainability of the practice of ‘adding value’. This is seen as an important construct of progress.

Methodology: Value added in manufacturing is the sum of gross output less the value of intermediate inputs used in production for industries classified in ISIC major division 3. Machinery and transport equipment comprise ISIC groups 382-84 (WB, 2006b).

Variable Profiles for RIE Index

Variable #: 53 **Description:** Gross fixed capital formation – machinery and equipment [GFCF_Mc]

Units: % GDP

Source: OECD (2006a), *OECD Factbook 2006: Economic, Environmental and Social Statistics* (available online from SourceOECD) (accessed November 2006).

Logic: Investment in machinery and equipment provides a solid base for national progress.

Methodology: Gross fixed capital formation (formerly gross domestic fixed investment) includes plant, machinery, and equipment purchases. According to the 1993 SNA, net acquisitions of valuables are also considered capital formation (WB, 2006b).

Variable Profiles for RIE Index

Variable #: 54 **Description:** Telephone mainlines [TphnMai]

Units: Per 1,000 people

Source: World Bank (2006b), *World Development Indicators 2006* (available online, derived from International Telecommunication Union, World Telecommunication Development Report and database, and World Bank estimates) (accessed November 2006).

Logic: Given the importance of knowledge to progress, appropriate infrastructure is required to sustain and externalise output and facilitate higher levels of national progress.

Methodology: Telecommunication data are supplied by annual questionnaires sent to telecommunication authorities and operating companies. These data are supplemented by annual reports and statistical yearbooks of telecommunication ministries, regulators, operators and industry associations. ITU divides their main telephone line data by population data and multiplies this quotient by 100 to calculate main telephone lines per 100 people. The WDI then multiplies this by 10 to determine main telephone lines per 1,000 people (ITU, 2005). The data was adjusted for 1997 for Australia and is considered fairly reliable and complete.

Variable Profiles for RIE Index

Variable #: 55 **Description:** Personal computers [PCs]

Units: Per 1,000 people

Source: World Bank (2006b), *World Development Indicators 2006* (available online, derived from International Telecommunication Union, World Telecommunication Development Report and database, and World Bank estimates) (accessed November 2006).

Logic: Given the importance of knowledge to progress, appropriate equipment is required to sustain and externalise output and facilitate higher levels of national progress.

Methodology: Obtaining data on personal computers is difficult; data collected are supplemented by sales and import figures, adjusted to take into account the average life of a computer. Sales and import figures are misleading because of re-shipment, re-assembly and evasion. Thus, cross-country comparisons need to be made with caution (ITU, 2005). The data was adjusted for 1997 for Australia and is the most complete dataset available.

Variable Profiles for RIE Index

Variable #: 56 **Description:** Radio receivers [Radios]

Units: Per 1,000 people

Source: World Resources Institute (WRI) (2006c), *Statistical Online Database: Access to Information* (http://earthtrends.wri.org/searchable_db/index.php?theme=4) (accessed July 2006).

Logic: Given the importance of knowledge to progress, appropriate equipment is required to sustain and externalise output and increase knowledge renewal.

Methodology: ITU relies heavily on UIS for estimates on number of radios. Calculations are made via the following: the number of radios per 1,000 people by dividing the total number of radios by the total population of a given country for a specific year; this quotient is multiplied by 1,000 (WRI, 2006a). The data was adjusted for 1997 for Australia. Although the methodology is defensible, the data is a very rough approximation hence only general trends can be illustrated.

Variable Profiles for RIE Index

Variable #: 57 **Description:** Televisions sets [TVsets]

Units: % per 1,000 people

Source: World Resources Institute (WRI) (2006c), *Statistical Online Database: Access to Information* (http://earthtrends.wri.org/searchable_db/index.php?theme=4) (accessed July 2006).

Logic: Given the importance of knowledge to progress, appropriate equipment is required to sustain and externalise output and increase knowledge renewal.

Methodology: ITU relies heavily on UIS for estimates on number of television receivers. Calculations are made via the following: the number of television receivers per 1,000 people by dividing the total number of television receivers by the total population of a given country for a specific year; this quotient is multiplied by 1,000 (WRI, 2006a). The data was adjusted for 1997 for Australia. Although the methodology is defensible, the data is a very rough approximation; hence only general trends can be illustrated.

Variable Profiles for RIE Index

Variable #: 58 **Description:** Daily newspapers [Newspap]

Units: Per 1,000 people

Source: World Bank (2006b), *World Development Indicators 2006* (available online, derived from UIS) (accessed November 2006); additional data located in the United Nations Statistical Division (UNSD) (2005) *Statistical Yearbook*, editions 43, 44, and 49.

Logic: Given the importance of knowledge to progress, the circulation of newspapers plays an important part in increasing knowledge renewal.

Methodology: Daily newspapers are periodic publications, issued at least four times a week, intended for the general public and mainly designed to be a primary source of written information on current events connected with public affairs, international questions, politics, etc. It is calculated as average circulation, or copies printed, per 1,000 people. Circulation comprises the average number of copies sold directly, by subscription, and mainly distributed free of charge both in the country and abroad (WRI, 2006a). The data was adjusted for 1997 for Australia.

Variable Profiles for RIE Index

Variable #: 59 **Description:** ICT expenditure [ICT_exp]

Units: % of GDP

Source: World Bank (2006b), *World Development Indicators 2006* (available online, derived from World Information Technology and Services Alliance, Digital Planet 2004: The Global Information Economy, and Global Insight, Inc) (accessed November 2006).

Logic: Given the importance of knowledge to progress and the emerging nature of this theme, appropriate investment is required to sustain and externalise output and facilitate higher levels of national progress.

Methodology: Information and communications technology expenditures include computer hardware; computer software; computer services; communications services, and wired and wireless communications equipment. Data availability of ICT investment varies with regards to the measurement of investment in software, the methods of deflation, the breakdown by institutional sector and the length of time series. The United States is among the few countries that produce estimates of expenditure on the three separate software components; other countries usually provide estimates for some software components only (WB, 2006b).

Variable Profiles for RIE Index

Variable #: 60 **Description:** Air transport freight [AirTptFt]

Units: Million tons per km

Source: World Bank (2006b), *World Development Indicators 2006* (available online, derived from International Civil Aviation Organization, Civil Aviation Statistics of the World and ICAO staff estimates) (accessed November 2006).

Logic: The efficient movement of goods is vitally important to material progress as it facilitates international trade, reduces environmental damage and is less of a burden on public finances.

Methodology: Airfreight is the volume of freight, express and diplomatic bags carried on each flight stage (operation of an aircraft from takeoff to its next landing), measured in metric tons times kilometres travelled (WB, 2006b).

Variable Profiles for RIE Index

Variable #: 61 **Description:** Air transport passengers carried [Air_Pas]

Units: Per million people

Source: World Bank (2006b), *World Development Indicators 2006* (available online, derived from International Civil Aviation Organization, Civil Aviation Statistics of the World and ICAO staff estimates) (accessed November 2006).

Logic: The movement of passengers is important to national progress as it enables people access to and from employment, crucial health services, etc. Furthermore, poor planning and efficiency can damage the environment.

Methodology: Air passengers carried include both domestic and international aircraft passengers of air carriers registered in the country (WB, 2006b). The data was then transformed on a comparable basis (per million people) using population data obtained from World Development Indicators and adjusted for Australia for 1997.

Variable Profiles for RIE Index

Variable #: 62 **Description:** Container port traffic [ConPtTf]

Units: TEU: Twenty-foot equivalent units per million people

Source: World Bank (2006b), *World Development Indicators 2006* (available online, derived from Containerisation International, Containerisation International Yearbook) (accessed November 2006).

Logic: The efficient movement of goods is vitally important to national progress as it facilitates international trade, reduces environmental damage and is less of a burden on public finances.

Methodology: Port container traffic measures the flow of containers from land to sea transport modes, and vice versa, in twenty-foot equivalent units (TEUs), a standard-size container. Data refer to coastal shipping as well as international journeys. Transhipment traffic is counted as two lifts at the intermediate port (once to off-load and again as an outbound lift) and includes empty units (WB, 2006b). The data was then transformed on a comparable basis (per million people) using population data obtained from World Development Indicators adjusted in 1997 for Australia.

Variable Profiles for RIE Index

Variable #: 63 **Description:** Railways and roads goods transported [RaRdGd]

Units: Million ton per km

Source: World Bank (2006b), *World Development Indicators 2006* (available online, derived from World Bank, Transportation, Water, and Urban Development Department, Transport Division) (accessed November 2006).

Logic: The efficient movement of goods is vitally important to national progress as it facilitates international trade, reduces environmental damage and is less of a burden on public finances.

Methodology: Goods transported data is compiled from official sources within national statistics offices and national road administrations (WB, 2006b). When observations for the two variables coincided the individual totals were joined. For Australia, the road goods variable only occurs once, so was treated as being uniform then added to the observed values of railway goods.

Variable Profiles for RIE Index

Variable #: 64 **Description:** Railways passengers carried [RailPas]

Units: Million passengers per km

Source: World Bank (2006b), *World Development Indicators 2006* (available online, derived from World Bank, Transportation, Water, and Urban Development Department, Transport Division) (accessed November 2006).

Logic: The movement passengers is important to national progress as it enables people access, whether it is to and from employment, crucial health services, etc. Inadequacy or inefficiency in this variable can make the poor worse off and damage the environment.

Methodology: Passengers carried by railway are the number of passengers transported by rail times kilometres travelled. Railway passenger data is compiled from official sources within national statistics offices and national railway administrations (WB, 2006b).

Variable Profiles for RIE Index

Variable #: 65 **Description:** Roads, goods vehicles in use [RdVhcl]

Units: Per 1,000 people
.
Source: OECD (2005b), *OECD Environmental Data Compendium 2004*, Table 2C, p. 229.

Logic: The efficient movement of goods is vitally important to national progress as it enables goods to be transported, which in turn, facilitates trade. However, this needs to be balanced against potential environmental damage.

Methodology: The data refers to vans, lorries (trucks) and road tractors. They do not include caravans, trailers and semi-trailers, military or special vehicles, or agricultural tractors (OECD, 2005b). It is based on data compiled from official sources within national statistics offices and national road administrations. The data was then transformed on a comparable basis (per thousand people) using population data obtained from World Development Indicators.

Variable Profiles for RIE Index

Variable #: 66 **Description:** Sulphur oxide emissions [SulphOx]

Units: Kilograms per capita

Source: OECD (2006b), *OECD Health Data 2006: A Comparative Analysis of 30 Countries* (available online from SourceOECD, derived from OECD Environmental Data, Compendium 2004, Environment Directorate, OECD, Paris) (accessed November 2006).

Logic: Emissions of sulphur oxide contribute to climate deterioration, aquatic and ecosystem externalities as well as negatively affecting human health.

Methodology: The figures refer to the major categories of emission sources for these pollutants: mobile sources (motor vehicles, etc.), and stationary sources, which include power stations, fuel combustion (industrial, domestic, etc.); industrial processes (pollutants emitted in manufacturing); and miscellaneous sources such as waste incineration, agricultural burning, etc. Please note that the definitions of sources and measurement methods may differ from country to country, although comparisons can still be made (OECD, 2006b).

Variable Profiles for RIE Index

Variable #: 67 **Description:** Nitrogen oxide emissions [NitOx]

Units: Kilograms per capita

Source: OECD (2006b), *OECD Health Data 2006: A Comparative Analysis of 30 Countries* (available online from SourceOECD, derived from OECD Environmental Data, Compendium 2004, Environment Directorate, OECD, Paris) (accessed November 2006).

Logic: Emissions of nitrogen oxide play an important role in the production of, and contribution to, smog and acid precipitation. This can negatively affect human health and the environment.

Methodology: The figures refer to the major categories of emission sources for these pollutants: mobile sources (motor vehicles, etc.), and stationary sources, which include power stations, fuel combustion (industrial, domestic, etc.); industrial processes (pollutants emitted in manufacturing); and miscellaneous sources such as waste incineration, agricultural burning, etc. Please note that the definitions of sources and measurement methods may differ from country to country, although comparisons can still be made (OECD, 2006b).

Variable Profiles for RIE Index

Variable #: 68 **Description:** Carbon monoxide emissions [CarbMon]

Units: Kilograms per capita

Source: OECD (2006b), *OECD Health Data 2006: A Comparative Analysis of 30 Countries* (available online from SourceOECD, derived from OECD Environmental Data, Compendium 2004, Environment Directorate, OECD, Paris) (accessed November 2006).

Logic: Emissions of carbon monoxide interfere with the absorption of oxygen by red blood cells, thus having the potential to adversely affect human health.

Methodology: The figures refer to the major categories of emission sources for these pollutants: mobile sources (motor vehicles, etc.), and stationary sources, which include power stations, fuel combustion (industrial, domestic, etc.); industrial processes (pollutants emitted in manufacturing); and miscellaneous sources such as waste incineration, agricultural burning, etc. Please note that the definitions of sources and measurement methods may differ from country to country, although comparisons can still be made (OECD, 2006b).

Variable Profiles for RIE Index

Variable #: 69 **Description:** Carbon dioxide emissions [CbDxEm]

Units: Metric tons of carbon dioxide per capita

Source: Energy Information Administration (EIA) (2006), *International Energy Annual 2005*, Table H.1 cco2 World Per Capita Carbon Dioxide Emissions from the Consumption and Flaring of Fossil Fuels, 1980-2004 (metric tons of carbon dioxide).
(http://www.eia.doe.gov/pub/international/iealf/tableh1cco2.xls) (accessed August 2006).

Logic: Emissions of carbon dioxide contribute to climate deterioration. This negatively affects both the ecosystem and human health.

Methodology: The data represents the per capita carbon dioxide emissions resulting from the consumption and flaring of fossil fuels. Obtained from the IEA, emissions are in line with the methods outlined in the *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*. The IEA has created estimates from energy statistics that are based on well-established and institutionalised accounting methodologies and undergo thorough review and adjustments (WRI, 2006a).

Variable Profiles for RIE Index

Variable #: 70 **Description:** Carbon dioxide emissions [CbDxTEm]

Units: % share of world total

Source: Energy Information Administration (EIA) (2006), *International Energy Annual 2005*, Table H.1 cco2 World Carbon Dioxide Emissions from the Consumption and Flaring of Fossil Fuels, 1980-2004 (million metric tons of carbon dioxide). (http://www.eia.doe.gov/pub/international/iealf/tableh1co2.xls) (accessed August 2006).

Logic: Given the global impact of climate deterioration due to carbon dioxide emissions, and the fact the emissions cross boundaries, the above variable is designed to assess which nations contribute most to this negative factor affecting progress.

Methodology: The data pertaining to the nations annual million metric tons of carbon dioxide emissions from the consumption and flaring of fossil fuels was divided by the annual world total, to obtain a share of the world total. Obtained from the IEA, emissions are in line with the methods outlined in the *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*. The IEA has created estimates from energy statistics that are based on well-established and institutionalised accounting methodologies and undergo thorough review and adjustments (WRI, 2006a).

Variable Profiles for RIE Index

Variable #: 71 **Description:** Ecological Footprint [EcoFPt]

Units: Hectares of biologically productive land required per capita

Source: 2003 data from World Wildlife Fund (WWF) (2006), *Living Planet Report 2006*; 2002 data from Global Footprint Network (2005), *National Footprint and Biocapacity Accounts;* 2001 data from World Wildlife Fund (WWF) (2004), *Living Planet Report 2004*; 2000 data from Venetoulis, J, Chazan, D & Gaudet, C (2004), *Ecological Footprint of Nations 2004*; 1999 data from World Wildlife Fund (WWF) (2002), *Living Planet Report 2002*.

Logic: This variable measures the biologically productive land that is required to sustain a country’s population at current consumption levels. If rates are high then a nation is consuming at unsustainable levels which are detrimental to progress.

Methodology: Due to changes in the methodology over time used to calculate the ecological footprint of nations, the results from previous reports cannot be directly compared. However, the methodology has improved greatly over the years and general trends can be established (WEF, 2005).

Variable Profiles for RIE Index

Variable #: 72 **Description:** Final consumption expenditure [FnCnExp]

Units: % gross national disposable income

Source: OECD (2006d), *OECD Statistics Portal: National Accounts: Disposable income, saving and net lending / borrowing for OECD member countries: Dataset 2: Net lending / net borrowing,* (http://stats.oecd.org/wbos/default.aspx?datasetcode=SNA_TABLE2) (accessed September 2006).

Logic: Consumption has for many years, and over many studies, been considered vital to progress. This variable provides an indication of that and complements the other two variables in the conspicuous consumption dimension.

Methodology: We take the final consumption expenditure figure, which consists of goods and services used up by individual households or the community to satisfy their individual or collective needs or wants, and divide it by the gross national disposable income figure. This is derived by adding all current transfers in cash or in kind receivable by resident institutional units and subtracting all current transfers in cash or in kind payable by resident institutional units to non-resident units (OECD, 2004).

Variable Profiles for RIE Index

Variable #: 73 **Description:** Defensive expenditures [DefExp]

Units: US$ million per 1,000 people

Source: Consumption of fixed capital: OECD (2006d), *OECD Statistics Portal: National Accounts: Disposable income, saving and net lending / borrowing for OECD member countries: Dataset 2: Net lending / net borrowing*, (http://stats.oecd.org/wbos/default.aspx?datasetcode=SNA_TABLE2) (accessed October 2006). **Total health expenditure**: OECD (2006b), *OECD Health Data 2006: A Comparative Analysis of 30 Countries* (available online from SourceOECD) (accessed October 2006). **Total gross premiums**: OECD (2006a), *OECD Factbook 2006: Economic, Environmental and Social Statistics* (available online from SourceOECD, derived from SourceOECD Insurance Statistics: Comparative Insurance Data Vol 2003 release 01) (accessed October 2006). **Government expenditure on defence and Government expenditure on social security and welfare**: Euromonitor International (2006), *Global Market Information Database* (available online, derived from International Monetary Fund, Government Finance Statistics/ national statistics historic) (accessed October 2006).

Logic: Acting as a counter balance to final consumption expenditure, not all consumption increases national welfare, in fact some consumption merely restores or compensates for decreases in national wellbeing. This is a reflection of that stance.

Methodology: Defensive expenditures involve outlays that are normally a response to the deterioration in national wellbeing, rather than increasing net levels of it (Hamilton, 1998). Initially, four areas were chosen: health, defence, insurance, and social security and welfare. Unlike studies such as the GPI, this research has not included post-secondary education as a part of its defensive expenditures, rather treating the entire education area as an investment in human resources. Additionally, given that one could argue that defensive expenditures occur throughout the economy, the component consumption of fixed capital (depreciation) from the national accounts has been included to represent that. To what extent one chooses the percentage figure to deduct to arrive at a defensive expenditure figure is open to debate, arbitrary even; however the present research adopts a similar strategy as the GPI. The main difference is that since depreciation is explicitly incorporated our deductions are slightly less in the areas of health and defence. The entire amount of the components, consumption of fixed capital, total gross premiums, and social security and welfare were deducted. Government expenditure on defence was considered to comprise 80 per cent defensive expenditure, while total health expenditures were 40 per cent.

Variable Profiles for RIE Index

Variable #: 74 **Description:** Roads, paved [RoadPvd]

Units: % total roads

Source: World Bank (2006b), *World Development Indicators 2006* (available online, derived from International Road Federation, World Road Statistics) (accessed November 2006).

Logic: This facilitates human activity and access to and from work, and is generally seen as influencing general wellbeing.

Methodology: Paved roads are those surfaced with crushed stone (macadam) and hydrocarbon binder or bituminised agents, with concrete, or with cobblestones, as a percentage of all the country's roads, measured in length (WB, 2006b).

Variable Profiles for RIE Index

Variable #: 75 **Description:** Gross fixed capital formation [GFCF]

Units: % GDP

Source: World Bank (2006b), *World Development Indicators 2006* (available online, derived from World Bank national accounts data, and OECD National Accounts data files) (accessed November 2006).

Logic: Areas such as schools, hospitals and general land improvements is acknowledged as influencing quality of life.

Methodology: Gross fixed capital formation (formerly gross domestic fixed investment) includes land improvements (fences, ditches, drains, and so on); and the construction of roads, railways, and the like, including schools, offices, hospitals, private residential dwellings, and commercial and industrial buildings. According to the 1993 SNA, net acquisitions of valuables are also considered capital formation (WB, 2006b). The WDI figure was subtracted from the OECD plant and machinery figure for Gross fixed capital formation – machinery and equipment.

Variable Profiles for RIE Index

Variable #: 76 **Description:** Average number of occupants [AvNoOcc]

Units: Per household

Source: Euromonitor International (2006), *Global Market Information Database* (available online, derived from UN National Statistics) (accessed October 2006).

Logic: Although subject to cultural interpretation, the view was taken that fewer numbers is indicative of higher levels of progress, making lower numbers reflective of desire rather than choice.

Methodology: Includes those who live in the same address and who share common catering facilities, thus not necessarily defined by blood or marriage. For instance, it includes resident domestic servants. This was obtained through census information (Euromonitor International, 2006).

Variable Profiles for RIE Index

Variable #: 77 **Description:** Housing stock [HseStck]
Units: Per capita

Source: Euromonitor International (2006), *Global Market Information Database* (available online, derived from National Statistics) (accessed October 2006).

Logic: Housing is seen as an essential pre-requisite to wellbeing. It also comprises part of the Millennium Indicator Goals.

Methodology: Refers to stock of permanent dwellings, which is a self-contained unit of accommodation. This was obtained through census information (Euromonitor International, 2006).

Variable Profiles for RIE Index

Variable #: 78 **Description:** Population with sustainable access to affordable essential drugs [PopAcDg]

Units: % of population

Source: United Nations Development Programme (UNDP) (2005), *Human Development Report 2005: International Cooperation at the Crossroads,* Oxford University Press, New York.

Logic: It acts as a gauge as to whether a nation is meeting the basic needs of its population.

Methodology: The data is based on statistical estimates received from the WHO, and represent the best available information available to them. In their analysis, the WHO employ four segments to their data. They are: very low access = 0 to 49%, low access = 50 to 79%, medium access = 80 to 94%, and good access = 95 to 100%. The data comes from a wide variety of sources of varying quality, with some countries having numerous sources of data, while others few. Thus, comparisons between countries should be made with care (WRI, 2006a). Furthermore, the data for essential drugs was transformed from a percentage range (interval estimate) to a single data point (point estimate), by taking the mean.

Variable Profiles for RIE Index

Variable #: 79 **Description:** Population with sustainable access to improved water source [PopAcWt]

Units: % of population

Source: World Bank (2006b), *World Development Indicators 2006* (available online, derived from the WHO and UNICEF, *Meeting the MDG Drinking Water and Sanitation Target: A Mid-Term Assessment of Progress*) (accessed December 2006).

Logic: It acts as a gauge as to whether a nation is meeting the basic needs of its population.

Methodology: Calculated as the percentage of the population with reasonable access to an adequate amount of water from an improved source, such as a household connection, public standpipe, borehole, protected well or spring, and rainwater collection. Unimproved water source includes vendors, tanker trucks, and unprotected wells and springs. Reasonable access is defined as the availability of at least 20 litres a person a day from a source within one kilometre of the dwelling. The data is collected by household surveys and assessment questionnaires, which complements the survey data. The data comes from a wide variety of sources of varying quality, with some countries having numerous sources of data, while others few. Thus, comparisons between countries should be made with care (WRI, 2006a).

Variable Profiles for RIE Index

Variable #: 80 **Description:** Population with sustainable access to improved sanitation facilities [PopAcSn]

Units: % of population

Source: World Bank (2006b), *World Development Indicators 2006* (available online, derived from the WHO and UNICEF, *Meeting the MDG Drinking Water and Sanitation Target: A Mid-Term Assessment of Progress*) (accessed December 2006).

Logic: It acts as a gauge as to whether a nation is meeting the basic needs of its population.

Methodology: Calculated as the percentage of the population with at least adequate access to excreta disposal facilities that can effectively prevent human, animal and insect contact with excreta. Improved facilities range from simple but protected pit latrines to flush toilets with a sewerage connection. To be effective, facilities must be correctly constructed and properly maintained. The data is collected by household surveys and assessment questionnaires, which complements the survey data. The data comes from a wide variety of sources of varying quality, with some countries having numerous sources of data, while others few. Thus, comparisons between countries should be made with care (WRI, 2006a).

Variable Profiles for RIE Index

Variable #: 81 **Description:** Group membership [GpMemb]

Units: Average groups respondent belong to

Source: OECD (2005a), *Society at a Glance: OECD Social Indicators 2005,* derived from World Values Survey. Australian Institute of Family Studies (2001) *The Families, Social Capital and Citizenship Project,* undertook additional data for Australia in 2000/2001, [2001 in RIE index].

Logic: One of a range of indicators used to assess the extent of social cohesion within a nation, which comprises an important part of progress.

Methodology: A survey was conducted asking respondents the amount of groups to which they belonged. An average figure was derived from the respondents. Data from the 1990-1991 wave is located in 1991. Data from the 1995-1996 wave is located in 1996, and data from the 1999-2002 wave is located in 2002 (OECD, 2005a).

Variable Profiles for RIE Index

Variable #: 82 **Description:** Life satisfaction ages 18+ [LifeSat]

Units: Mean score (0 = dissatisfied to 10 = satisfied)

Source: Veenhoven, R (2005), *World Database of Happiness, Distributional Findings in Nations,* Erasmus University Rotterdam (www.worlddatabaseofhappiness.eur.nl) (revised October 2005; accessed August 2006). Additional Australian data was obtained from Household, Income and Labour Dynamics (HILDA) in Australia via Leigh, A & Wolfers, J (2006), ‘Happiness and the Human Development Index: Australia Is Not a Paradox’, *The Australian Economic Review*, vol. 39, no. 2, p. 184.

Logic: A prominent variable in subjective measures of wellbeing studies. It provides an individual perspective on how life is progressing.

Methodology: The question asks, 'All things considered, how satisfied are you with your life as a whole these days?' Rankings are from 1 dissatisfied to 10 satisfied (Veenhoven, 2005). The World Values Survey also converts this data to a 0-10 scale, which is what is used in this index.

<u>Variable Profiles for RIE Index</u>

Variable #: 83 **Description:** Household work hours [HholdWk]

Units: Hours per person (15+) per week

Source: Australian Bureau of Statistics (ABS) (1993), *How Australians Use Their Time*, cat. no. 4153.0; ABS (1997), *Unpaid Work and the Australian Economy*, cat. no. 5240.0; National Institute of Statistics (NIS) 1997, *National Survey of Work, Allocation and Time Use 1996*, Geography and Informatics of Mexico, Mexico; NIS (2003), *National Survey of Work, Allocation and Time Use 2002*, Geography and Informatics of Mexico, Mexico; Bureau of Labor Statistics 2005, *American Time Use Survey*, Bureau of Labor Statistics, Washington, DC.

Logic: Unpaid household work has always made a large contribution to human welfare, hence its inclusion in RIE index.

Methodology: Obtained from time-use survey data. It incorporates daily household activities performed by each person in the survey; it includes meal preparation, cleaning and laundry, shopping, childcare, gardening, repairs and maintenance, voluntary community work, and other domestic work (Bureau of Labor Statistics, 2005). For Australia, a figure for total hours worked is achieved and then divided by the population aged 15 and above, adjusted for 1997. The US provides a ready-made figure for ages 15+, while for Mexico, their time use survey provides figures per hour for ages 8 and above, but is used to proxy ages 15+. The remaining observations are imputed as a percentage of the 15+ aged population figure that occurs with the observed original data.

<u>Variable Profiles for RIE Index</u>

Variable #: 84 **Description:** GNI per capita PPP [GNI_PPP]

Units: Current international $

Source: World Bank (2006b), *World Development Indicators 2006* (available online).

Logic: Along with consumption, income has long been seen as vital to achieving higher levels of progress.

Methodology: GNI per capita based on PPP. Purchasing power parity GNI is gross national income (GNI) converted to international dollars using purchasing power parity rates. An international dollar has the same purchasing power over GNI as a US dollar has in the United States. GNI is the sum of value added by all resident producers plus any product taxes (less subsidies) not included in the valuation of output plus net receipts of primary income (compensation of employees and property income) from abroad. Data are in current international dollars (WB, 2006b).

<u>Variable Profiles for RIE Index</u>

Variable #: 85 **Description:** Income inequality measure [GINI]

Units: Gini coefficient

Source: Luxembourg Income Study (2005), *Income Inequality Measures*, (http://www.listproject.org/KEYFIGURES/ineqtable.htm) (accessed July 2006); additional Australian data from ABS (2005), *Household Income and Income Distribution 2003-04,* cat. no. 6253.0, Table 1: Equivalised Disposable Household Income.

Logic: Indicates the extent to which income is fairly distributed throughout society which can assist in exposing hidden inequalities that exist.

Methodology: The data presented for this variable are for disposable income (the Luxembourg Income Study aggregate income variable DPI). All surveyed households and their members are included in the estimates of Gini coefficient. All missing values and zero income are excluded. Results may not always be fully comparable as for some countries; datasets may be based on different surveys (Luxembourg Income Study, 2005).

Variable Profiles for RIE Index

Variable #: 86 **Description:** Youth unemployment rate [YthUnpt]

Units: % labour force ages 15-24

Source: World Bank (2006b), *World Development Indicators 2006* (available online, derived from International Labour Organization, Key Indicators of the Labour Market database) (accessed November 2006).

Logic: This age group (15-24) is a vital development phase for individual wellbeing and potential contribution to national wellbeing. Hence, it is important to ensure they are not left behind.

Methodology: Youth unemployment refers to the share of the labour force aged 15-24 without work but available for and seeking employment. Definitions of labour force and unemployment differ by country, thus making comparability between nations need to be made with care (WB, 2006b).

Variable Profiles for RIE Index

Variable #: 87 **Description:** Divorce rate [DivceRt]

Units: Per 100 marriages

Source: OECD (2005a), *Society at a Glance: OECD Social Indicators 2005*; additional Australian data obtained from ABS (2005b), *Australian Social Trends*, cat. no. 4102.0, Table 1: Family and Community: National Summary – 2005.

Logic: Provides part of an assessment of the extent of social fragmentation existent in society. Thus, it is seen as important in capturing the social contribution to national progress.

Methodology: The divorce rate per 100 marriages compares the number of divorces in a given year to the number of marriages in the same year. This definition is more standardised across countries than divorce rates by year of marriage derived from duration data. However, this indicator should be carefully interpreted, as the ratio can be stable because marriage and divorce rates have both increased in the same proportion. Indicators of divorce can only give an incomplete perspective on structure of families within society. Measure disregards families based on informal partnerships (OECD, 2005a).

Variable Profiles for RIE Index

Variable #: 88 **Description:** Prisoners – convicted adults [P'sners]

Units: Per 100,000 people

Source: OECD (2006a), *OECD Factbook 2006: Economic, Environmental and Social Statistics* (available online from SourceOECD) (accessed November 2006).

Logic: Determines the extent to which the social bond is being broken in society. As with the divorce rate, this variable is important in capturing the social contribution to national progress.

Methodology: Not everyone in prison has been found guilty of a crime, especially those awaiting trial or adjudication. The indicator here considers only those sentenced to incarceration, excluding pre-trial and non-guilty offenders. The numbers of prisoners are shown per 100,000 population. The data are collected for a typical day that can be considered representative of the whole year, hence only general comparisons can be made. This information is collected by the UN as part of its work on the operation of criminal justice systems (OECD, 2006a).

Variable Profiles for RIE Index

Variable #: 89 **Description:** Suicide rates [ScdeRte]

Units: Per 100,000 people

Source: OECD (2005a), *Society at a Glance: OECD Social Indicators 2005*, Paris.

Logic: A logical flipside to the life satisfaction variable. This variable helps assess the extent of social fragmentation in society and thus helps capture the social contribution to national progress.

Methodology: Data on suicides are based on official registers of 'causes of death', expressed per 100,000 individuals. Given the stigma attached to suicide, some surviving families from some countries may exert pressure to change cause of death from suicide to other causes. Given that administrative records are the only source of information on suicide rates, this reduces data comparability across countries. That said, large differences between data still presumably reflect real differences in frequency of suicides across countries (OECD, 2005a).

Variable Profiles for RIE Index

Variable #: 90 **Description:** Control of corruption index [CptnInd]

Units: Standardised (z-score), with high scores corresponding to effective control of corruption

Source: World Bank, (2006c), *Aggregate Governance Indicators 1996-2004*, (http://www.worldbank.org/wbi/governance/pdf/2004kkdata.xls) (accessed June 2006).

Logic: Corruption contributes to lax enforcement of regulations. This can ultimately lead to a sub-optimal allocation of resources and greater inefficiencies leading to lower levels of progress and the 'free-rider' problem. It also allows the possibility of environmental damage since people or corporations can evade responsibilities.

Methodology: Individual sources of data relating to this field are collected and then an unobserved components model is used to construct aggregate indicators from these individual measures. These aggregate indicators are weighted averages of the underlying data, with weights reflecting the precision of the individual data sources. This methodology also generates margins of error for the estimate, which need to be taken into account when making comparisons of governance across countries and over time

(Kaufmann et al., 2004). The control of corruption index is measured in units ranging from about -2.5 to 2.5, with higher values corresponding to better governance outcomes. The governance indicators presented here reflect the statistical compilation of responses on the quality of governance given by a large number of enterprise, citizen and expert survey respondents in industrial and developing countries, as reported by a number of survey institutes, think tanks, non-governmental organizations and international organizations. The methodologies used here are subject to rigorous internal and external reviews. These data are reproducible and the index components are clear. A centralized team of researchers assigns ratings. Thus, the data are considered to be generally reliable. Nonetheless, there is an unavoidable amount of subjectivity in any index calculation. Users should bear in mind that this index is, in part, measuring ideas and behaviours rather than discrete physical quantities. The data can illustrate rough comparisons and trends over time (WRI, 2006a).

Variable Profiles for RIE Index

Variable #: 91 **Description:** Rule of law index [LawIndx]

Units: Standardised (z-score), with high values corresponding to high degrees of rule of law

Source: World Bank, (2006c), *Aggregate Governance Indicators 1996-2004*, (http://www.worldbank.org/wbi/governance/pdf/2004kkdata.xls) (accessed June 2006).

Logic: The rule of law establishes the 'rules of the game'. Hence, a lax enforcement will lead to a sub-optimal allocation of resources and greater inefficiencies, leading to lower levels of progress and the 'free-rider' problem. It also allows the possibility of environmental and human damage since people or corporations can evade responsibilities.

Methodology: Deals with contract enforcement, police, the courts, as well as likelihood of crime and violence. Individual sources of data relating to this field are collected and then an unobserved components model is used to construct aggregate indicators from these individual measures. These aggregate indicators are weighted averages of the underlying data, with weights reflecting the precision of the individual data sources. This methodology also generates margins of error for the estimate, which need to be taken into account when making comparisons of governance across countries and over time (Kaufmann et al., 2004). The rule of law index is measured in units ranging from about -2.5 to 2.5, with higher values corresponding to better governance outcomes. The governance indicators presented here reflect the statistical compilation of responses on the quality of governance given by a large number of enterprise, citizen and expert survey respondents in industrial and developing countries, as reported by a number of survey institutes, think tanks, non-governmental organizations and international organizations. The methodologies used here are subject to rigorous internal and external reviews. These data are reproducible and the index components are clear. A centralized team of researchers assigns ratings. Thus, the data are considered to be generally reliable. Nonetheless, there is an unavoidable amount of subjectivity in any index calculation. Users should bear in mind that this index is, in part, measuring ideas and behaviours rather than discrete physical quantities. The data can illustrate rough comparisons and trends over time (WRI, 2006a).

Variable Profiles for RIE Index

Variable #: 92 **Description:** Government effectiveness index [GovEfId]

Units: Standardised (z-score), with high scores corresponding to high levels of effectiveness

Source: World Bank, (2006c), *Aggregate Governance Indicators 1996-2004*, (http://www.worldbank.org/wbi/governance/pdf/2004kkdata.xls) (accessed June 2006).

Logic: When a government is operating effectively it is able to supervise and react to major concerns to both society and the environment.

Methodology: Deals with contract enforcement, police, the courts, as well as likelihood of crime and violence. Individual sources of data relating to this field are collected and then an unobserved components model is used to construct aggregate indicators from these individual measures. These aggregate indicators are weighted averages of the underlying data, with weights reflecting the precision of the individual data sources. This methodology also generates margins of error for the estimate, which need to be taken into account when making comparisons of governance across countries and over time (Kaufmann et al., 2004). The government effectiveness index is measured in units ranging from about -2.5 to 2.5, with higher values corresponding to better governance outcomes. The governance indicators presented here reflect the statistical compilation of responses on the quality of governance given by a large number of enterprise, citizen and expert survey respondents in industrial and developing countries, as reported by a number of survey institutes, think tanks, non-governmental organizations and international organizations. The methodologies used here are subject to rigorous internal and external reviews. These data are reproducible and the index components are clear. A centralized team of researchers assigns ratings. Thus, the data are considered to be generally reliable. Nonetheless, there is an unavoidable amount of subjectivity in any index calculation. Users should bear in mind that this index is, in part, measuring ideas and behaviours rather than discrete physical quantities. The data can illustrate rough comparisons and trends over time (WRI, 2006a).

Variable Profiles for RIE Index

Variable #: 93 **Description:** Political stability index [PolStId]

Units: Standardised (z-score), with high scores corresponding to high levels of political stability

Source: World Bank, (2006c), *Aggregate Governance Indicators 1996-2004*, (http://www.worldbank.org/wbi/governance/pdf/2004kkdata.xls) (accessed June 2006).

Logic: This provides an indication of the likelihood of a destabilised government. This is important because the more stable a nation’s government, the better equipped it is to prevent progress deterioration occurring as well as ensuring issues of political violence are reduced.

Methodology: Deals with contract enforcement, police, the courts, as well as likelihood of crime and violence. Individual sources of data relating to this field are collected and then an unobserved components model is used to construct aggregate indicators from these individual measures. These aggregate indicators are weighted averages of the underlying data, with weights reflecting the precision of the individual data sources. This methodology also generates margins of error for the estimate, which need to be taken into account when making comparisons of governance across countries and over time (Kaufmann et al., 2004). The political stability index is measured in units ranging from about -2.5 to 2.5, with higher values corresponding to better governance outcomes. The governance indicators presented here reflect the statistical compilation of responses on the quality of governance given by a large number of enterprise, citizen and expert survey respondents in industrial and developing countries, as reported by a number of survey institutes, think tanks, non-governmental organizations and international organizations. The methodologies used here are subject to rigorous internal and external reviews. These data are reproducible and the index components are clear. A centralized team of researchers assigns ratings. Thus, the data are considered to be generally reliable. Nonetheless, there is an unavoidable amount of subjectivity in any index calculation. Users should bear in mind that this index is, in part, measuring ideas and behaviours rather than discrete physical quantities. The data can illustrate rough comparisons and trends over time (WRI, 2006a).

Variable Profiles for RIE Index

Variable #: 94 **Description:** Voice and accountability index [V&Aind]

Units: Standardised (z-score); with high scores corresponding to high levels of political process, civil liberties and political rights

Source: World Bank, (2006c), *Aggregate Governance Indicators 1996-2004*, (http://www.worldbank.org/wbi/governance/pdf/2004kkdata.xls) (accessed June 2006).

Logic: Issues of freedom of expression are seen as one of the cornerstones to progress, along with free media and citizen participation in elections. This variable provides an indication of this.

Methodology: Deals with contract enforcement, police, the courts, as well as likelihood of crime and violence. Individual sources of data relating to this field are collected and then an unobserved components model is used to construct aggregate indicators from these individual measures. These aggregate indicators are weighted averages of the underlying data, with weights reflecting the precision of the individual data sources. This methodology also generates margins of error for the estimate, which need to be taken into account when making comparisons of governance across countries and over time (Kaufmann et al., 2004). The voice and accountability index is measured in units ranging from about -2.5 to 2.5, with higher values corresponding to better governance outcomes. The governance indicators presented here reflect the statistical compilation of responses on the quality of governance given by a large number of enterprise, citizen and expert survey respondents in industrial and developing countries, as reported by a number of survey institutes, think tanks, non-governmental organizations and international organizations. The methodologies used here are subject to rigorous internal and external reviews. These data are reproducible and the index components are clear. A centralized team of researchers assigns ratings. Thus, the data are considered to be generally reliable. Nonetheless, there is an unavoidable amount of subjectivity in any index calculation. Users should bear in mind that this index is, in part, measuring ideas and behaviours rather than discrete physical quantities. The data can illustrate rough comparisons and trends over time (WRI, 2006a).

Variable Profiles for RIE Index

Variable #: 95 **Description:** Civilian employment rates [EmpRate]

Units: % of ages 15-64

Source: OECD (2006a), *OECD Factbook 2006: Economic, Environmental and Social Statistics* (available online from SourceOECD, derived from OECD Labour Force Statistics, 1985-2005) (accessed November 2006).

Logic: This variable helps assess the extent of engagement in economic activity, which is an important part of achieving progress.

Methodology: Employment rates are calculated as the ratio of the employed to the working age population. To calculate this employment rate, the population of working age is divided into two groups: those who are employed and those who are not. Employment is generally measured through household labour force surveys and, according to the ILO Guidelines; employed persons are defined as those aged 15 or over who report that they have worked in gainful employment for at least one hour in the previous week. For the denominators – the population in each age group – the data are taken from labour force surveys. All OECD countries use the ILO Guidelines for measuring employment, but the operational definitions used in national labour force surveys vary slightly in Mexico. Employment levels are also likely to be affected by changes in the survey design and/or the survey conduct, but employment rates are likely to be fairly consistent over time (OECD, 2006c). Specifically, the Household Labour Force Survey collects all data. For Mexico, from 1995 the survey is annual whereas 1991-94 is biannual, with estimates for 1992 and 1994 obtained using annualised rates of growth between the survey years 1991-93 and 1993-95. For the US, the data for 2000 is not strictly comparable with previous years due to new population control estimates, while 1997-1999 is not strictly comparable to previous years due to the introduction of revised population controls. This is also true for 1994, where the questionnaire and design underwent a major redesign, as did the collection methodology. For Australia, the annual data refers to August, and are revised after each census date. A new questionnaire was introduced in 2001, and the employment and the unemployment series were re-estimated from 1986 (OECD, 2006c).

Variable Profiles for RIE Index

Variable #: 96 **Description:** Adult unemployment rate [AdUptRt]

Units: % for 25-54 year olds

Source: OECD (2006a), *OECD Factbook 2006: Economic, Environmental and Social Statistics* (available online from SourceOECD, derived from OECD Labour Force Statistics, 1985-2005) (accessed November 2006).

Logic: This variable helps assess the extent of disengagement in economic activity, which is an important barrier to achieving progress.

Methodology: Unemployed persons are defined as those who report that they are without work, that they are available for work and that they have taken active steps to find work, although slight variations exist between the countries. The Household Labour Force Survey collects all data. Data for all persons refer to those over 25. For Mexico, from 1995 the survey is annual whereas 1991-94 is biannual, with estimates for 1992 and 1994 obtained using annualised rates of growth between the survey years 1991-93, and 1993-95. For the US, the data for 2000 is not strictly comparable with previous years due to new population control estimates, while 1997-1999 is not strictly comparable to previous years due to the introduction of revised population controls. This is also true for 1994, where the questionnaire and design underwent a major redesign, as did the collection methodology. For Australia, the annual data refers to August, and are revised after each census date. A new questionnaire was introduced in 2001, and the employment and the unemployment series were re-estimated from 1986 (OECD, 2006c).

Variable Profiles for RIE Index

Variable #: 97 **Description:** Long-term unemployment [LTUnpt]

Units: % of total unemployment

Source: OECD (2006a), *OECD Factbook 2006: Economic, Environmental and Social Statistics* (available online from SourceOECD, derived from OECD Labour Force Statistics, 1985-2005) (accessed November 2006).

Logic: This variable helps assesses the plight of individuals who have experienced noticeable absences from engaging in economic activity. This has the ability to dramatically hinder future progress aspirations.

Methodology: Long-term unemployment is conventionally defined either as those unemployed for 6 months or more or, as here, those unemployed for 12 months or more. Unemployment is defined in most OECD countries according to the ILO Guidelines. Unemployment is usually measured by household labour force surveys and the unemployed are defined as those persons who report that they have worked in gainful employment for less than one hour in the previous week, who are available for work and who have taken actions to seek employment in the previous four weeks. The ILO Guidelines specify the kinds of actions that count as seeking work. All OECD countries use the ILO Guidelines for measuring unemployment, but the operational definitions used in national labour force surveys vary slightly in Mexico. Unemployment levels are also likely to be affected by changes in the survey design and/or the survey conduct, but unemployment rates are likely to be fairly consistent over time (OECD, 2006c). Specifically, the Household Labour Force Survey collects all data. For Mexico, from 1995 the survey is annual whereas 1991-94 is biannual, with estimates for 1992 and 1994 obtained using annualised rates of growth between the survey years 1991-93, and 1993-95. For the US, the data for 2000 is not strictly comparable with previous years due to new population control estimates, while 1997-1999 is not strictly comparable to previous years due to the introduction of revised population controls. This is also true for 1994, where the questionnaire and design underwent a major redesign, as did the collection methodology. For Australia, the annual data refers to August, and are revised after each census date. A new questionnaire was introduced in 2001, and the employment and the unemployment series were re-estimated from 1986 (OECD, 2006c).

Variable Profiles for RIE Index

Variable #: 98 **Description:** Overwork hours [O_WkHrs]

Units: Per person in employment

Source: OECD (2006a), *OECD Factbook 2006: Economic, Environmental and Social Statistics* (available online from SourceOECD, derived from OECD Labour Force Statistics, 1985-2005) (accessed November 2006).

Logic: This is seen as an alternative measure of leisure and reflects increasing acknowledgement of people being 'time-poor' impacting on leisure, an important aspect of progress.

Methodology: The costs of overwork are evaluated by assessing the amount of involuntary work performed (Hamilton, 1998). The extent of overwork is estimated by totalling the hours worked each year per worker, over and above the average annual hours worked in the period 1990-2004. Comparisons are restricted as, unlike Hamilton who only uses *full-time* worker hours for Australia's GPI, this variable is restricted to all workers. Given the discrepancy of part-time workers, Australia has close to double Mexico; only partial comparisons can be attempted.

Variable Profiles for RIE Index

Variable #: 99 **Description:** Jobless households [JblessH]

Units: % of total population

Source: OECD (2005a), *Society at a Glance: OECD Social Indicators 2005*; obtained from: Forster, M & d'Ercole, MM 2006, 'Income Distribution and Poverty in OECD Countries in the Second Half of the 1990s', OECD Social, Employment and Migration Working Paper No. 22 (accessed November 2006).

Logic: This variable helps assess the extent of disengagement in economic activity and the associated financial pressures, which can encumber progress.

Methodology: The data refers to persons, including children, living in households with a working age head where no one works. Work is defined by the presence of earnings or self-employment income during the previous year. The data is derived from household income surveys and micro datasets, and are used in other sections to describe trends in income distribution and poverty (OECD, 2005a).

Variable Profiles for RIE Index

Variable #: 100 **Description:** Relative poverty rate [RelPvRt]

Units: % of population

Source: OECD (2005a), *Society at a Glance: OECD Social Indicators 2005*; obtained from: Forster, M & d'Ercole, MM 2006, 'Income Distribution and Poverty in OECD Countries in the Second Half of the 1990s', OECD Social, Employment and Migration Working Paper No. 22 (accessed August 2006).

Logic: This poverty variable signifies an extra burden on people's wellbeing. Hence high levels of this variable can be seen as detracting from progress.

Methodology: Poverty rates are measured as the proportion of individuals with equivalised disposable income less than 50 per cent of the median income of the entire population (Forster and d'Ercole, 2006).

Variable Profiles for RIE Index

Variable #: 101 **Description:** Relative poverty rate among elderly [RlPvEld]

Units: % of population aged 66 and above

Source: OECD (2005a), *Society at a Glance: OECD Social Indicators 2005*; obtained from: Forster, M & d'Ercole, MM 2006, 'Income Distribution and Poverty in OECD Countries in the Second Half of the 1990s', OECD Social, Employment and Migration Working Paper No. 22 (accessed November 2006).

Logic: This complements the above variable by focusing on the elderly who are more susceptible to a range of negative risks impacting poorly on their wellbeing and overall progress.

Methodology: The poverty thresholds are set at 50 per cent of the median income for the entire population. Elderly refer to the population aged 66 and above, while calculations are based from OECD questionnaire on distribution of household incomes (OECD, 2005a).

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Appendix B: RIE Index Imputed Data

RIE Index Imputed Data - Australia

Year	LexpA	InfMortA	HALEA	PhysA	PopnGwtA	FertRatA	CalorieA	FatConsA	SugConsA	SchLexpA	NetEnrlA	PbExpEdA	TSSM&EA
1990	77.0	8.2	69.9	2.2	1.48	1.91	3253	135.2	50.5	20.35	86.7	4.85	20.78
1991	77.4	7.1	70.2	2.3	1.27	1.86	3174	130.7	48.9	20.35	86.7	4.85	20.78
1992	77.5	7	70.3	2.4	1.20	1.90	3098	125.5	51.2	20.35	86.7	4.85	20.78
1993	78	6.1	70.8	2.4	0.97	1.87	3073	128.2	46.2	20.35	86.7	4.85	20.78
1994	78	5.9	70.8	2.4	1.65	1.85	3079	127	44.7	20.35	86.7	4.85	20.78
1995	77.9	5.7	70.7	2.5	0.65	1.82	3137	128.1	48.3	20.35	86.7	4.85	20.78
1996	78.2	5.8	71.0	2.4	1.31	1.80	3124	130.5	45.3	20.35	86.7	4.85	20.78
1997	78.5	5.3	71.2	2.4	1.12	1.77	3119	128	49.1	20.35	86.7	4.85	20.78
1998	78.7	5.0	71.4	2.4	1.03	1.76	3048	127.8	48.2	20.35	86.7	4.85	20.78
1999	79	5.7	71.7	2.4	1.14	1.75	3058	131.7	44	20.35	86.7	4.85	20.78
2000	79.3	5.2	72.0	2.5	1.19	1.75	3069	135.9	45.2	20.35	86.7	4.85	20.78
2001	79.7	5.3	72.3	2.5	1.35	1.73	3130	137.9	45.8	20.35	86.7	4.85	20.78
2002	80	5.0	72.6	2.5	1.17	1.75	3090	131.3	46.1	20.35	86.7	4.85	20.78
2003	80.3	4.8	72.9	2.6	1.17	1.77	3135	132.3	47.4	20.35	86.7	4.85	20.78
2004	80.5	4.7	73.1	2.7	1.19	1.75	3181	133.3	48.7	20.35	86.7	4.85	20.78

Note : The 'A' at the end of the variable code refers to Australia. For measurement unit please refer to Appendix A.

RIE Index Imputed Data - Australia

Year	PupilTcA	PISAsciA	R&DexpA	R&DrsrcA	HiTechXA	PatentsA	Sci&TArA	NFBtertA	HSkImmA	NtTyGnA	FstAreaA	AgLandA	ArblLanA
1990	19.34	526.5	1.31	5.5	11.9	62.12	624.90	14.41	28.87	10	21.65	60.46	6.24
1991	19.13	526.5	1.45	6.24	12.83	57.34	621.50	14.41	28.87	10.14	21.65	60.27	5.95
1992	18.92	526.5	1.52	6.7	13.42	52.82	654.59	14.41	28.87	10.28	21.65	60.68	6.14
1993	18.71	526.5	1.49	6.54	14.45	54.98	675.40	14.41	28.87	10.42	21.65	59.92	6.03
1994	18.5	526.5	1.59	7	15.97	58.86	711.01	14.41	28.87	10.56	21.65	61.06	6.76
1995	18.2	526.5	1.53	6.84	15.68	48.09	740.76	14.41	28.87	10.7	21.65	60.31	6.01
1996	18.1	526.5	1.67	7.3	15.62	45.11	759.71	14.41	28.87	10.84	21.65	60.56	6.77
1997	17.9	526.5	1.57	7.14	15.03	43.42	753.59	14.41	28.87	10.98	21.65	60.16	6.5
1998	17.9	526.5	1.51	7.3	14.92	62.53	786.17	14.41	28.87	11.12	21.65	60.37	6.97
1999	17.3	526.5	1.61	7.44	15.09	53.00	802.39	14.41	28.87	11.26	21.65	59.06	6.24
2000	17.3	526.5	1.56	7.3	15.22	53.99	767.50	14.41	28.87	11.4	21.65	59.29	6.55
2001	17.0	526.5	1.65	7.74	15.45	55.12	761.76	14.41	28.87	11.54	21.65	59.32	6.61
2002	16.9	526.5	1.69	7.8	16.45	49.9	756.02	14.41	28.87	11.68	21.65	58.19	6.28
2003	16.6	526.5	1.69	8.04	13.77	51.38	750.28	14.41	28.87	11.82	21.65	57.21	6.2
2004	16.4	526.5	1.71	8.19	13.65	58.58	744.54	14.41	28.87	11.96	21.65	56.25	6.12

RIE Index
Imputed Data -
Australia

Year	IrrigLnA	FertConA	TractUsA	AgPdnInA	FdPdnInA	GDPEgUsA	RbleEgSA	ElecConA	FWaterAA	InGdWtAA	WtrWdlA	OrgWtPtA
1990	3.81	242.94	151.7	83.6	78.3	3.99	6.0	8,455.50	24.61	4.22	4.9	10.91
1991	4.39	281.09	145.2	80.6	74.9	4.02	6.2	8,474.89	24.30	4.17	4.9	10.51
1992	4.37	300.4	150.4	82.8	80.7	4.07	5.6	8,519.49	24.01	4.12	4.9	9.9
1993	4.53	326.46	147.6	85.3	84.1	4.01	6.1	8,667.71	23.78	4.08	4.9	5.64
1994	4.62	332.47	165.4	76.8	75.1	4.2	6.0	8,724.64	23.39	4.01	4.9	5.63
1995	5.18	404.68	147.1	84.3	83.9	4.32	6.1	8,956.06	23.24	3.98	4.9	5.59
1996	4.58	387.64	165.8	94.1	93.8	4.18	6.3	9,072.36	22.94	3.93	4.9	5.41
1997	4.74	437.08	159.4	92.2	91	4.29	6.5	9,262.39	22.68	3.78	4.9	4.94
1998	4.4	420.23	170.7	96.6	96	4.44	6.2	9,760.35	22.45	3.85	4.9	4.96
1999	4.67	490.63	153.1	101.1	101.1	4.44	6.0	9,929.15	22.19	3.8	4.9	4.98
2000	4.71	452.25	160.6	98.2	97.6	4.43	6.0	10,054.61	21.93	3.76	4.9	4.98
2001	4.82	469.34	162.2	100.6	101.4	4.67	6.1	10,365.58	21.63	3.71	4.9	4.97
2002	5.24	472.21	154.3	83.3	85.1	4.67	6.1	10,772.97	21.38	3.67	4.9	4.99
2003	5.31	475.08	152.2	92.8	96.5	4.81	5.8	10,713.38	21.13	3.62	4.9	5.03
2004	5.38	477.95	150.1	87.9	89.2	4.95	5.4	10,654.12	20.88	3.58	4.9	5.05

RIE Index
Imputed Data - Australia

Year	FishCapA	FishConA	NBI_A	ThtMammA	ThtBirdA	NtDmCdtA	DmCdtBnA	FDINInfA	NetLndA	MktCptA	StksTdA	Real_IRA	RealXRtA
1990	0.22	18.9	0.85	20.39	3.82	16,659	71.46	2.61	-651.86	35.1	12.92	13.93	124.99
1991	0.24	18.95	0.85	20.67	3.96	16,970	72.14	1.36	-473.47	47.05	14.79	11.91	122.43
1992	0.25	19.16	0.85	20.95	4.1	18,050	74.14	1.82	-607.47	46.35	14.63	9.49	110.59
1993	0.24	19.37	0.85	21.22	4.24	18,889	74.74	1.42	-658.66	67.5	22.31	8.48	102.12
1994	0.2	19.58	0.85	21.5	4.39	20,232	76.83	1.45	-1,172.56	63.67	27.56	8.07	107.19
1995	0.2	19.5	0.85	21.78	4.53	22,028	79.42	3.24	-851.12	65.99	26.55	8.27	105.38
1996	0.19	20.01	0.85	22.31	4.67	24,076	83.5	1.5	-666.09	75.51	35.19	8.88	115.32
1997	0.18	20.22	0.85	22.33	4.81	25,058	82.99	1.84	-897.36	71.28	41.34	7.41	114.19
1998	0.2	20.43	0.85	22.6	4.96	27,667	87.8	1.61	-1,332.12	88.81	43.49	8.01	104.33
1999	0.2	20.64	0.85	22.89	5.1	29,927	90.85	0.82	-1,264.03	106.33	48.31	5.96	104.89
2000	0.18	20.85	0.85	22.4	5.31	32,228	92.35	3.51	-669.30	96.2	58.4	4.01	100.00
2001	0.18	21.2	0.85	23.44	5.38	34,507	93.92	2.24	-715.22	101.69	65.24	5.79	96.13
2002	0.17	21.28	0.85	24.23	5.39	38,970	100.96	4.29	-1,492.97	91.97	71.54	5.02	101.47
2003	0.17	21.49	0.85	24	5.67	42,373	103.55	1.87	-1,713.84	111.01	70.12	4.88	114.67
2004	0.16	21.7	0.85	24.27	5.88	47,004	108.97	6.66	-2,038.74	121.82	80.69	5.21	124.04

RIE Index Imputed Data - Australia

Year	M&TeqpA	GFCF_McA	TphnMaiA	PCsA	RadiosA	TVsetsA	NewspapA	ICT_ExpA	AirTpFtA	Air_PasA	ConPtTfA
1990	20.18	7.4	456.3	149.78	1265.7	521.5	184.02	6.24	1,222.30	1,028,614.00	219,182.80
1991	19.35	7	465.52	160.39	1272.3	543.6	181.69	6.24	1,222.60	1,264,759.00	219,182.80
1992	20.45	7.4	472.04	183.99	1277.9	564.8	179.37	6.24	1,361.50	1,365,339.00	219,182.80
1993	20.89	7.6	483.52	207.52	1287.4	594.7	177.04	6.24	1,525.80	1,524,703.00	219,182.80
1994	21.33	8.5	492.9	238.77	1289.4	622.3	174.72	6.24	1,645.50	1,505,937.00	219,182.80
1995	21.76	8.4	492.47	275.5	1289.9	697.6	172.39	6.24	1,737.50	1,595,363.00	219,182.80
1996	22.2	8.2	500.79	289.44	1365.3	699	170.07	6.24	1,833.70	1,642,461.00	219,182.80
1997	22.64	8.4	512.88	329.41	1506.3	699.4	167.74	6.24	1,953.80	1,671,536.00	219,182.80
1998	23.08	8.1	509.86	368.77	1603.3	705.5	165.61	6.24	1,904.40	1,613,260.00	219,182.80
1999	23.52	8.2	515.69	422.7	1743.6	708	162.71	6.24	1,693.00	1,668,588.00	219,182.80
2000	23.95	7.9	540.39	469.9	1879.6	736.2	160.96	6.24	1,730.70	1,700,914.00	219,182.80
2001	24.39	7.8	540.1	515.12	1905.9	731.5	158.44	6.24	1,678.10	1,724,484.00	219,182.80
2002	24.86	8.3	555.22	565.14	1960.2	728.1	156.12	6.24	1,544.70	1,986,742.00	219,182.80
2003	25.29	8.41	551.75	603.83	1961.7	724.3	153.79	6.24	1,358.98	1,831,639.00	219,182.80
2004	25.71	8.48	540.6	682.21	1963.2	720.5	151.47	6.24	1,898.07	2,070,304.00	219,182.80

RIE Index
Imputed Data - Australia

Year	RaRdGdA	RailPasA	RdVhclA	SulphOxA	NitOxA	CarbMonA	CbDxEmA	CbDxTEmA	EcoFPtA	FnCnExpA	DefExpA	RoadPvdA
1990	1,155,880.00	839.63	112.94	96	82	336	15.44	1.23	6.91	80.54	93.03	35
1991	1159829.62	877.4	110.8	97	80	316	15.27	1.24	6.91	83.07	102.88	35.7
1992	1162325.93	915.17	116.66	102	79	306	15.80	1.3	6.91	81.4	112.74	36.4
1993	1164822.24	952.93	109.61	104	79	301	15.89	1.31	6.91	84.17	120.34	37.1
1994	1167318.55	990.71	112.01	106	80	295	15.59	1.29	6.91	80.81	136.05	37.9
1995	1169814.86	1028.48	111.89	99	79	291	15.72	1.29	6.91	80.54	140.19	38.6
1996	1172311.17	1066.28	110.32	101	81	285	16.22	1.32	6.91	79.44	154.52	38.7
1997	1,177,234.00	1,093.00	104.06	99	85	285	17.61	1.43	6.91	79.46	160.37	38.7
1998	1177303.79	1141.79	108.12	98	87	283	17.76	1.46	6.91	80.17	165.96	38.7
1999	1,180,085.00	1,155.00	105.46	102	86	275	18.49	1.51	6.91	79.35	158.79	38.7
2000	1,182,530.00	1,265.00	108.44	127	86	265	18.43	1.48	6.91	79.97	151.06	38.8
2001	1184792.72	1255.11	111.83	130	85	247	18.93	1.52	6.91	79.16	144.17	38.8
2002	1187289.03	1292.88	114.95	143	86	249	19.15	1.53	6.91	79.42	136.72	38.8
2003	1,190,780.00	1,340.00	118.13	149	87	243	18.84	1.45	6.91	79.04	129.41	38.8
2004	1,189,794.00	1,347.00	121.32	157	88	237	19.39	1.43	6.91	79.53	122.1	38.9

RIE Index
Imputed Data - Australia

Year	GFCF_A	AvNoOccA	HseStckA	PopAcDgA	PopAcWtA	PopAcSnA	GpMembA	LifeSatA	HholdWkA	GNI_PPPA	GINI_A	YthUnptA
1990	14.7	2.93	0.38	97.5	100	100	2.85	6.84	27.65	15,954	0.303	13.2
1991	14.7	2.91	0.39	97.5	100	100	2.85	6.93	27.65	16,344	0.303	17.1
1992	14.7	2.89	0.39	97.5	100	100	2.85	7.03	27.65	17,125	0.303	19.5
1993	14.7	2.85	0.39	97.5	100	100	2.85	7.12	27.65	18,026	0.303	18.6
1994	14.7	2.82	0.39	97.5	100	100	2.85	7.21	27.65	18,868	0.303	16.2
1995	14.7	2.81	0.39	97.5	100	100	2.85	7.28	27.65	19,944	0.303	14.4
1996	14.7	2.82	0.39	97.5	100	100	2.85	7.4	27.65	20,819	0.303	14.8
1997	14.7	2.8	0.39	97.5	100	100	2.85	7.49	27.65	21,863	0.303	15.9
1998	14.7	2.78	0.39	97.5	100	100	2.85	7.59	27.65	23,040	0.303	14.1
1999	14.7	2.77	0.4	97.5	100	100	2.85	7.68	27.65	23,976	0.303	13
2000	14.7	2.75	0.4	97.5	100	100	2.85	7.77	27.65	24,706	0.303	11.8
2001	14.7	2.75	0.4	97.5	100	100	2.85	8.0	27.65	25,931	0.303	12.9
2002	14.7	2.74	0.4	97.5	100	100	2.85	7.9	27.65	26,890	0.303	12.7
2003	14.7	2.71	0.41	97.5	100	100	2.85	8.0	27.65	28,085	0.303	11.6
2004	14.7	2.7	0.41	97.5	100	100	2.85	8.14	27.65	29,339	0.303	11.7

RIE Index
Imputed Data - Australia

Year	DivceRtA	P'snersA	ScdeRteA	CptnIndA	LawIndxA	GovEfIdA	PolStIdA	V&AindA	EmpRateA	AdUptRtA	LTUnptA	O_WkHrsA	JblessHA
1990	36.4	75.3	12.9	2.01	1.9	1.9	1.03	1.99	68.8	5.1	21.6	15	13.01
1991	40.32	77.3	13.2	2.01	1.9	1.9	1.06	1.95	66.5	7.3	24.9	2	13.18
1992	41.27	79.3	12.9	2.01	1.9	1.9	1.09	1.91	65.4	8.3	34.5	-6	13.35
1993	42.22	81.3	11.5	2.01	1.9	1.9	1.12	1.87	65.2	8.6	36.5	19	13.52
1994	43.4	83.4	12.8	2.01	1.9	1.9	1.15	1.83	66.6	7.6	36.3	24	13.68
1995	45.4	85.4	12	2.01	1.9	1.9	1.18	1.79	68.4	6.6	30.8	21	13.64
1996	49.5	86.8	13.2	2.01	1.9	1.9	1.22	1.73	68.4	6.7	28.4	11	13.59
1997	48.1	89.3	14.3	2.01	1.9	1.9	1.24	1.7	68.3	6.6	30.7	10	13.54
1998	46.5	91.1	14.1	2.01	1.9	1.9	1.26	1.66	69.0	6.1	34.5	5	13.49
1999	46	96.5	13.1	2.01	1.9	1.9	1.3	1.62	69.3	5.5	30.2	9	13.45
2000	44	93.4	12.5	2.01	1.9	1.9	1.34	1.61	70.2	5.1	29.1	4	13.4
2001	53.6	97.46	12.7	2.01	1.9	1.9	1.25	1.54	70.0	5.3	21.2	-14	13.35
2002	51.2	99.48	11.8	2.01	1.9	1.9	1.16	1.5	70.4	5.1	22.1	-27	13.31
2003	49.9	101.49	11.1	2.01	1.9	1.9	1.1	1.46	71.0	4.8	22.5	-37	13.26
2004	52.7	103.5	10.4	2.01	1.9	1.9	1.03	1.4	71.6	4.2	20.7	-35	13.21

RIE Index
Imputed Data - Australia

Year	RelPvRtA	RlPvEldA
1990	10.25	19.88
1991	10.25	19.88
1992	10.25	19.88
1993	10.25	19.88
1994	10.25	19.88
1995	10.25	19.88
1996	10.25	19.88
1997	10.25	19.88
1998	10.25	19.88
1999	10.25	19.88
2000	10.25	19.88
2001	10.25	19.88
2002	10.25	19.88
2003	10.25	19.88
2004	10.25	19.88

RIE Index Imputed Data - Mexico

Year	LexpM	InfMortM	HALEM	PhysM	PopnGwtM	FertRatM	CalorieM	FatConsM	SugConsM	SchLexpM	NetEnrlM	PbExpEdM	TSSM&EM	PupilTcM
1990	71.2	36.2	62.42	1.0	1.89	3.31	3074	77.7	53.4	9.84	37.86	5.1	25.01	28.55
1991	71.8	32.2	62.95	1.2	1.87	3.20	3106	83.6	49.9	10.04	39.72	5.1	25.01	28.41
1992	72	30.9	63.12	1.4	1.84	3.20	3123	83.5	50.6	10.24	41.59	5.1	25.01	28.27
1993	72.3	29.6	63.39	1.4	1.82	2.99	3140	85.3	51.4	10.44	43.45	5.1	25.01	28.12
1994	72.6	28.5	63.65	1.5	1.79	2.95	3141	86	50.3	10.64	45.31	5.1	25.01	27.98
1995	72.7	27.6	63.74	1.5	1.77	2.88	3111	84.3	49.5	10.84	47.18	5.1	25.01	27.84
1996	72.8	26.7	63.82	1.5	1.55	2.75	3142	86.9	50.2	11.03	49.04	5.1	25.01	27.7
1997	73.2	26	64.17	1.5	1.45	2.64	3103	87.6	47	11.23	50.9	5.1	25.01	27.55
1998	73.3	25.3	64.26	1.5	1.40	2.57	3121	87.3	49.1	11.43	52.76	5.1	25.01	27.41
1999	73.7	24.4	64.61	1.5	1.39	2.50	3113	85.4	48.4	11.63	54.89	5.1	25.01	27.23
2000	74	23.3	64.88	1.5	1.42	2.41	3158	86.4	49	11.85	56.15	5.1	25.01	27.16
2001	74.3	22.4	65.14	1.5	1.04	2.34	3179	87.9	48.5	11.98	58.28	5.1	25.01	26.98
2002	74.6	21.4	65.4	1.5	1.01	2.27	3192	90.2	49.6	12.22	60.16	5.1	25.01	26.87
2003	74.9	20.5	65.66	1.5	1.01	2.21	3171	89.1	48.5	12.49	62.44	5.1	25.01	26.66
2004	75.2	19.7	65.93	1.6	1.01	2.2	3150	88	47.4	12.59	63.78	5.1	25.01	26.55

Note : The 'M' at the end of the variable code refers to Mexico. For measurement unit please refer to Appendix A.

RIE Index Imputed Data - Mexico

Year	PISAsciM	R&DexpM	R&DrsrcM	HiTechXM	PatentsM	Sci&TArM	NFBtertM	HSkImmM	NtTyGnM	FstAreaM	AgLandM	ArblLanM	IrrigLnM
1990	413.5	0.15	0.41	8.29	1.59	12.47	-6.12	1.33	-0.7	35.25	54.17	12.57	21.62
1991	413.5	0.18	0.44	8.5	1.52	12.76	-6.12	1.33	-0.8	35.25	54.49	12.63	22.31
1992	413.5	0.21	0.46	11.15	3.1	15.47	-6.12	1.33	-0.9	35.25	54.85	12.68	23.28
1993	413.5	0.22	0.4	11.51	3.9	17.08	-6.12	1.33	-1	35.25	55.38	12.94	22.98
1994	413.5	0.29	0.5	13.84	3.22	18.57	-6.12	1.33	-1.1	35.25	55.8	13.07	22.85
1995	413.5	0.31	0.6	15.08	1.62	20.86	-6.12	1.33	-1.2	35.25	56.16	13.2	22.73
1996	413.5	0.31	0.6	15.72	1.25	22.94	-6.12	1.33	-1.3	35.25	56.16	13.18	22.49
1997	413.5	0.34	0.6	17.46	1.19	24.18	-6.12	1.33	-1.4	35.25	56.16	13.05	22.92
1998	413.5	0.38	0.5	19.18	1.48	27.45	-6.12	1.33	-1.5	35.25	56.16	13.05	22.93
1999	413.5	0.43	0.6	20.68	1.24	30.28	-6.12	1.33	-1.6	35.25	56.16	12.99	23
2000	413.5	0.37	0.63	22.4	1.15	30.11	-6.12	1.33	-1.7	35.25	56.22	12.99	23.08
2001	413.5	0.39	0.65	22	1.19	32.29	-6.12	1.33	-1.8	35.25	56.22	12.99	23.15
2002	413.5	0.41	0.67	21.38	1.37	34.51	-6.12	1.33	-1.9	35.25	56.22	12.99	23.15
2003	413.5	0.43	0.69	21.34	1.19	36.43	-6.12	1.33	-2	35.25	56.22	12.99	23.15
2004	413.5	0.45	0.71	21.2	1.56	38.34	-6.12	1.33	-2.1	35.25	56.22	12.99	23.15

RIE Index
Imputed Data - Mexico

Year	FertConM	TractUsM	AgPdnInM	FdPdnInM	GDPEgUsM	RbleEgSM	ElecConM	FWaterAM	InGdWtAM	WtrWdlM	OrgWtPtM	FishCapM
1990	641.27	86.3	91.5	89.4	5.1	11.1	1,277.49	3.82	1.67	19.1	2.11	1.4
1991	671.95	81.9	93	91.7	5.07	11.0	1,289.84	3.75	1.64	19.1	2.05	1.42
1992	667.77	82.1	90.9	91	5.15	11.2	1,298.48	3.68	1.61	19.1	1.97	1.17
1993	644.49	83.3	91.2	91.1	5.25	11.4	1,324.87	3.62	1.58	19.1	1.78	1.08
1994	660.48	83.7	94.1	93.4	5.33	10.3	1,407.99	3.55	1.55	19.1	3.21	1.08
1995	677.13	84.1	98.9	97.9	5.23	11.4	1,426.29	3.49	1.53	19.1	2.98	1.16
1996	650.66	84.1	95.8	94	5.32	11.3	1,505.81	3.44	1.5	19.1	2.97	1.24
1997	660.28	84.1	97.7	96.6	5.43	10.6	1,613.15	3.39	1.48	19.1	3.02	1.24
1998	724.62	84.1	96.9	95.8	5.45	10.3	1,636.43	3.34	1.46	19.1	3.05	1.03
1999	716.13	84.1	99.5	99.2	5.56	10.5	1,710.15	3.29	1.44	19.1	3.05	0.99
2000	738.71	84	98.7	98.8	5.89	10.6	1,802.04	3.25	1.42	19.1	3.02	1.05
2001	752.17	84	101.8	102	5.81	10.2	1,804.40	3.2	1.4	19.1	3.03	1.13
2002	690.28	84	98.9	99.6	5.69	9.6	1,825.34	3.16	1.38	19.1	3.04	1.2
2003	734.51	84	100.8	101.4	5.62	9.6	1,801.47	3.11	1.36	19.1	3.03	1.27
2004	741.68	84	103.3	103.7	5.55	9.9	1,777.91	3.07	1.34	19.1	3.03	1.34

**RIE Index
Imputed Data -
Mexico**

Year	FishConM	NBI_M	ThtMammM	ThtBirdM	NtDmCdtM	DmCdtBnM	FDINInfM	NetLndM	MktCptM	StksTdM	Real_IRM	RealXRtM	M&TeqpM
1990	12.6	0.93	11.4	4.02	3,216	36.22	0.97	-173.43	12.45	4.65	11.72	77.69	24.19
1991	12.37	0.93	11.67	4.14	4,084	36.49	1.51	-305.59	31.23	10.09	10.93	86.05	24.76
1992	12.02	0.93	11.95	1.25	5,082	39.01	1.21	-458.42	38.23	12.26	10.15	93.26	25.24
1993	11.67	0.93	12.22	1.36	5,615	39.31	1.09	-411.64	49.85	15.49	7.52	99.67	23.48
1994	11.32	0.93	12.49	1.47	7,322	46.06	2.6	-506.84	30.83	19.67	9.98	95.27	22.56
1995	10.2	0.93	12.76	4.58	8,390	41.55	3.32	-36.57	31.63	11.99	7.80	64.55	22.62
1996	10.6	0.93	13.03	4.66	7,175	26.25	2.76	-51.47	32	12.93	4.32	72.07	24.68
1997	10.27	0.93	13.31	4.81	14,412	49.39	3.2	-148.44	39	13.05	3.78	83.40	25.81
1998	9.91	0.93	13.58	4.92	15,591	45.99	2.95	-312.90	21.78	8.11	9.51	84.21	26.54
1999	9.56	0.93	13.86	5.13	16,526	43.07	2.79	-244.18	32.01	7.49	7.52	92.13	26.27
2000	9.21	0.93	14.15	5.31	17,164	38.3	2.94	-293.36	21.53	7.8	4.30	100.00	27.07
2001	8.7	0.93	14.4	5.26	16,710	37.81	4.45	-263.68	20.3	6.44	6.53	106.52	27.65
2002	8.16	0.93	14.66	5.18	18,759	40.48	2.38	-193.84	15.89	4.27	1.16	106.74	28.17
2003	7.81	0.93	14.95	5.48	19,185	39.45	1.92	-125.55	19.17	3.68	-1.46	95.28	28.69
2004	7.46	0.93	15.22	5.65	20,291	38.44	2.57	-110.59	25.42	6.33	-0.21	91.50	29.22

RIE Index Imputed Data - Mexico

Year	GFCF_McM	TphnMaiM	PCsM	RadiosM	TVsetsM	NewspapM	ICT_ExpM	AirTpFtM	Air_PasM	ConPtTfM	RaRdGdM	RailPasM
1990	8.9	64.34	8.17	260.3	149.5	101.79	3.03	143.2	172,318.00	15507.2	108,955.20	5,336.30
1991	9.4	71.05	10.61	250.5	145.2	101.03	3.03	162.7	175,734.00	15507.2	124,955.80	4,686.00
1992	10	78.2	15.05	251.3	182	100.27	3.03	158.8	179,835.00	15507.2	134,370.00	4,793.90
1993	8.6	86.65	18.19	252.2	184.2	99.51	3.03	150.9	187,426.00	15507.2	139,747.30	3,219.30
1994	8.9	94.84	23.45	254.1	187.1	98.75	3.03	225.2	209,852.00	15507.2	158,392.60	1,855.10
1995	7.6	96.56	26.33	255.9	213.3	97.98	3.03	155.9	164,231.00	15507.2	162,899.70	1,898.60
1996	8.9	95.34	31.33	315.5	231.4	97	3.03	168.8	158,557.00	15507.2	170,910.80	1,799.31
1997	10	98.52	34.07	324.8	253.5	96.46	3.03	227.2	183,830.00	15507.2	177,499.24	1795.21
1998	11.1	104.22	36.74	313.02	260.9	95.7	3.03	284.8	186,007.00	15507.2	179,158.30	1767.32
1999	11	113.14	44.52	322.45	272.2	95.82	3.03	317	212,882.00	15507.2	195,321.80	1739.42
2000	10.8	125.88	58.18	331.88	283.2	93.51	3.03	309.9	213,280.00	15507.2	204233.08	1711.53
2001	9.7	138.6	69.43	341.31	285.3	93.41	3.03	295.9	202,992.00	15507.2	213144.36	1683.63
2002	8.9	148.54	82.85	350.74	284.1	92.65	3.03	341.6	194,594.00	15507.2	222055.64	1655.74
2003	8.5	159.64	97.76	360.05	283	91.89	3.03	349.56	192,024.00	15507.2	230966.92	1627.84
2004	8.1	174.12	108	369.48	276.4	91.13	3.03	402.6	204,629.00	15507.2	239878.2	1599.95

RIE Index Imputed Data - Mexico

Year	RdVhclM	SulphOxM	NitOxM	CarbMonM	CbDxEmM	CbDxTEmM	EcoFPtM	FnCnExpM	DefExpM	RoadPvdM	GFCF_M	AvNoOccM	HseStckM
1990	35.67	11.67	12	110	3.53	1.4	2.51	79.31	54.21	35.1	9	5.09	0.19
1991	38.29	11.67	12	106.3	3.56	1.44	2.51	81	58.46	35.3	9.2	4.98	0.2
1992	40.58	11.67	12	100.29	3.53	1.46	2.51	83.14	62.71	35.5	9.6	4.86	0.21
1993	41.77	11.67	12	94.27	3.50	1.46	2.51	84.59	66.96	36	10	4.76	0.21
1994	42.87	11.67	12	93	3.65	1.54	2.51	84.89	71.21	31	10.5	4.66	0.21
1995	42.49	11.67	12	82.24	3.43	1.45	2.51	80.07	53.73	31.3	8.5	4.55	0.21
1996	43.26	11.67	12	76	3.49	1.46	2.51	76.96	58.31	31.8	9	4.52	0.22
1997	44.62	11.67	12	70.21	3.61	1.51	2.51	75.61	68.12	29.7	9.5	4.49	0.22
1998	46.24	11.67	12	62	3.79	1.61	2.51	79.17	73.41	34.3	9.8	4.46	0.23
1999	48.04	11.67	12	58.19	3.66	1.55	2.51	79.15	85.19	32.8	10.1	4.44	0.23
2000	50.34	11.67	12	52.17	3.80	1.59	2.51	79.17	99.95	33	10.5	4.41	0.23
2001	55.31	11.67	12	46.16	3.73	1.57	2.51	81.91	112.94	33.2	10.3	4.38	0.23
2002	59.43	11.67	12	40.14	3.76	1.58	2.51	81.4	118.52	33.5	10.3	4.36	0.24
2003	61.02	11.67	12	34.13	3.77	1.52	2.51	80.87	128.45	33.5	10.4	4.34	0.24
2004	63.98	11.67	12	28.11	3.67	1.43	2.51	79.23	138.37	33.5	10.5	4.31	0.24

RIE Index
Imputed Data - Mexico

Year	PopAcDgM	PopAcWtM	PopAcSnM	GpMembM	LifeSatM	HholdWkM	GNI_PPPM	GINI_M	YthUnptM	DivceRtM	P'snersM	ScdeRteM	CptnIndM
1990	87	82	58	0.75	7.12	64.42	6,019	0.485	5.4	7.2	44.4	2.3	-0.31
1991	87	83.07	59.5	0.75	7.15	64.42	6,373	0.485	5.4	7.13	47.7	2.4	-0.31
1992	87	84.14	61	0.75	7.23	64.42	6,633	0.485	5.4	7.05	50.4	2.6	-0.31
1993	87	85.21	62.5	0.75	7.31	64.42	6,793	0.485	5.4	6.98	51.3	2.7	-0.31
1994	87	86.29	64	0.75	7.39	64.42	7,117	0.485	7.1	6.9	50.2	2.9	-0.31
1995	87	87.36	65.5	0.75	7.46	64.42	6,691	0.485	9.6	6.83	57.1	3.2	-0.31
1996	87	88.43	67	0.75	7.43	64.42	7,058	0.485	7.7	6.75	64.1	3.3	-0.31
1997	87	89.5	68.5	0.75	7.62	64.42	7,552	0.485	6.4	6.68	71.1	3.6	-0.31
1998	87	90.57	70	0.75	7.7	64.42	7,899	0.485	5.4	6.6	78.3	3.5	-0.31
1999	87	91.64	71.5	0.75	7.78	64.42	8,208	0.485	3.4	6.6	84.2	3.4	-0.31
2000	87	92.71	73	0.75	7.92	64.42	8,815	0.485	4.4	7.4	92.9	3.5	-0.31
2001	87	93.79	74.5	0.75	7.93	64.42	8,885	0.485	4.1	8.6	99.21	3.8	-0.31
2002	87	94.86	76	0.75	8.01	64.42	8,977	0.485	4.9	9.8	106.22	3.97	-0.31
2003	87	95.93	77.5	0.75	8.09	64.42	9,137	0.485	5.3	10.8	113.24	4.1	-0.31
2004	87	97	79	0.75	8.16	64.42	9,645	0.485	6.4	11.88	120.26	4.24	-0.31

RIE Index Imputed Data - Mexico

Year	LawIndxM	GovEfIdM	PolStIdM	V&AindM	EmpRateM	AdUptRtM	LTUnptM	O_WkHrsM	JblessHM	RelPvRtM	RlPvEldM
1990	-0.57	0.04	-0.17	-0.77	50.6	2.1	1.6	25.31	3.47	20.99	30.56
1991	-0.55	0.04	-0.17	-0.69	60.5	2.2	1.5	22.68	3.45	20.99	30.56
1992	-0.53	0.04	-0.17	-0.6	61.4	2.3	1.5	20.06	3.44	20.99	30.56
1993	-0.5	0.04	-0.17	-0.52	62.2	2.5	1.4	17.43	3.42	20.99	30.56
1994	-0.48	0.04	-0.17	-0.43	62.9	3.3	1.4	14.8	3.41	20.99	30.56
1995	-0.46	0.04	-0.17	-0.35	60.7	4.4	1.3	-11	3.43	20.99	30.56
1996	-0.44	0.04	-0.17	-0.23	61.6	3.3	1.3	26	3.46	20.99	30.56
1997	-0.42	0.04	-0.17	-0.18	63.7	2.5	1.4	6.93	3.49	20.99	30.56
1998	-0.38	0.04	-0.17	-0.17	64.2	2.2	0.8	5	3.51	20.99	30.56
1999	-0.38	0.04	-0.17	0	63.9	1.8	1.7	1.67	3.54	20.99	30.56
2000	-0.38	0.04	-0.17	0.09	63.6	1.5	1.1	14	3.56	20.99	30.56
2001	-0.33	0.04	-0.17	0.17	62.9	1.6	1.1	-10	3.59	20.99	30.56
2002	-0.31	0.04	-0.17	0.36	63.0	1.8	0.9	14	3.62	20.99	30.56
2003	-0.29	0.04	-0.17	0.34	62.5	1.9	1.0	-17	3.64	20.99	30.56
2004	-0.26	0.04	-0.17	0.36	63.6	2.3	1.1	-26	3.67	20.99	30.56

RIE Index
Imputed Data - USA

Year	LexpU	InfMortU	HALEU	PhysU	PopnGwtU	FertRatU	CalorieU	FatConsU	SugConsU	SchLexpU	NetEnrlU	PbExpEdU	TSSM&EAU	PupilTcU
1990	75.3	9.2	67.6	2.04	1.13	2.08	3472	138.2	63	15.73	87.78	5.6	17.48	15.06
1991	75.5	8.9	67.78	2.07	1.34	2.06	3500	139.9	63.5	15.73	87.78	5.6	17.48	15.06
1992	75.7	8.5	67.96	2.09	1.39	2.05	3533	141.2	64.4	15.73	87.78	5.6	17.48	15.06
1993	75.5	8.4	67.78	2.1	1.32	2.02	3576	142.2	65.5	15.73	87.78	5.6	17.48	15.06
1994	75.7	8	67.96	2.1	1.23	2.00	3635	144	66.4	15.73	87.78	5.6	17.48	15.06
1995	75.7	7.6	67.96	2.2	1.19	1.98	3580	141	67.2	15.73	87.78	5.6	17.48	15.06
1996	76.1	7.3	68.31	2.2	1.16	1.98	3593	138.4	68.6	15.73	87.78	5.6	17.48	15.06
1997	76.5	7.2	68.67	2.3	1.20	1.97	3652	140.3	71	15.73	87.78	5.6	17.48	15.06
1998	76.7	7.2	68.85	2.3	1.17	2.00	3664	143.6	71.5	15.73	87.78	5.6	17.48	15.06
1999	76.7	7.1	68.85	2.2	1.15	2.01	3705	147.5	69.6	15.73	87.78	5.6	17.48	15.06
2000	76.8	6.9	68.94	2.3	1.13	2.06	3817	156	71.8	15.73	87.78	5.6	17.48	15.06
2001	77.1	6.8	69.21	2.4	1.09	2.03	3785	157.6	71.1	15.73	87.78	5.6	17.48	15.06
2002	77.2	7	69.3	2.3	1.06	2.01	3766	156.4	71.9	15.73	87.78	5.6	17.48	15.06
2003	77.5	6.9	69.57	2.4	0.84	2.04	3754	155.3	70.7	15.73	87.78	5.6	17.48	15.06
2004	77.6	6.7	69.66	2.4	0.97	2.04	3742	154.2	69.5	15.73	87.78	5.6	17.48	15.06

Note : The 'U' at the end of the variable code refers to the USA. For measurement unit please refer to Appendix A.

RIE Index Imputed Data - USA

Year	PISAsciU	R&DexpU	R&DrsrcU	HiTechXU	PatentsU	Sci&TArU	NFBtertU	HSkImmU	NtTyGnU	FstAreaU	AgLandU	ArblLanU	IrrigLnU
1990	495	2.65	7.73	33.68	189.86	767.39	3.55	13.86	3.6	32.81	46.62	20.28	11.13
1991	495	2.71	8.1	33.91	202.32	766.92	3.55	13.86	3.78	32.81	46.62	20.28	11.13
1992	495	2.64	8.04	34.35	203.71	775.26	3.55	13.86	3.96	32.81	46.45	20.1	11.49
1993	495	2.52	8.2	33.19	204.82	759.46	3.55	13.86	4.14	32.81	46.18	19.97	11.62
1994	495	2.42	8.35	33.06	213.08	759.21	3.55	13.86	4.32	32.81	45.98	19.88	11.78
1995	495	2.51	8.1	32.8	209.33	761.94	3.55	13.86	4.5	32.81	45.87	19.88	11.84
1996	495	2.55	8.67	33.22	226.82	749.08	3.55	13.86	4.68	32.81	45.45	19.57	12.13
1997	495	2.58	8.8	33.46	226.32	724.47	3.55	13.86	4.86	32.81	45.3	19.44	12.65
1998	495	2.62	8.98	34.37	291.07	717.37	3.55	13.86	5.04	32.81	45.18	19.35	12.66
1999	495	2.66	9.3	35.53	300.7	711.45	3.55	13.86	5.22	32.81	44.99	19.22	12.7
2000	495	2.74	9.3	35.29	301.43	711.30	3.55	13.86	5.4	32.81	44.99	19.22	12.66
2001	495	2.76	9.5	34.26	307.05	704.02	3.55	13.86	5.58	32.81	44.81	19.04	12.73
2002	495	2.65	9.6	33.46	301.61	697.5	3.55	13.86	5.76	32.81	44.71	18.96	12.74
2003	495	2.68	9.76	32.62	302.26	690.61	3.55	13.86	5.94	32.81	44.69	18.94	12.75
2004	495	2.68	9.92	32.29	286.97	683.72	3.55	13.86	6.12	32.81	44.67	18.92	12.76

RIE Index
Imputed Data - USA

Year	FertConU	TractUsU	AgPdnInU	FdPdnInU	GDPEgUsU	RbleEgSU	ElecConU	FWaterAU	InGdWtAU	WtrWdlU	OrgWtPtU	FishCapU
1990	1,000.69	40.8	93	92.4	3.67	5.2	11,713.33	7.01	5.21	17.1	10.32	5.95
1991	1,011.30	41.3	91.3	90.1	3.64	5.4	12,134.17	6.92	5.14	17.1	9.91	5.6
1992	1,031.39	41.6	98.3	97.9	3.71	5.6	12,014.96	6.83	5.07	17.1	9.89	5.54
1993	1,112.62	41.2	89.1	88.4	3.75	5.3	12,261.52	6.74	5	17.1	9.81	5.67
1994	1,059.77	40.9	101.6	100.7	3.83	5.2	12,455.16	6.65	4.94	17.1	9.72	5.25
1995	1,100.45	40.8	94.6	94.1	3.85	5.3	12,659.61	6.58	4.88	17.1	9.78	4.83
1996	1,133.03	40	98	97.3	3.89	5.4	12,845.92	6.5	4.83	17.1	9.64	4.48
1997	1,132.61	39.6	100.7	100	4.01	5.2	12,876.93	6.42	4.77	17.1	9.69	4.41
1998	1,115.71	39.1	99.6	100.2	4.11	5.1	13,168.18	6.35	4.71	17.1	9.64	4.36
1999	1,111.45	38.5	100.2	100.3	4.16	4.9	13,281.30	6.28	4.66	17.1	9.4	4.11
2000	1,115.78	38.1	101.2	101.6	4.16	4.8	13,667.43	6.2	4.61	17.1	7.15	3.96
2001	1,124.68	37.4	98.6	98.1	4.29	4.3	13,029.89	6.14	4.56	17.1	6.26	4.16
2002	1,111.30	36.9	96.7	97	4.35	4.3	13,125.88	6.07	4.51	17.1	5.1	3.64
2003	1117.11	36.9	98.2	98.4	4.51	4.5	13,078.35	6.02	4.47	17.1	3.92	3.45
2004	1117.55	36.9	103.1	102.4	4.68	4.5	13,030.99	5.96	4.43	17.1	3.74	3.26

RIE Index
Imputed Data - USA

Year	FishConU	NBI_U	ThtMammU	ThtBirdU	NtDmCdtU	DmCdtBnU	FDINInfU	NetLndU	MktCptU	StksTdU	Real_IRU	RealXRtU	M&TeqpU
1990	21.6	0.68	7.43	6.99	18,374	124.38	0.84	-572.46	53.15	30.42	5.91	87.29	31.12
1991	21.6	0.68	7.55	7.12	18,299	127.59	0.39	-251.01	68.78	36.72	4.8	85.68	31.07
1992	21.6	0.68	7.66	7.24	18,538	130.63	0.32	-546.56	71.42	33.11	3.86	83.88	30.85
1993	21.6	0.68	7.78	7.36	19,001	135.81	0.78	-812.56	77.77	50.8	3.62	85.08	31.36
1994	21.6	0.68	7.9	7.48	19,763	136.05	0.66	-947.83	72.21	50.79	4.93	85.22	32.2
1995	21.6	0.68	8.02	7.61	20,946	144.83	0.79	-725.18	93.4	69.58	6.65	83.95	32.41
1996	21.6	0.68	8.1	7.69	21,842	150.57	1.11	-722.73	109.3	91.74	6.25	86.57	32.04
1997	21.6	0.68	8.26	7.85	23,310	159.36	1.28	-667.14	137.06	123.82	6.66	91.02	31.69
1998	21.6	0.68	8.38	7.97	25,280	173.79	2.06	-628.96	154.71	151.23	7.16	98.24	31.34
1999	21.6	0.68	8.5	8.1	26,735	186.15	3.14	-870.84	180.5	201.54	6.46	96.96	30.99
2000	21.6	0.68	8.62	8.22	29,012	188.75	3.29	-957.75	154.68	326.3	6.9	100.00	30.64
2001	21.6	0.68	8.74	8.34	30,709	193.42	1.66	-987.67	137.5	288.22	4.41	105.69	30.29
2002	21.6	0.68	9.03	8.62	32,381	192.1	0.77	-1,521.31	106.36	243.14	2.97	105.80	29.76
2003	21.6	0.68	8.98	8.58	33,800	207.29	0.61	-1,940.79	130.27	141.97	2.25	99.59	29.75
2004	21.6	0.68	8.97	8.59	35,769	215.48	0.91	-2,444.70	139.38	165.26	1.66	95.37	29.74

RIE Index
Imputed Data - USA

Year	GFCF_McU	TphnMaiU	PCsU	RadiosU	TVsetsU	NewspapU	ICT_ExpU	AirTpFtU	Air_PasU	ConPtTfU	RaRdGdU
1990	6.4	545.28	217.13	2128.7	776	222.42	7.3	14,791.40	1,861,103.00	106515.8	3,074,312.63
1991	6	551.08	233.22	2125.5	774.4	218	7.42	14,486.20	1,786,758.00	106515.8	3,106,418.50
1992	6	558.81	251.45	2120.2	772.8	217.41	7.53	15,617.60	1,820,427.00	106515.8	3,234,679.38
1993	6.4	569.82	270.08	2118.6	778.8	214.91	7.65	16,343.00	1,807,971.00	106515.8	3,372,798.25
1994	6.7	583.17	294.54	2117.8	808	212.4	7.77	19,083.80	1,956,948.00	106515.8	3,602,601.25
1995	7.1	599.88	324.1	2099.3	814.9	209.9	7.89	19,622.90	2,003,591.00	106515.8	3,685,103.25
1996	7.2	612.66	358.58	2115.9	827.8	212	8	21,676.40	2,119,839.00	106515.8	3,552,118.60
1997	7.2	632.49	399.77	2109	839.9	205.59	8.12	25,478.80	2,165,987.00	106515.8	3,505,558.25
1998	7.3	651.87	449.51	2096.24	837.4	201.41	8.24	25,757.90	2,132,182.00	106515.8	3,688,816.20
1999	7.4	657.69	505.3	2091.9	835	198.52	8.35	27,292.20	2,273,382.00	106515.8	3,757,165.00
2000	7.4	682.13	570.47	2078.7	835	196.3	8.47	30,166.00	2,350,395.00	106515.8	3,741,899.25
2001	6.6	671.87	623.87	2083.22	869.9	194.86	8.7	27,920.00	2,172,446.00	106515.8	3893862.6
2002	5.8	656.76	658.88	2078.88	882	192.36	8.55	31,761.90	2,075,155.00	106515.8	3962211.4
2003	5.6	629.42	687.73	2074.54	899.45	189.85	8.79	35,124.76	2,122,697.00	106515.8	4,030,560.20
2004	6	605.97	749.18	2070.2	917.04	187.35	9.01	37,450.12	2,309,205.00	106515.8	4098909

RIE Index Imputed Data - USA

Year	RailPasU	RdVhclU	SulphOxU	NitOxU	CarbMonU	CbDxEmU	CbDxTEmU	EcoFPtU	FnCnExpU	DefExpU	RoadPvdU	GFCF_U	AvNoOccU
1990	39,651.80	24.82	84	91	522	20.04	23.4	9.6	84.55	2140.04	59.14	11	2.66
1991	38,897.13	24.4	80	89	498	19.59	23.31	9.6	84.67	2242.71	59.14	10.2	2.67
1992	38,901.49	23.57	78	89	476	19.73	23.86	9.6	85.56	2345.39	59.14	10.2	2.67
1993	39,473.97	23.42	76	88	452	19.86	24.04	9.6	85.86	2443.44	59.14	10.3	2.67
1994	39,498.75	25.04	74	86	429	19.88	24.19	9.6	85.09	2555.95	59.14	10.5	2.68
1995	39,202.38	25.23	63	84	409	19.86	24.02	9.6	84.25	2656.92	59.14	10.6	2.65
1996	40,185.46	26.03	62	82	385	20.32	24.34	9.6	83.73	2752.04	59.14	11	2.66
1997	40,671.39	25.98	63	82	370	20.33	24.22	9.6	82.57	2947.57	59.14	11.4	2.65
1998	40,510.13	26.38	62	80	358	20.23	24.44	9.6	82	3138.76	59.14	11.8	2.64
1999	40682.82	26.28	57	74	338	20.25	24.39	9.6	82.29	3305.72	59.14	12.2	2.63
2000	40855.52	26.76	52	72	329	20.60	24.38	9.6	82.47	3574.09	59.14	12.5	2.63
2001	41028.21	27.54	51	68	313	20.14	23.8	9.6	84.08	3760.26	59.14	12.6	2.56
2002	41200.9	27.88	48	65	304	20.01	23.55	9.6	86.11	3963.5	59.14	12.1	2.56
2003	41373.59	28.02	44.38	65.96	270.07	20.00	22.63	9.6	86.98	4169.57	59.14	12.4	2.53
2004	41546.29	28.35	41.38	63.85	251.7	20.18	21.86	9.6	87.2	4375.64	59.14	12.7	2.54

RIE Index
Imputed Data -
USA

Year	HseStckU	PopAcDgU	PopAcWtU	PopAcSnU	GpMembU	LifeSatU	HholdWkU	GNI_PPPU	GINI_U	YthUnptU	DivceRtU	P'snersU	ScdeRteU
1990	0.43	97.5	100	100	2.43	7.45	25.24	23,029	0.339	11.2	48.95	393.2	12.4
1991	0.43	97.5	100	100	2.43	7.44	25.24	23,472	0.338	13.4	48.95	401.0	12.2
1992	0.42	97.5	100	100	2.43	7.43	25.24	24,472	0.346	14.2	48.95	408.8	12
1993	0.43	97.5	100	100	2.43	7.43	25.24	25,371	0.35	13.4	48.95	416.6	12.1
1994	0.43	97.5	100	100	2.43	7.42	25.24	26,630	0.355	12.5	48.95	424.4	11.9
1995	0.43	97.5	100	100	2.43	7.41	25.24	27,533	0.357	12.1	48.95	432.2	11.6
1996	0.43	97.5	100	100	2.43	7.41	25.24	28,771	0.36	12	48.95	440.1	11.4
1997	0.43	97.5	100	100	2.43	7.41	25.24	30,216	0.372	11.3	48.95	447.9	11.3
1998	0.43	97.5	100	100	2.43	7.4	25.24	31,472	0.371	10.4	48.95	452.9	10.7
1999	0.44	97.5	100	100	2.43	7.4	25.24	32,979	0.37	9.9	48.95	469.1	10.4
2000	0.43	97.5	100	100	2.43	7.39	25.24	34,548	0.368	9.3	48.95	468.5	10.8
2001	0.44	97.5	100	100	2.43	7.38	25.24	35,262	0.367	10.6	48.95	479.1	11
2002	0.44	97.5	100	100	2.43	7.38	25.24	36,132	0.366	12	48.95	486.91	11.3
2003	0.44	97.5	100	100	2.43	7.37	25.24	37,602	0.364	12.4	48.95	494.72	11.6
2004	0.45	97.5	100	100	2.43	7.37	25.24	39,824	0.363	11.8	48.95	502.53	11.9

RIE Index Imputed Data - USA

Year	CptnIndU	LawIndxU	GovEfIdU	PolStIdU	V&AindU	EmpRateU	AdUptRtU	LTUnptU	O_WkHrsU	JblessHU	RelPvRtU	RlPvEldU
1990	1.81	1.98	1.82	0.83	1.73	72.3	4.6	5.5	6	6.74	16.91	22.61
1991	1.81	1.95	1.82	0.87	1.7	70.9	5.7	6.3	-4	6.63	16.91	22.61
1992	1.81	1.92	1.82	0.92	1.66	70.6	6.4	11.1	-2	6.53	16.91	22.61
1993	1.81	1.89	1.82	0.96	1.62	70.8	5.8	11.5	5	6.42	16.91	22.61
1994	1.81	1.86	1.82	1	1.59	71.5	5	12.2	9	6.31	16.91	22.61
1995	1.81	1.83	1.82	1.04	1.55	71.7	4.5	9.7	18	6.20	16.91	22.61
1996	1.81	1.79	1.82	1.06	1.53	71.8	4.3	9.5	9	5.94	16.91	22.61
1997	1.81	1.78	1.82	1.13	1.48	72.3	3.9	8.7	20	5.68	16.91	22.61
1998	1.81	1.77	1.82	1.18	1.41	72.3	3.5	8.0	19	5.42	16.91	22.61
1999	1.81	1.72	1.82	1.21	1.4	72.4	3.2	6.8	18	5.15	16.91	22.61
2000	1.81	1.69	1.82	1.3	1.37	73.3	3.1	6.0	3	4.89	16.91	22.61
2001	1.81	1.66	1.82	1.29	1.33	72.3	3.8	6.1	-19	4.88	16.91	22.61
2002	1.81	1.62	1.82	0.21	1.32	71.2	4.8	8.5	-25	4.7	16.91	22.61
2003	1.81	1.6	1.82	1.38	1.26	70.9	5	11.8	-33	4.51	16.91	22.61
2004	1.81	1.58	1.82	1.42	1.21	70.9	4.6	12.7	-31	4.33	16.91	22.61

VOLUME 2
Appendix C: RIE Index Standardised Data

RIE Index
Standardised
Data - Australia

Year	LexpA	InfMortA	HALEA	PhysA	PopnGwtA	FertRatA	CalorieA	FatConsA	SugConsA	SchLexpA	NetEnrlA	PbExpEdA	TSSM&EA
1990	0.838	0.609	0.849	0.726	-0.053	-0.685	0.067	-0.533	0.785	0.957	0.558	-0.873	-0.082
1991	0.973	0.678	0.943	0.881	-0.605	-0.750	0.463	-0.401	1.029	0.957	0.558	-0.873	-0.082
1992	1.006	0.684	0.967	1.037	-0.789	-0.698	0.844	-0.248	0.678	0.957	0.558	-0.873	-0.082
1993	1.174	0.741	1.087	1.037	-1.393	-0.737	0.970	-0.328	1.442	0.957	0.558	-0.873	-0.082
1994	1.174	0.753	1.087	1.037	0.394	-0.764	0.940	-0.292	1.671	0.957	0.558	-0.873	-0.082
1995	1.140	0.766	1.061	1.192	-2.235	-0.803	0.649	-0.325	1.121	0.957	0.558	-0.873	-0.082
1996	1.241	0.760	1.134	1.037	-0.499	-0.829	0.714	-0.395	1.579	0.957	0.558	-0.873	-0.082
1997	1.342	0.791	1.205	1.037	-0.999	-0.868	0.739	-0.322	0.999	0.957	0.558	-0.873	-0.082
1998	1.409	0.810	1.252	1.037	-1.236	-0.881	1.095	-0.316	1.136	0.957	0.558	-0.873	-0.082
1999	1.509	0.766	1.323	1.037	-0.946	-0.894	1.045	-0.430	1.778	0.957	0.558	-0.873	-0.082
2000	1.610	0.797	1.393	1.192	-0.815	-0.894	0.990	-0.553	1.595	0.957	0.558	-0.873	-0.082
2001	1.744	0.791	1.490	1.192	-0.394	-0.921	0.684	-0.612	1.503	0.957	0.558	-0.873	-0.082
2002	1.845	0.810	1.561	1.192	-0.868	-0.894	0.885	-0.418	1.457	0.957	0.558	-0.873	-0.082
2003	1.945	0.823	1.631	1.348	-0.868	-0.868	0.659	-0.448	1.258	0.957	0.558	-0.873	-0.082
2004	2.012	0.829	1.679	1.504	-0.815	-0.894	0.428	-0.477	1.060	0.957	0.558	-0.873	-0.082

Note: The 'A' at the end of the variable code refers to Australia.

RIE Index Standardised Data - Australia

Year	PupilTcA	PISAsciA	R&DexpA	R&DrsrcA	HiTechXA	PatentsA	Sci&TArA	NFBtertA	HSkImmA	NtTyGnA	FstAreaA	AgLandA	ArblLanA
1990	0.238	0.826	-0.048	0.254	-0.441	-0.233	0.391	1.019	1.029	1.059	-1.138	0.968	-0.966
1991	0.269	0.826	0.064	0.451	-0.373	-0.283	0.382	1.019	1.029	1.085	-1.138	0.941	-1.007
1992	0.299	0.826	0.120	0.574	-0.330	-0.330	0.465	1.019	1.029	1.111	-1.138	1.000	-0.980
1993	0.330	0.826	0.096	0.531	-0.255	-0.307	0.516	1.019	1.029	1.137	-1.138	0.890	-0.996
1994	0.360	0.826	0.176	0.654	-0.145	-0.267	0.605	1.019	1.029	1.163	-1.138	1.055	-0.892
1995	0.404	0.826	0.128	0.611	-0.166	-0.379	0.679	1.019	1.029	1.189	-1.138	0.947	-0.998
1996	0.418	0.826	0.240	0.734	-0.170	-0.410	0.727	1.019	1.029	1.215	-1.138	0.983	-0.890
1997	0.447	0.826	0.160	0.691	-0.213	-0.428	0.711	1.019	1.029	1.241	-1.138	0.925	-0.929
1998	0.447	0.826	0.112	0.734	-0.221	-0.229	0.793	1.019	1.029	1.267	-1.138	0.955	-0.862
1999	0.534	0.826	0.192	0.771	-0.209	-0.328	0.833	1.019	1.029	1.293	-1.138	0.766	-0.966
2000	0.534	0.826	0.152	0.734	-0.199	-0.318	0.746	1.019	1.029	1.319	-1.138	0.799	-0.922
2001	0.578	0.826	0.224	0.851	-0.182	-0.306	0.732	1.019	1.029	1.345	-1.138	0.804	-0.913
2002	0.592	0.826	0.256	0.867	-0.110	-0.360	0.717	1.019	1.029	1.371	-1.138	0.641	-0.960
2003	0.636	0.826	0.256	0.931	-0.305	-0.345	0.703	1.019	1.029	1.397	-1.138	0.499	-0.971
2004	0.665	0.826	0.272	0.971	-0.314	-0.270	0.689	1.019	1.029	1.423	-1.138	0.361	-0.983

RIE Index Standardised Data - Australia

Year	IrrigLnA	FertConA	TractUsA	AgPdnInA	FdPdnInA	GDPEgUsA	RbleEgSA	ElecConA	FWaterAA	InGdWtAA	WtrWdlA	OrgWtPtA
1990	-0.936	1.017	-1.054	-1.142	-1.131	0.351	-0.448	-0.245	1.143	0.285	1.145	-0.636
1991	-0.871	0.916	-0.938	-1.736	-1.589	0.311	-0.385	-0.248	1.115	0.257	1.145	-0.555
1992	-0.873	0.865	-1.031	-1.300	-0.808	0.244	-0.573	-0.257	1.089	0.230	1.145	-0.431
1993	-0.855	0.796	-0.981	-0.805	-0.350	0.324	-0.417	-0.284	1.069	0.208	1.145	0.435
1994	-0.845	0.780	-1.300	-2.488	-1.562	0.071	-0.448	-0.295	1.034	0.170	1.145	0.437
1995	-0.783	0.590	-0.972	-1.003	-0.377	-0.089	-0.417	-0.338	1.021	0.153	1.145	0.445
1996	-0.850	0.635	-1.307	0.937	0.956	0.098	-0.354	-0.360	0.994	0.126	1.145	0.482
1997	-0.832	0.504	-1.192	0.561	0.579	-0.049	-0.292	-0.396	0.971	0.044	1.145	0.577
1998	-0.870	0.549	-1.395	1.432	1.252	-0.249	-0.385	-0.489	0.950	0.082	1.145	0.573
1999	-0.840	0.363	-1.079	2.323	1.939	-0.249	-0.448	-0.521	0.927	0.055	1.145	0.569
2000	-0.835	0.464	-1.214	1.749	1.467	-0.235	-0.448	-0.544	0.904	0.033	1.145	0.569
2001	-0.823	0.419	-1.243	2.224	1.979	-0.555	-0.417	-0.602	0.877	0.005	1.145	0.571
2002	-0.776	0.412	-1.101	-1.201	-0.215	-0.555	-0.417	-0.679	0.854	-0.016	1.145	0.567
2003	-0.768	0.404	-1.063	0.680	1.319	-0.742	-0.510	-0.668	0.832	-0.044	1.145	0.559
2004	-0.760	0.397	-1.025	-0.290	0.337	-0.928	-0.635	-0.657	0.810	-0.066	1.145	0.555

RIE Index Standardised Data - Australia

Year	FishCapA	FishConA	NBI_A	ThtMammA	ThtBirdA	NtDmCdtA	DmCdtBnA	FDINInfA	NetLndA	MktCptA	StksTdA	Real_IRA	RealXRtA
1990	0.761	-0.260	0.235	-1.102	0.633	0.471	-0.133	1.152	-0.725	-0.075	0.234	-0.823	1.133
1991	0.755	-0.271	0.235	-1.144	0.554	0.508	-0.117	-0.115	-0.029	-0.661	0.092	-0.336	1.031
1992	0.751	-0.316	0.235	-1.186	0.475	0.639	-0.072	0.351	-0.552	-0.627	0.104	0.249	0.557
1993	0.755	-0.362	0.235	-1.227	0.396	0.740	-0.059	-0.054	-0.752	-1.664	-0.480	0.492	0.219
1994	0.768	-0.407	0.235	-1.269	0.312	0.901	-0.012	-0.024	-2.756	-1.476	-0.879	0.591	0.421
1995	0.768	-0.390	0.235	-1.311	0.233	1.118	0.047	1.791	-1.502	-1.590	-0.802	0.543	0.349
1996	0.771	-0.500	0.235	-1.391	0.154	1.364	0.139	0.027	-0.781	-2.057	-1.459	0.396	0.746
1997	0.774	-0.546	0.235	-1.394	0.075	1.483	0.127	0.372	-1.683	-1.849	-1.926	0.751	0.701
1998	0.768	-0.591	0.235	-1.435	-0.009	1.797	0.235	0.139	-3.378	-2.709	-2.090	0.606	0.307
1999	0.768	-0.637	0.235	-1.478	-0.088	2.069	0.304	-0.662	-3.113	-3.568	-2.456	1.101	0.329
2000	0.774	-0.682	0.235	-1.405	-0.207	2.347	0.338	2.064	-0.793	-3.071	-3.223	1.572	0.134
2001	0.774	-0.758	0.235	-1.561	-0.246	2.621	0.373	0.777	-0.972	-3.340	-3.743	1.142	-0.021
2002	0.778	-0.775	0.235	-1.680	-0.252	3.159	0.532	2.855	-4.006	-2.864	-4.221	1.328	0.193
2003	0.778	-0.821	0.235	-1.646	-0.409	3.569	0.590	0.402	-4.867	-3.797	-4.113	1.362	0.720
2004	0.781	-0.866	0.235	-1.686	-0.528	4.127	0.712	5.257	-6.134	-4.328	-4.917	1.282	1.095

RIE Index Standardised Data - Australia

Year	M&TeqpA	GFCF_McA	TphnMaiA	PCsA	RadiosA	TVsetsA	NewspapA	ICT_ExpA	AirTpFtA	Air_PasA	ConPtTfA	RaRdGdA	RailPasA
1990	-0.900	-0.132	0.395	0.232	0.051	0.124	0.237	0.322	-0.510	0.009	1.033	-0.193	-0.680
1991	-1.050	-0.450	0.431	0.332	0.058	0.194	0.199	0.322	-0.483	0.289	1.033	-0.191	-0.678
1992	-0.852	-0.132	0.456	0.553	0.064	0.262	0.162	0.322	-0.467	0.408	1.033	-0.189	-0.676
1993	-0.772	0.026	0.501	0.773	0.074	0.357	0.124	0.322	-0.448	0.597	1.033	-0.187	-0.675
1994	-0.693	0.742	0.538	1.066	0.076	0.444	0.086	0.322	-0.434	0.575	1.033	-0.186	-0.673
1995	-0.615	0.662	0.536	1.411	0.077	0.683	0.048	0.322	-0.424	0.681	1.033	-0.184	-0.671
1996	-0.535	0.503	0.569	1.542	0.157	0.688	0.011	0.322	-0.412	0.736	1.033	-0.182	-0.669
1997	-0.456	0.662	0.616	1.916	0.308	0.689	-0.027	0.322	-0.398	0.771	1.033	-0.179	-0.668
1998	-0.376	0.424	0.604	2.285	0.412	0.708	-0.062	0.322	-0.404	0.702	1.033	-0.179	-0.666
1999	-0.297	0.503	0.627	2.791	0.562	0.716	-0.109	0.322	-0.429	0.767	1.033	-0.177	-0.665
2000	-0.219	0.265	0.723	3.233	0.707	0.806	-0.137	0.322	-0.424	0.806	1.033	-0.175	-0.660
2001	-0.140	0.185	0.722	3.657	0.735	0.791	-0.178	0.322	-0.430	0.833	1.033	-0.174	-0.660
2002	-0.055	0.583	0.781	4.126	0.793	0.780	-0.216	0.322	-0.446	1.144	1.033	-0.172	-0.659
2003	0.023	0.670	0.768	4.489	0.795	0.768	-0.253	0.322	-0.467	0.960	1.033	-0.170	-0.656
2004	0.099	0.726	0.724	5.224	0.797	0.756	-0.291	0.322	-0.405	1.243	1.033	-0.171	-0.656

RIE Index Standardised Data - Australia

Year	RdVhclA	SulphOxA	NitOxA	CarbMonA	CbDxEmA	CbDxTEmA	EcoFPtA	FnCnExpA	DefExpA	RoadPvdA	GFCF_A	AvNoOccA
1990	1.147	-0.704	-0.470	-0.065	-0.286	0.584	-0.159	-0.338	0.561	-0.581	1.083	0.473
1991	1.103	-0.726	-0.424	0.032	-0.266	0.583	-0.159	0.585	0.553	-0.531	1.083	0.488
1992	1.225	-0.835	-0.401	0.081	-0.328	0.579	-0.159	-0.024	0.544	-0.480	1.083	0.503
1993	1.078	-0.879	-0.401	0.105	-0.339	0.578	-0.159	0.987	0.538	-0.430	1.083	0.533
1994	1.128	-0.923	-0.424	0.134	-0.304	0.579	-0.159	-0.240	0.525	-0.372	1.083	0.556
1995	1.125	-0.770	-0.401	0.153	-0.319	0.579	-0.159	-0.338	0.521	-0.322	1.083	0.563
1996	1.093	-0.813	-0.447	0.183	-0.378	0.577	-0.159	-0.740	0.509	-0.315	1.083	0.556
1997	0.963	-0.770	-0.540	0.183	-0.541	0.568	-0.159	-0.732	0.505	-0.315	1.083	0.571
1998	1.047	-0.748	-0.586	0.192	-0.558	0.566	-0.159	-0.473	0.500	-0.315	1.083	0.586
1999	0.992	-0.835	-0.563	0.231	-0.644	0.562	-0.159	-0.772	0.506	-0.315	1.083	0.593
2000	1.054	-1.383	-0.563	0.279	-0.637	0.564	-0.159	-0.546	0.512	-0.308	1.083	0.608
2001	1.124	-1.449	-0.540	0.367	-0.696	0.561	-0.159	-0.842	0.518	-0.308	1.083	0.608
2002	1.189	-1.734	-0.563	0.357	-0.721	0.560	-0.159	-0.747	0.524	-0.308	1.083	0.616
2003	1.255	-1.866	-0.586	0.386	-0.685	0.567	-0.159	-0.886	0.531	-0.308	1.083	0.638
2004	1.322	-2.041	-0.609	0.415	-0.750	0.568	-0.159	-0.707	0.537	-0.301	1.083	0.646

RIE Index Standardised Data - Australia

Year	HseStckA	PopAcDgA	PopAcWtA	PopAcSnA	GpMembA	LifeSatA	HholdWkA	GNI_PPPA	GINI_A	YthUnptA	DivceRtA	P'snersA
1990	0.369	0.577	0.577	0.577	0.756	-0.972	-0.522	0.112	0.754	-0.806	-0.259	0.495
1991	0.448	0.577	0.577	0.577	0.756	-0.677	-0.522	0.157	0.754	-1.769	-0.442	0.485
1992	0.448	0.577	0.577	0.577	0.756	-0.349	-0.522	0.249	0.754	-2.361	-0.486	0.475
1993	0.448	0.577	0.577	0.577	0.756	-0.055	-0.522	0.354	0.754	-2.139	-0.531	0.464
1994	0.448	0.577	0.577	0.577	0.756	0.240	-0.522	0.453	0.754	-1.547	-0.586	0.454
1995	0.448	0.577	0.577	0.577	0.756	0.469	-0.522	0.579	0.754	-1.103	-0.679	0.443
1996	0.448	0.577	0.577	0.577	0.756	0.862	-0.522	0.681	0.754	-1.201	-0.871	0.436
1997	0.448	0.577	0.577	0.577	0.756	1.157	-0.522	0.803	0.754	-1.473	-0.805	0.423
1998	0.448	0.577	0.577	0.577	0.756	1.485	-0.522	0.941	0.754	-1.028	-0.731	0.414
1999	0.527	0.577	0.577	0.577	0.756	1.779	-0.522	1.050	0.754	-0.757	-0.707	0.386
2000	0.527	0.577	0.577	0.577	0.756	2.074	-0.522	1.136	0.754	-0.461	-0.614	0.402
2001	0.527	0.577	0.577	0.577	0.756	2.827	-0.522	1.279	0.754	-0.732	-1.062	0.380
2002	0.527	0.577	0.577	0.577	0.756	2.500	-0.522	1.391	0.754	-0.683	-0.950	0.370
2003	0.606	0.577	0.577	0.577	0.756	2.827	-0.522	1.531	0.754	-0.411	-0.889	0.360
2004	0.606	0.577	0.577	0.577	0.756	3.286	-0.522	1.678	0.754	-0.436	-1.020	0.349

RIE Index Standardised Data - Australia

Year	ScdeRteA	CptnIndA	LawIndxA	GovEfIdA	PolStIdA	V&AindA	EmpRateA	AdUptRtA	LTUnptA	O_WkHrsA	JblessHA	RelPvRtA	RlPvEldA
1990	-0.619	0.653	0.550	0.615	0.726	0.660	0.421	-0.726	-1.135	0.045	-1.087	1.070	0.806
1991	-0.669	0.653	0.550	0.615	0.773	0.634	0.223	-2.095	-1.447	1.391	-1.122	1.070	0.806
1992	-0.619	0.653	0.550	0.615	0.819	0.608	0.129	-2.717	-2.349	2.219	-1.156	1.070	0.806
1993	-0.385	0.653	0.550	0.615	0.866	0.582	0.112	-2.903	-2.536	-0.369	-1.191	1.070	0.806
1994	-0.602	0.653	0.550	0.615	0.913	0.556	0.232	-2.281	-2.519	-0.886	-1.225	1.070	0.806
1995	-0.468	0.653	0.550	0.615	0.959	0.530	0.386	-1.659	-1.994	-0.576	-1.216	1.070	0.806
1996	-0.669	0.653	0.550	0.615	1.021	0.490	0.386	-1.721	-1.773	0.459	-1.206	1.070	0.806
1997	-0.853	0.653	0.550	0.615	1.053	0.471	0.378	-1.659	-1.984	0.563	-1.196	1.070	0.806
1998	-0.819	0.653	0.550	0.615	1.084	0.445	0.438	-1.348	-2.350	1.080	-1.187	1.070	0.806
1999	-0.652	0.653	0.550	0.615	1.146	0.418	0.464	-0.975	-1.941	0.666	-1.177	1.070	0.806
2000	-0.552	0.653	0.550	0.615	1.208	0.412	0.541	-0.726	-1.836	1.184	-1.167	1.070	0.806
2001	-0.585	0.653	0.550	0.615	1.068	0.366	0.524	-0.850	-1.097	3.047	-1.157	1.070	0.806
2002	-0.435	0.653	0.550	0.615	0.928	0.340	0.558	-0.726	-1.181	4.392	-1.149	1.070	0.806
2003	-0.318	0.653	0.550	0.615	0.835	0.314	0.609	-0.539	-1.219	5.427	-1.138	1.070	0.806
2004	-0.201	0.653	0.550	0.615	0.726	0.275	0.661	-0.166	-1.047	5.220	-1.128	1.070	0.806

RIE Index Standardised Data - Mexico

Year	LexpM	InfMortM	HALEM	PhysM	PopnGwtM	FertRatM	CalorieM	FatConsM	SugConsM	SchLexpM	NetEnrlM	PbExpEdM	TSSM&EM
1990	-1.107	-1.154	-1.102	-1.141	1.025	1.148	0.965	1.154	0.341	-1.038	-1.154	-0.218	1.039
1991	-0.906	-0.902	-0.964	-0.830	0.973	1.004	0.804	0.981	0.876	-1.000	-1.089	-0.218	1.039
1992	-0.838	-0.820	-0.919	-0.518	0.894	1.004	0.719	0.983	0.769	-0.962	-1.024	-0.218	1.039
1993	-0.738	-0.739	-0.848	-0.518	0.841	0.729	0.634	0.931	0.647	-0.924	-0.958	-0.218	1.039
1994	-0.637	-0.669	-0.780	-0.363	0.762	0.676	0.629	0.910	0.815	-0.886	-0.893	-0.218	1.039
1995	-0.604	-0.613	-0.757	-0.363	0.710	0.585	0.779	0.960	0.937	-0.848	-0.828	-0.218	1.039
1996	-0.570	-0.556	-0.736	-0.363	0.131	0.415	0.624	0.884	0.830	-0.812	-0.762	-0.218	1.039
1997	-0.436	-0.512	-0.644	-0.363	-0.131	0.271	0.819	0.863	1.320	-0.774	-0.697	-0.218	1.039
1998	-0.402	-0.468	-0.621	-0.363	-0.263	0.179	0.729	0.872	0.999	-0.736	-0.632	-0.218	1.039
1999	-0.268	-0.411	-0.529	-0.363	-0.289	0.087	0.769	0.928	1.106	-0.698	-0.557	-0.218	1.039
2000	-0.168	-0.342	-0.459	-0.363	-0.210	-0.031	0.543	0.898	1.014	-0.656	-0.513	-0.218	1.039
2001	-0.067	-0.285	-0.391	-0.363	-1.209	-0.122	0.438	0.854	1.090	-0.632	-0.438	-0.218	1.039
2002	0.034	-0.222	-0.323	-0.363	-1.288	-0.214	0.373	0.787	0.922	-0.586	-0.372	-0.218	1.039
2003	0.134	-0.166	-0.255	-0.363	-1.288	-0.292	0.478	0.819	1.090	-0.535	-0.292	-0.218	1.039
2004	0.235	-0.115	-0.184	-0.207	-1.288	-0.305	0.584	0.852	1.258	-0.516	-0.245	-0.218	1.039

Note: The 'M' at the end of the variable code refers to Mexico.

RIE Index Standardised Data - Mexico

Year	PupilTcM	PISAsciM	R&DexpM	R&DrsrcM	HiTechXM	PatentsM	Sci&TArM	NFBtertM	HSkImmM	NtTyGnM	FstAreaM	AgLandM	ArblLanM
1990	-1.098	-1.112	-0.975	-1.103	-0.704	-0.863	-1.136	-0.980	-0.969	-0.929	0.737	0.061	-0.065
1991	-1.077	-1.112	-0.951	-1.095	-0.688	-0.864	-1.136	-0.980	-0.969	-0.947	0.737	0.107	-0.057
1992	-1.057	-1.112	-0.927	-1.089	-0.496	-0.847	-1.129	-0.980	-0.969	-0.966	0.737	0.159	-0.050
1993	-1.035	-1.112	-0.919	-1.105	-0.469	-0.839	-1.125	-0.980	-0.969	-0.984	0.737	0.235	-0.013
1994	-1.015	-1.112	-0.863	-1.079	-0.300	-0.846	-1.121	-0.980	-0.969	-1.003	0.737	0.296	0.006
1995	-0.995	-1.112	-0.847	-1.052	-0.209	-0.863	-1.115	-0.980	-0.969	-1.022	0.737	0.348	0.024
1996	-0.974	-1.112	-0.847	-1.052	-0.163	-0.866	-1.110	-0.980	-0.969	-1.040	0.737	0.348	0.021
1997	-0.953	-1.112	-0.823	-1.052	-0.036	-0.867	-1.107	-0.980	-0.969	-1.059	0.737	0.348	0.003
1998	-0.932	-1.112	-0.791	-1.079	0.089	-0.864	-1.099	-0.980	-0.969	-1.077	0.737	0.348	0.003
1999	-0.906	-1.112	-0.751	-1.052	0.198	-0.867	-1.092	-0.980	-0.969	-1.096	0.737	0.356	-0.006
2000	-0.896	-1.112	-0.799	-1.044	0.323	-0.867	-1.092	-0.980	-0.969	-1.114	0.737	0.356	-0.006
2001	-0.870	-1.112	-0.783	-1.039	0.294	-0.867	-1.087	-0.980	-0.969	-1.133	0.737	0.356	-0.006
2002	-0.854	-1.112	-0.767	-1.033	0.249	-0.865	-1.081	-0.980	-0.969	-1.152	0.737	0.356	-0.006
2003	-0.823	-1.112	-0.751	-1.028	0.246	-0.867	-1.077	-0.980	-0.969	-1.170	0.737	0.356	-0.006
2004	-0.808	-1.112	-0.735	-1.023	0.236	-0.863	-1.072	-0.980	-0.969	-1.189	0.737	0.356	-0.006

RIE Index Standardised Data - Mexico

Year	IrrigLnM	FertConM	TractUsM	AgPdnInM	FdPdnInM	GDPEgUsM	RbleEgSM	ElecConM	FWaterAM	InGdWtAM	WtrWdlM	OrgWtPtM	FishCapM
1990	1.054	-0.034	0.119	0.422	0.364	-1.128	1.146	1.100	-0.714	-1.111	-0.703	1.153	0.371
1991	1.131	-0.115	0.198	0.719	0.673	-1.088	1.114	1.097	-0.720	-1.128	-0.703	1.165	0.365
1992	1.239	-0.104	0.194	0.304	0.579	-1.195	1.177	1.096	-0.726	-1.144	-0.703	1.181	0.447
1993	1.206	-0.043	0.173	0.363	0.592	-1.328	1.239	1.091	-0.732	-1.161	-0.703	1.220	0.477
1994	1.191	-0.085	0.166	0.937	0.902	-1.435	0.896	1.075	-0.738	-1.177	-0.703	0.929	0.477
1995	1.178	-0.129	0.158	1.888	1.508	-1.301	1.239	1.072	-0.743	-1.188	-0.703	0.976	0.451
1996	1.151	-0.059	0.158	1.274	0.983	-1.421	1.208	1.057	-0.748	-1.205	-0.703	0.978	0.424
1997	1.199	-0.084	0.158	1.650	1.333	-1.568	0.989	1.037	-0.752	-1.216	-0.703	0.968	0.424
1998	1.200	-0.254	0.158	1.492	1.225	-1.595	0.896	1.032	-0.757	-1.226	-0.703	0.962	0.494
1999	1.208	-0.232	0.158	2.007	1.683	-1.741	0.958	1.019	-0.761	-1.237	-0.703	0.962	0.507
2000	1.217	-0.291	0.160	1.848	1.629	-2.181	0.989	1.001	-0.765	-1.248	-0.703	0.968	0.487
2001	1.225	-0.327	0.160	2.462	2.060	-2.074	0.864	1.001	-0.769	-1.259	-0.703	0.966	0.461
2002	1.225	-0.164	0.160	1.888	1.737	-1.914	0.677	0.997	-0.773	-1.270	-0.703	0.964	0.437
2003	1.225	-0.280	0.160	2.264	1.979	-1.821	0.677	1.002	-0.777	-1.281	-0.703	0.966	0.414
2004	1.225	-0.299	0.160	2.759	2.289	-1.728	0.771	1.006	-0.781	-1.292	-0.703	0.966	0.391

RIE Index Standardised Data - Mexico

Year	FishConM	NBI_M	ThtMammM	ThtBirdM	NtDmCdtM	DmCdtBnM	FDINInfM	NetLndM	MktCptM	StksTdM	Real_IRM	RealXRtM	M&TeqpM
1990	1.104	0.862	0.252	0.520	-1.149	-0.927	-0.510	1.141	1.035	0.862	-0.290	-0.759	-0.176
1991	1.154	0.862	0.211	0.453	-1.044	-0.921	0.037	0.625	0.115	0.449	-0.099	-0.424	-0.073
1992	1.230	0.862	0.169	0.391	-0.924	-0.864	-0.267	0.029	-0.229	0.284	0.089	-0.136	0.014
1993	1.306	0.862	0.129	0.329	-0.860	-0.857	-0.389	0.212	-0.798	0.039	0.724	0.121	-0.304
1994	1.381	0.862	0.088	0.267	-0.654	-0.705	1.142	-0.160	0.134	-0.279	0.130	-0.055	-0.470
1995	1.624	0.862	0.047	0.205	-0.525	-0.807	1.872	1.675	0.095	0.305	0.657	-1.284	-0.460
1996	1.537	0.862	0.007	0.160	-0.672	-1.152	1.304	1.616	0.077	0.233	1.497	-0.983	-0.087
1997	1.609	0.862	-0.036	0.075	0.200	-0.630	1.750	1.238	-0.266	0.224	1.627	-0.530	0.117
1998	1.687	0.862	-0.076	0.013	0.342	-0.707	1.497	0.597	0.578	0.599	0.244	-0.498	0.249
1999	1.762	0.862	-0.118	-0.049	0.455	-0.773	1.335	0.865	0.076	0.647	0.724	-0.181	0.200
2000	1.838	0.862	-0.162	-0.207	0.532	-0.880	1.487	0.673	0.590	0.623	1.502	0.134	0.345
2001	1.949	0.862	-0.200	-0.178	0.477	-0.891	3.017	0.789	0.651	0.726	0.963	0.394	0.449
2002	2.066	0.862	-0.239	-0.133	0.724	-0.831	0.919	1.061	0.867	0.891	2.260	0.403	0.543
2003	2.141	0.862	-0.283	-0.302	0.775	-0.854	0.453	1.328	0.706	0.936	2.892	-0.055	0.637
2004	2.217	0.862	-0.323	-0.398	0.909	-0.877	1.112	1.386	0.399	0.735	2.590	-0.206	0.733

RIE Index Standardised Data - Mexico

Year	GFCF_McM	TphnMaiM	PCsM	RadiosM	TVsetsM	NewspapM	ICT_ExpM	AirTpFtM	Air_PasM	ConPtTfM	RaRdGdM	RailPasM	RdVhclM
1990	1.060	-1.137	-1.096	-1.024	-1.056	-1.097	-1.121	-0.642	-1.005	-0.963	-0.889	-0.468	-0.461
1991	1.457	-1.111	-1.073	-1.035	-1.070	-1.110	-1.121	-0.606	-1.001	-0.963	-0.879	-0.499	-0.406
1992	1.934	-1.083	-1.031	-1.034	-0.953	-1.122	-1.121	-0.607	-0.996	-0.963	-0.872	-0.494	-0.359
1993	0.821	-1.050	-1.002	-1.033	-0.946	-1.134	-1.121	-0.608	-0.987	-0.963	-0.869	-0.568	-0.334
1994	1.060	-1.018	-0.952	-1.031	-0.937	-1.147	-1.121	-0.599	-0.960	-0.963	-0.856	-0.632	-0.311
1995	0.026	-1.011	-0.925	-1.029	-0.854	-1.159	-1.121	-0.607	-1.014	-0.963	-0.853	-0.630	-0.319
1996	1.060	-1.016	-0.878	-0.965	-0.796	-1.175	-1.121	-0.606	-1.021	-0.963	-0.848	-0.635	-0.303
1997	1.934	-1.004	-0.853	-0.955	-0.726	-1.184	-1.121	-0.599	-0.991	-0.963	-0.844	-0.635	-0.274
1998	2.808	-0.981	-0.828	-0.968	-0.703	-1.196	-1.121	-0.592	-0.988	-0.963	-0.843	-0.636	-0.241
1999	2.729	-0.946	-0.755	-0.958	-0.667	-1.194	-1.121	-0.588	-0.957	-0.963	-0.832	-0.638	-0.203
2000	2.570	-0.897	-0.627	-0.948	-0.632	-1.232	-1.121	-0.589	-0.956	-0.963	-0.826	-0.639	-0.155
2001	1.695	-0.847	-0.521	-0.938	-0.625	-1.233	-1.121	-0.591	-0.968	-0.963	-0.820	-0.640	-0.052
2002	1.060	-0.808	-0.395	-0.928	-0.629	-1.246	-1.121	-0.586	-0.978	-0.963	-0.814	-0.642	0.034
2003	0.742	-0.765	-0.256	-0.918	-0.633	-1.258	-1.121	-0.585	-0.981	-0.963	-0.808	-0.643	0.067
2004	0.424	-0.708	-0.160	-0.908	-0.654	-1.270	-1.121	-0.579	-0.966	-0.963	-0.802	-0.644	0.128

RIE Index Standardised Data - Mexico

Year	SulphOxM	NitOxM	CarbMonM	CbDxEmM	CbDxTEmM	EcoFPtM	FnCnExpM	DefExpM	RoadPvdM	GFCF_M	AvNoOccM	HseStckM	PopAcDgM
1990	1.145	1.148	1.031	1.112	0.571	1.070	-0.787	0.594	-0.574	-0.888	-1.149	-1.132	-1.155
1991	1.145	1.148	1.049	1.108	0.568	1.070	-0.170	0.590	-0.559	-0.818	-1.066	-1.053	-1.155
1992	1.145	1.148	1.078	1.112	0.566	1.070	0.611	0.586	-0.545	-0.680	-0.976	-0.974	-1.155
1993	1.145	1.148	1.107	1.115	0.566	1.070	1.140	0.583	-0.509	-0.542	-0.901	-0.974	-1.155
1994	1.145	1.148	1.113	1.098	0.560	1.070	1.249	0.579	-0.869	-0.369	-0.826	-0.974	-1.155
1995	1.145	1.148	1.165	1.124	0.567	1.070	-0.510	0.594	-0.847	-1.060	-0.743	-0.974	-1.155
1996	1.145	1.148	1.196	1.117	0.566	1.070	-1.645	0.590	-0.811	-0.888	-0.721	-0.895	-1.155
1997	1.145	1.148	1.224	1.102	0.562	1.070	-2.137	0.582	-0.962	-0.715	-0.698	-0.895	-1.155
1998	1.145	1.148	1.263	1.081	0.554	1.070	-0.838	0.577	-0.631	-0.611	-0.676	-0.816	-1.155
1999	1.145	1.148	1.282	1.097	0.559	1.070	-0.845	0.568	-0.739	-0.507	-0.661	-0.816	-1.155
2000	1.145	1.148	1.311	1.080	0.556	1.070	-0.838	0.555	-0.725	-0.369	-0.638	-0.816	-1.155
2001	1.145	1.148	1.340	1.088	0.557	1.070	0.162	0.544	-0.710	-0.438	-0.616	-0.816	-1.155
2002	1.145	1.148	1.369	1.085	0.557	1.070	-0.024	0.540	-0.689	-0.438	-0.601	-0.737	-1.155
2003	1.145	1.148	1.413	1.084	0.561	1.070	-0.218	0.531	-0.689	-0.403	-0.586	-0.737	-1.155
2004	1.145	1.148	1.428	1.095	0.568	1.070	-0.816	0.523	-0.689	-0.369	-0.563	-0.737	-1.155

RIE Index Standardised Data - Mexico

Year	PopAcWtM	PopAcSnM	GpMembM	LifeSatM	HholdWkM	GNI_PPPM	GINI_M	YthUnptM	DivceRtM	P'snersM	ScdeRteM	CptnIndM	LawIndxM
1990	-1.155	-1.155	-1.134	-0.055	1.153	-1.051	-1.134	1.119	1.104	0.656	1.154	-1.151	-1.154
1991	-1.052	-1.093	-1.134	0.044	1.153	-1.010	-1.134	1.119	1.107	0.639	1.137	-1.151	-1.140
1992	-0.949	-1.031	-1.134	0.306	1.153	-0.979	-1.134	1.119	1.111	0.624	1.104	-1.151	-1.127
1993	-0.846	-0.969	-1.134	0.568	1.153	-0.961	-1.134	1.119	1.114	0.619	1.087	-1.151	-1.106
1994	-0.742	-0.907	-1.134	0.830	1.153	-0.923	-1.134	0.699	1.118	0.625	1.053	-1.151	-1.092
1995	-0.639	-0.845	-1.134	1.059	1.153	-0.972	-1.134	0.082	1.121	0.590	1.003	-1.151	-1.078
1996	-0.536	-0.784	-1.134	0.961	1.153	-0.930	-1.134	0.551	1.125	0.553	0.986	-1.151	-1.065
1997	-0.433	-0.722	-1.134	1.583	1.153	-0.872	-1.134	0.872	1.128	0.517	0.936	-1.151	-1.051
1998	-0.330	-0.660	-1.134	1.845	1.153	-0.931	-1.134	1.119	1.132	0.480	0.953	-1.151	-1.023
1999	-0.227	-0.598	-1.134	2.107	1.153	-0.795	-1.134	1.613	1.132	0.449	0.970	-1.151	-1.023
2000	-0.124	-0.536	-1.134	2.565	1.153	-0.724	-1.134	1.366	1.095	0.404	0.953	-1.151	-1.023
2001	-0.020	-0.474	-1.134	2.598	1.153	-0.716	-1.134	1.440	1.039	0.372	0.903	-1.151	-0.989
2002	0.083	-0.412	-1.134	2.860	1.153	-0.705	-1.134	1.242	0.983	0.335	0.874	-1.151	-0.975
2003	0.186	-0.351	-1.134	3.122	1.153	-0.686	-1.134	1.144	0.936	0.299	0.853	-1.151	-0.961
2004	0.289	-0.289	-1.134	3.351	1.153	-0.627	-1.134	0.872	0.886	0.263	0.829	-1.151	-0.940

RIE Index Standardised Data - Mexico

Year	GovEfIdM	PolStIdM	V&AindM	EmpRateM	AdUptRtM	LTUnptM	O_WkHrsM	JblessHM	RelPvRtM	RlPvEldM
1990	-1.154	-1.141	-1.151	-1.142	1.141	0.752	-1.022	0.881	-0.911	-1.119
1991	-1.154	-1.141	-1.092	-0.292	1.078	0.756	-0.750	0.884	-0.911	-1.119
1992	-1.154	-1.141	-1.033	-0.215	1.016	0.760	-0.478	0.887	-0.911	-1.119
1993	-1.154	-1.141	-0.981	-0.146	0.892	0.764	-0.206	0.890	-0.911	-1.119
1994	-1.154	-1.141	-0.922	-0.086	0.394	0.767	0.066	0.893	-0.911	-1.119
1995	-1.154	-1.141	-0.869	-0.275	-0.290	0.775	2.736	0.888	-0.911	-1.119
1996	-1.154	-1.141	-0.791	-0.197	0.394	0.775	-1.093	0.882	-0.911	-1.119
1997	-1.154	-1.141	-0.758	-0.017	0.892	0.764	0.880	0.877	-0.911	-1.119
1998	-1.154	-1.141	-0.752	0.026	1.078	0.821	1.080	0.872	-0.911	-1.119
1999	-1.154	-1.141	-0.641	0.000	1.327	0.738	1.425	0.866	-0.911	-1.119
2000	-1.154	-1.141	-0.582	-0.026	1.514	0.797	0.149	0.861	-0.911	-1.119
2001	-1.154	-1.141	-0.530	-0.086	1.452	0.799	2.633	0.856	-0.911	-1.119
2002	-1.154	-1.141	-0.405	-0.077	1.327	0.813	0.149	0.850	-0.911	-1.119
2003	-1.154	-1.141	-0.418	-0.120	1.265	0.802	3.357	0.845	-0.911	-1.119
2004	-1.154	-1.141	-0.405	-0.026	1.016	0.796	4.288	0.839	-0.911	-1.119

RIE Index Standardised Data - USA

Year	LexpU	InfMortU	HALEU	PhysU	PopnGwtU	FertRatU	CalorieU	FatConsU	SugConsU	SchLexpU	NetEnrlU	PbExpEdU	TSSM&EAU
1990	0.268	0.546	0.253	0.415	-0.973	-0.463	-1.032	-0.621	-1.126	0.080	0.596	1.091	-0.956
1991	0.335	0.564	0.300	0.570	-0.421	-0.489	-1.172	-0.671	-1.202	0.080	0.596	1.091	-0.956
1992	0.402	0.590	0.347	0.570	-0.289	-0.502	-1.338	-0.709	-1.340	0.080	0.596	1.091	-0.956
1993	0.335	0.596	0.300	0.570	-0.473	-0.541	-1.554	-0.738	-1.508	0.080	0.596	1.091	-0.956
1994	0.402	0.621	0.347	0.570	-0.710	-0.567	-1.849	-0.791	-1.646	0.080	0.596	1.091	-0.956
1995	0.402	0.646	0.347	0.726	-0.815	-0.593	-1.574	-0.703	-1.768	0.080	0.596	1.091	-0.956
1996	0.537	0.665	0.439	0.726	-0.894	-0.593	-1.639	-0.627	-1.982	0.080	0.596	1.091	-0.956
1997	0.671	0.671	0.533	0.881	-0.789	-0.606	-1.935	-0.682	-2.349	0.080	0.596	1.091	-0.956
1998	0.738	0.671	0.580	0.881	-0.868	-0.567	-1.995	-0.779	-2.425	0.080	0.596	1.091	-0.956
1999	0.738	0.678	0.580	0.726	-0.920	-0.554	-2.201	-0.894	-2.135	0.080	0.596	1.091	-0.956
2000	0.771	0.690	0.603	0.881	-0.973	-0.489	-2.763	-1.143	-2.471	0.080	0.596	1.091	-0.956
2001	0.872	0.697	0.674	1.037	-1.078	-0.528	-2.602	-1.190	-2.364	0.080	0.596	1.091	-0.956
2002	0.906	0.684	0.698	0.881	-1.157	-0.554	-2.507	-1.155	-2.486	0.080	0.596	1.091	-0.956
2003	1.006	0.690	0.768	1.037	-1.735	-0.515	-2.446	-1.122	-2.303	0.080	0.596	1.091	-0.956
2004	1.040	0.703	0.792	1.037	-1.393	-0.515	-2.386	-1.090	-2.119	0.080	0.596	1.091	-0.956

Note: The 'U' at the end of the variable code refers to the USA.

RIE Index Standardised Data - USA

Year	PupilTcU	PISAsciU	R&DexpU	R&DrsrcU	HiTechXU	PatentsU	Sci&TArU	NFBtertU	HSkImmU	NtTyGnU	FstAreaU	AgLandU	ArblLanU
1990	0.859	0.286	1.023	0.848	1.145	1.096	0.746	-0.039	-0.060	-0.130	0.401	-1.029	1.031
1991	0.859	0.286	1.071	0.947	1.161	1.226	0.745	-0.039	-0.060	-0.097	0.401	-1.029	1.031
1992	0.859	0.286	1.015	0.931	1.193	1.240	0.765	-0.039	-0.060	-0.063	0.401	-1.053	1.006
1993	0.859	0.286	0.919	0.974	1.109	1.252	0.726	-0.039	-0.060	-0.030	0.401	-1.092	0.987
1994	0.859	0.286	0.839	1.014	1.100	1.338	0.725	-0.039	-0.060	0.004	0.401	-1.121	0.974
1995	0.859	0.286	0.911	0.947	1.081	1.299	0.732	-0.039	-0.060	0.037	0.401	-1.137	0.974
1996	0.859	0.286	0.943	1.099	1.111	1.481	0.700	-0.039	-0.060	0.071	0.401	-1.198	0.930
1997	0.859	0.286	0.967	1.134	1.129	1.475	0.639	-0.039	-0.060	0.104	0.401	-1.219	0.912
1998	0.859	0.286	0.999	1.182	1.195	2.149	0.621	-0.039	-0.060	0.137	0.401	-1.237	0.899
1999	0.859	0.286	1.031	1.267	1.279	2.249	0.606	-0.039	-0.060	0.171	0.401	-1.264	0.880
2000	0.859	0.286	1.095	1.267	1.262	2.257	0.606	-0.039	-0.060	0.204	0.401	-1.264	0.880
2001	0.859	0.286	1.111	1.320	1.187	2.315	0.588	-0.039	-0.060	0.238	0.401	-1.290	0.855
2002	0.859	0.286	1.023	1.347	1.129	2.259	0.572	-0.039	-0.060	0.271	0.401	-1.305	0.843
2003	0.859	0.286	1.047	1.389	1.068	2.265	0.554	-0.039	-0.060	0.305	0.401	-1.307	0.841
2004	0.859	0.286	1.047	1.432	1.043	2.106	0.537	-0.039	-0.060	0.338	0.401	-1.310	0.838

RIE Index Standardised Data - USA

Year	IrrigLnU	FertConU	TractUsU	AgPdnInU	FdPdnInU	GDPEgUsU	RbleEgSU	ElecConU	FWaterAU	InGdWtAU	WtrWdlU	OrgWtPtU	FishCapU
1990	-0.118	-0.982	0.935	0.719	0.767	0.777	-0.698	-0.855	-0.429	0.827	-0.442	-0.516	-1.133
1991	-0.118	-1.010	0.926	0.383	0.458	0.817	-0.635	-0.934	-0.437	0.788	-0.442	-0.433	-1.102
1992	-0.078	-1.063	0.921	1.769	1.508	0.724	-0.573	-0.911	-0.445	0.750	-0.442	-0.429	-0.997
1993	-0.063	-1.278	0.928	-0.053	0.229	0.671	-0.667	-0.958	-0.453	0.712	-0.442	-0.413	-1.040
1994	-0.045	-1.138	0.933	2.422	1.885	0.564	-0.698	-0.994	-0.461	0.679	-0.442	-0.394	-0.901
1995	-0.039	-1.246	0.935	1.036	0.996	0.537	-0.667	-1.032	-0.467	0.646	-0.442	-0.407	-0.762
1996	-0.006	-1.332	0.950	1.710	1.427	0.484	-0.635	-1.067	-0.475	0.619	-0.442	-0.378	-0.647
1997	0.052	-1.330	0.957	2.244	1.791	0.324	-0.698	-1.073	-0.482	0.586	-0.442	-0.388	-0.624
1998	0.053	-1.286	0.966	2.026	1.818	0.191	-0.729	-1.127	-0.488	0.553	-0.442	-0.378	-0.607
1999	0.057	-1.275	0.976	2.145	1.831	0.124	-0.792	-1.149	-0.494	0.526	-0.442	-0.329	-0.524
2000	0.053	-1.286	0.984	2.343	2.006	0.124	-0.823	-1.221	-0.501	0.498	-0.442	0.128	-0.475
2001	0.061	-1.310	0.996	1.828	1.535	-0.049	-0.979	-1.101	-0.507	0.471	-0.442	0.309	-0.541
2002	0.062	-1.274	1.005	1.452	1.387	-0.129	-0.979	-1.119	-0.513	0.443	-0.442	0.545	-0.310
2003	0.063	-1.290	1.005	1.749	1.575	-0.342	-0.917	-1.111	-0.517	0.422	-0.442	0.785	-0.306
2004	0.064	-1.291	1.005	2.719	2.114	-0.569	-0.917	-1.102	-0.523	0.400	-0.442	0.821	-0.243

RIE Index Standardised Data - USA

Year	FishConU	NBI_U	ThtMammU	ThtBirdU	NtDmCdtU	DmCdtBnU	FDINInfU	NetLndU	MktCptU	StksTdU	Real_IRU	RealXRtU	M&TeqpU
1990	-0.844	-1.097	0.850	-1.153	0.678	1.060	-0.642	-0.416	-0.960	-1.096	1.113	-0.375	1.076
1991	-0.844	-1.097	0.832	-1.226	0.669	1.132	-1.098	0.838	-1.727	-1.575	1.381	-0.439	1.067
1992	-0.844	-1.097	0.815	-1.294	0.697	1.201	-1.169	-0.315	-1.856	-1.301	1.608	-0.511	1.027
1993	-0.844	-1.097	0.797	-1.361	0.753	1.317	-0.703	-1.352	-2.168	-2.645	1.666	-0.463	1.120
1994	-0.844	-1.097	0.779	-1.429	0.845	1.323	-0.824	-1.880	-1.895	-2.644	1.349	-0.457	1.271
1995	-0.844	-1.097	0.761	-1.502	0.987	1.521	-0.693	-1.011	-2.934	-4.072	0.934	-0.508	1.309
1996	-0.844	-1.097	0.749	-1.547	1.095	1.650	-0.368	-1.002	-3.714	-5.757	1.031	-0.403	1.242
1997	-0.844	-1.097	0.725	-1.637	1.272	1.848	-0.196	-0.785	-5.075	-8.195	0.932	-0.225	1.179
1998	-0.844	-1.097	0.707	-1.705	1.510	2.173	0.595	-0.636	-5.940	-10.278	0.811	0.063	1.116
1999	-0.844	-1.097	0.389	-1.778	1.685	2.452	1.689	-1.579	-7.205	-14.102	0.980	0.012	1.053
2000	-0.844	-1.097	0.671	-1.846	1.959	2.510	1.841	-1.918	-5.939	-23.584	0.874	0.134	0.990
2001	-0.844	-1.097	0.653	-1.913	2.164	2.616	0.189	-2.035	-5.096	-20.689	1.475	0.361	0.926
2002	-0.844	-1.097	0.609	-2.071	2.365	2.586	-0.713	-4.116	-3.569	-17.263	1.823	0.366	0.831
2003	-0.844	-1.097	0.616	-2.049	2.536	2.928	-0.875	-5.752	-4.742	-9.574	1.996	0.117	0.829
2004	-0.844	-1.097	0.618	-2.054	2.773	3.113	-0.571	-7.718	-5.189	-11.344	2.139	-0.051	0.827

RIE Index Standardised Data - USA

Year	GFCF_McU	TphnMaiU	PCsU	RadiosU	TVsetsU	NewspapU	ICT_ExpU	AirTpFtU	Air_PasU	ConPtTfU	RaRdGdU	RailPasU	RdVhclU
1990	-0.927	0.742	0.864	0.974	0.932	0.860	0.799	1.152	0.995	-0.071	1.082	1.148	-0.687
1991	-1.245	0.765	1.014	0.970	0.927	0.788	0.853	1.057	0.907	-0.071	1.104	1.113	-0.695
1992	-1.245	0.795	1.185	0.965	0.922	0.779	0.903	1.188	0.947	-0.071	1.189	1.113	-0.713
1993	-0.927	0.838	1.360	0.963	0.941	0.738	0.957	1.272	0.932	-0.071	1.281	1.140	-0.716
1994	-0.689	0.891	1.589	0.962	1.034	0.698	1.010	1.590	1.109	-0.071	1.434	1.141	-0.682
1995	-0.371	0.956	1.866	0.942	1.055	0.657	1.064	1.653	1.164	-0.071	1.489	1.127	-0.678
1996	-0.291	1.006	2.190	0.960	1.096	0.691	1.114	1.891	1.302	-0.071	1.400	1.173	-0.661
1997	-0.291	1.083	2.576	0.953	1.135	0.587	1.168	2.333	1.356	-0.071	1.369	1.196	-0.662
1998	-0.212	1.159	3.042	0.939	1.127	0.519	1.222	2.365	1.316	-0.071	1.491	1.189	-0.654
1999	-0.132	1.182	3.565	0.934	1.119	0.472	1.271	2.543	1.484	-0.071	1.537	1.197	-0.656
2000	-0.132	1.277	4.176	0.920	1.119	0.436	1.325	2.877	1.575	-0.071	1.526	1.205	-0.646
2001	-0.768	1.237	4.677	0.925	1.230	0.413	1.429	2.616	1.364	-0.071	1.627	1.213	-0.630
2002	-1.404	1.178	5.005	0.920	1.268	0.372	1.361	3.062	1.249	-0.071	1.673	1.221	-0.623
2003	-1.563	1.071	5.276	0.916	1.324	0.332	1.469	3.453	1.305	-0.071	1.718	1.229	-0.620
2004	-1.245	0.980	5.852	0.911	1.380	0.291	1.568	3.723	1.526	-0.071	1.764	1.237	-0.613

RIE Index Standardised Data - USA

Year	SulphOxU	NitOxU	CarbMonU	CbDxEmU	CbDxTEmU	EcoFPtU	FnCnExpU	DefExpU	RoadPvdU	GFCF_U	AvNoOccU	HseStckU	PopAcDgU
1990	-0.441	-0.678	-0.966	-0.826	-1.155	-0.911	1.125	-1.155	1.155	-0.196	0.676	0.763	0.577
1991	-0.353	-0.632	-0.850	-0.773	-1.148	-0.911	1.169	-1.241	1.155	-0.473	0.668	0.763	0.577
1992	-0.309	-0.632	-0.743	-0.789	-1.191	-0.911	1.494	-1.327	1.155	-0.473	0.668	0.684	0.577
1993	-0.265	-0.609	-0.627	-0.805	-1.205	-0.911	1.603	-1.409	1.155	-0.438	0.668	0.763	0.577
1994	-0.222	-0.563	-0.515	-0.807	-1.217	-0.911	1.322	-1.503	1.155	-0.369	0.661	0.763	0.577
1995	0.020	-0.516	-0.418	-0.805	-1.203	-0.911	1.016	-1.588	1.155	-0.334	0.683	0.763	0.577
1996	0.041	-0.470	-0.302	-0.859	-1.228	-0.911	0.826	-1.667	1.155	-0.196	0.676	0.763	0.577
1997	0.020	-0.470	-0.229	-0.860	-1.219	-0.911	0.403	-1.831	1.155	-0.058	0.683	0.763	0.577
1998	0.041	-0.424	-0.171	-0.848	-1.236	-0.911	0.195	-1.992	1.155	0.081	0.691	0.763	0.577
1999	0.151	-0.285	-0.074	-0.851	-1.232	-0.911	0.300	-2.131	1.155	0.219	0.698	0.842	0.577
2000	0.261	-0.239	-0.031	-0.892	-1.232	-0.911	0.366	-2.356	1.155	0.323	0.698	0.763	0.577
2001	0.283	-0.146	0.047	-0.838	-1.186	-0.911	0.954	-2.512	1.155	0.357	0.751	0.842	0.577
2002	0.348	-0.077	0.090	-0.822	-1.166	-0.911	1.695	-2.683	1.155	0.184	0.751	0.842	0.577
2003	0.428	-0.099	0.255	-0.821	-1.094	-0.911	2.012	-2.855	1.155	0.288	0.773	0.842	0.577
2004	0.493	-0.050	0.344	-0.842	-1.034	-0.911	2.092	-3.028	1.155	0.392	0.766	0.921	0.577

RIE Index Standardised Data - USA

Year	PopAcWtU	PopAcSnU	GpMembU	LifeSatU	HholdWkU	GNI_PPPU	GINI_U	YthUnptU	DivceRtU	P'snersU	ScdeRteU	CptnIndU	LawIndxU
1990	0.577	0.577	0.378	1.026	-0.631	0.940	0.380	-0.313	-0.845	-1.151	-0.535	0.498	0.605
1991	0.577	0.577	0.378	0.993	-0.631	0.991	0.391	-0.856	-0.845	-1.191	-0.502	0.498	0.584
1992	0.577	0.577	0.378	0.961	-0.631	1.108	0.308	-1.053	-0.845	-1.232	-0.468	0.498	0.563
1993	0.577	0.577	0.378	0.961	-0.631	1.214	0.266	-0.856	-0.845	-1.272	-0.485	0.498	0.543
1994	0.577	0.577	0.378	0.928	-0.631	1.361	0.214	-0.634	-0.845	-1.313	-0.451	0.498	0.522
1995	0.577	0.577	0.378	0.895	-0.631	1.467	0.194	-0.535	-0.845	-1.353	-0.401	0.498	0.501
1996	0.577	0.577	0.378	0.895	-0.631	1.612	0.163	-0.510	-0.845	-1.394	-0.368	0.498	0.474
1997	0.577	0.577	0.378	0.895	-0.631	1.781	0.038	-0.337	-0.845	-1.434	-0.351	0.498	0.467
1998	0.577	0.577	0.378	0.862	-0.631	1.928	0.048	-0.115	-0.845	-1.460	-0.251	0.498	0.460
1999	0.577	0.577	0.378	0.862	-0.631	2.104	0.059	0.008	-0.845	-1.544	-0.201	0.498	0.425
2000	0.577	0.577	0.378	0.830	-0.631	2.288	0.080	0.156	-0.845	-1.541	-0.268	0.498	0.405
2001	0.577	0.577	0.378	0.797	-0.631	2.371	0.090	-0.165	-0.845	-1.596	-0.301	0.498	0.384
2002	0.577	0.577	0.378	0.797	-0.631	2.473	0.100	-0.510	-0.845	-1.636	-0.351	0.498	0.356
2003	0.577	0.577	0.378	0.764	-0.631	2.465	0.121	-0.609	-0.845	-1.677	-0.401	0.498	0.343
2004	0.577	0.577	0.378	0.764	-0.631	2.905	0.131	-0.461	-0.845	-1.717	-0.451	0.498	0.329

RIE Index Standardised Data - USA

Year	GovEfIdU	PolStIdU	V&AindU	EmpRateU	AdUptRtU	LTUnptU	O_WkHrsU	JblessHU	RelPvRtU	RlPvEldU
1990	0.539	0.415	0.490	0.721	-0.415	0.382	0.977	0.206	-0.159	0.314
1991	0.539	0.477	0.471	0.601	-1.099	0.311	2.012	0.228	-0.159	0.314
1992	0.539	0.555	0.445	0.575	-1.535	-0.142	1.805	0.250	-0.159	0.314
1993	0.539	0.617	0.418	0.592	-1.161	-0.183	1.080	0.273	-0.159	0.314
1994	0.539	0.679	0.399	0.652	-0.664	-0.252	0.666	0.295	-0.159	0.314
1995	0.539	0.741	0.373	0.670	-0.353	-0.012	-0.265	0.317	-0.159	0.314
1996	0.539	0.773	0.360	0.678	-0.228	0.010	0.666	0.371	-0.159	0.314
1997	0.539	0.881	0.327	0.721	0.021	0.077	-0.472	0.425	-0.159	0.314
1998	0.539	0.959	0.281	0.721	0.270	0.148	-0.369	0.479	-0.159	0.314
1999	0.539	1.006	0.275	0.730	0.456	0.261	-0.265	0.533	-0.159	0.314
2000	0.539	1.146	0.255	0.807	0.518	0.332	1.287	0.587	-0.159	0.314
2001	0.539	1.130	0.229	0.721	0.083	0.325	3.564	0.590	-0.159	0.314
2002	0.539	1.146	0.222	0.627	-0.539	0.097	4.185	0.627	-0.159	0.314
2003	0.539	1.270	0.183	0.601	-0.664	-0.212	5.013	0.666	-0.159	0.314
2004	0.539	1.332	0.150	0.601	-0.415	-0.293	4.806	0.703	-0.159	0.314

VOLUME 2
Appendix D: RIE Index Condorcet and Distance to Leader Results

RIE Index Condorcet Results - 1990

	Lexp +	InfMort -	HALE +	Phys +	PopnGwth +	FertRate +	Calories -	FatCons -	SugCons -	SchLexp +
Weight	0.014725	0.014725	0.014725	0.014725	0.0107	0.0107	0.019633	0.019633	0.019633	0.009483
AUS	77.0	8.2	69.9	2.2	1.48	1.91	3253	135.2	50.5	20.35
MEX	71.2	36.2	62.42	1.0	1.89	3.31	3074	77.7	53.4	9.84
USA	75.3	9.2	67.6	2.04	1.13	2.08	3472	138.2	63	15.73
AM	0.014725	0.014725	0.014725	0.014725	0	0	0	0	0.019633	0.009483
MA	0	0	0	0	0.0107	0.0107	0.019633	0.019633	0	0
AU	0.014725	0.014725	0.014725	0.014725	0.0107	0	0.019633	0.019633	0.019633	0.009483
UA	0	0	0	0	0	0.0107	0	0	0	0
MU	0	0	0	0	0.0107	0.0107	0.019633	0.019633	0.019633	0
UM	0.014725	0.014725	0.014725	0.014725	0	0	0	0	0	0.009483

E =

	AUS	**MEX**	**USA**
AUS	0	0.5352	0.6409
MEX	0.4645	0	0.5034
USA	0.3588	0.4962	0

AMU =	0.5352	0.6409	0.5034	**1.6795**
MUA =	0.5034	0.4645	0.3588	1.3267
UAM =	0.3588	0.4962	0.5352	1.3902
AUM =	0.6409	0.5352	0.4962	1.6724
MAU =	0.4645	0.5034	0.6409	1.6088
UMA =	0.4962	0.3588	0.4645	1.3195

The final Condorcet ranking for RIE index for 1990 is AMU.

RIE Index Distance to Leader Results - 1990

	Lexp +	InfMort -	HALE +	Phys +	PopnGwth +	FertRate +	Calories -	FatCons -	SugCons -	SchLexp +
AUS	100.00	100.00	100.00	100.00	78.31	57.70	94.50	57.47	100.00	100.00
MEX	92.47	22.65	89.32	45.45	100.00	100.00	100.00	100.00	94.57	48.35
USA	97.79	89.13	96.74	92.73	59.79	62.84	88.54	56.22	80.16	77.30
Weight	0.014725	0.014725	0.014725	0.014725	0.0107	0.0107	0.019633	0.019633	0.019633	0.009483

RIE_AUS	72.01
RIE_MEX	69.14
RIE_USA	61.32

The final DTL ranking for RIE index for 1990 is AMU.

RIE Index Condorcet Results - 1990

	NetEnrlt +	PbExpEdn +	TSSM&E +	PupilTch -	PISAsci +	R&Dexp +	R&Drsrch +	HiTechXt +	Patents +	Sci&Tert +
Weight	0.009483	0.009483	0.009483	0.009483	0.009483	0.00428	0.00428	0.00428	0.00428	0.00428
AUS	86.7	4.85	20.78	19.34	526.5	1.31	5.5	11.9	62.12	624.90
MEX	37.86	5.1	25.01	28.55	413.5	0.15	0.41	8.29	1.59	12.47
USA	87.78	5.6	17.48	15.06	495	2.65	7.73	33.68	189.86	767.39
AM	0.009483	0	0	0.009483	0.009483	0.00428	0.00428	0.00428	0.00428	0.00428
MA	0	0.009483	0.009483	0	0	0	0	0	0	0
AU	0	0	0.009483	0	0.009483	0	0	0	0	0
UA	0.009483	0.009483	0	0.009483	0	0.00428	0.00428	0.00428	0.00428	0.00428
MU	0	0	0.009483	0	0	0	0	0	0	0
UM	0.009483	0.009483	0	0.009483	0.009483	0.00428	0.00428	0.00428	0.00428	0.00428

RIE Index Distance to Leader Results - 1990

	NetEnrlt +	PbExpEdn +	TSSM&E +	PupilTch -	PISAsci +	R&Dexp +	R&Drsrch +	HiTechXt +	Patents +	Sci&Tert +
AUS	98.77	86.61	83.09	77.87	100.00	49.43	71.15	35.33	32.72	81.43
MEX	43.13	91.07	100.00	52.75	78.54	5.66	5.30	24.61	0.84	1.62
USA	100.00	100.00	69.89	100.00	94.02	100.00	100.00	100.00	100.00	100.00
Weight	0.009483	0.009483	0.009483	0.009483	0.009483	0.00428	0.00428	0.00428	0.00428	0.00428

RIE Index Condorcet Results - 1990

	NFBtert +	HSkImm +	NtTyGn +	FstArea +	AgLand +	ArblLand +	IrrigLnd +	FertCons -	TractUse -	AgPdnInd +	FdPdnInd +
Weight	0.018966	0.018966	0.018966	0.0076	0.0076	0.0076	0.0076	0.0076	0.0076	0.0076	0.0076
AUS	14.41	28.87	10	21.65	60.46	6.24	3.81	242.94	151.7	83.6	78.3
MEX	-6.12	1.33	-0.7	35.25	54.17	12.57	21.62	641.27	86.3	91.5	89.4
USA	3.55	13.86	3.6	32.81	46.62	20.28	11.13	1,000.69	40.8	93	92.4
AM	0.018966	0.018966	0.018966	0	0.0076	0	0	0.0076	0	0	0
MA	0	0	0	0.0076	0	0.0076	0.0076	0	0.0076	0.0076	0.0076
AU	0.018966	0.018966	0.018966	0	0.0076	0	0	0.0076	0	0	0
UA	0	0	0	0.0076	0	0.0076	0.0076	0	0.0076	0.0076	0.0076
MU	0	0	0	0.0076	0.0076	0	0.0076	0.0076	0	0	0
UM	0.018966	0.018966	0.018966	0	0	0.0076	0	0	0.0076	0.0076	0.0076

RIE Index Distance to Leader Results - 1990

	NFBtert +	HSkImm +	NtTyGn +	FstArea +	AgLand +	ArblLand +	IrrigLnd +	FertCons -	TractUse -	AgPdnInd +	FdPdnInd +
AUS	100.00	100.00	100.00	61.42	100.00	30.77	17.62	100.00	26.90	89.89	84.74
MEX	-42.47	4.61	-7.00	100.00	89.60	61.98	100.00	37.88	47.28	98.39	96.75
USA	24.64	48.01	36.00	93.08	77.11	100.00	51.48	24.28	100.00	100.00	100.00
Weight	0.018966	0.018966	0.018966	0.0076	0.0076	0.0076	0.0076	0.0076	0.0076	0.0076	0.0076

RIE Index Condorcet Results - 1990

	GDPEgUse -	RbleEgSp +	ElecCons -	FWaterAv +	InGdWtAv +	WtrWdls -	OrgWtrPt -	FishCapt -	FishCons -	NBI +
Weight	0.020266	0.020266	0.020266	0.0152	0.0152	0.0152	0.0152	0.0304	0.0304	0.020266
AUS	3.99	6.0	8,455.50	24.61	4.22	4.9	10.91	0.22	18.9	0.85
MEX	5.1	11.1	1,277.49	3.82	1.67	19.1	2.11	1.4	12.6	0.93
USA	3.67	5.2	11,713.33	7.01	5.21	17.1	10.32	5.95	21.6	0.68
AM	0.020266	0	0	0.0152	0.0152	0.0152	0	0.0304	0	0
MA	0	0.020266	0.020266	0	0	0	0.0152	0	0.0304	0.020266
AU	0	0.020266	0.020266	0.0152	0	0.0152	0	0.0304	0.0304	0.020266
UA	0.020266	0	0	0	0.0152	0	0.0152	0	0	0
MU	0	0.020266	0.020266	0	0	0	0.0152	0.0304	0.0304	0.020266
UM	0.020266	0	0	0.0152	0.0152	0.0152	0	0	0	0

RIE Index Distance to Leader Results - 1990

	GDPEgUse -	RbleEgSp +	ElecCons -	FWaterAv +	InGdWtAv +	WtrWdls -	OrgWtrPt -	FishCapt -	FishCons -	NBI +
AUS	91.98	54.05	15.11	100.00	81.00	100.00	19.34	100.00	66.67	91.40
MEX	71.96	100.00	100.00	15.52	32.05	25.65	100.00	15.71	100.00	100.00
USA	100.00	46.85	10.91	28.48	100.00	28.65	20.45	3.70	58.33	73.12
Weight	0.020266	0.020266	0.020266	0.0152	0.0152	0.0152	0.0152	0.0304	0.0304	0.020266

RIE Index Condorcet Results - 1990

	ThtMamm -	ThtBird -	NtDmCdt +	DmCdtBnk +	FDINInf +	NetLnd +	MktCpt -	StksTd -	Real_IR -	RealXRte +
Weight	0.020266	0.020266	0.002675	0.002675	0.002675	0.002675	0.002675	0.002675	0.002675	0.002675
AUS	20.39	3.82	16,659	71.46	2.61	-651.86	35.1	12.92	13.93	124.99
MEX	11.4	4.02	3,216	36.22	0.97	-173.43	12.45	4.65	11.72	77.69
USA	7.43	6.99	18,374	124.38	0.84	-572.46	53.15	30.42	5.91	87.29
AM	0	0.020266	0.002675	0.002675	0.002675	0	0	0	0	0.002675
MA	0.020266	0	0	0	0	0.002675	0.002675	0.002675	0.002675	0
AU	0	0.020266	0	0	0.002675	0	0.002675	0.002675	0	0.002675
UA	0.020266	0	0.002675	0.002675	0	0.002675	0	0	0.002675	0
MU	0	0.020266	0	0	0.002675	0.002675	0.002675	0.002675	0	0
UM	0.020266	0	0.002675	0.002675	0	0	0	0	0.002675	0.002675

RIE Index Distance to Leader Results - 1990

	ThtMamm -	ThtBird -	NtDmCdt +	DmCdtBnk +	FDINInf +	NetLnd +	MktCpt -	StksTd -	Real_IR -	RealXRte +
AUS	36.44	100.00	90.67	57.45	100.00	26.61	35.47	35.99	42.43	100.00
MEX	65.18	95.02	17.50	29.12	37.16	100.00	100.00	100.00	50.43	62.16
USA	100.00	54.65	100.00	100.00	32.18	30.30	23.42	15.29	100.00	69.84
Weight	0.020266	0.020266	0.002675	0.002675	0.002675	0.002675	0.002675	0.002675	0.002675	0.002675

RIE Index Condorcet Results - 1990

	M&Teqp +	GFCF_Mch +	TphnMain +	PCs +	Radios +	Tvsets +	Newspap +	ICT_Exp +	AirTptFt +	Air_Pass +
Weight	0.0107	0.0107	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566
AUS	20.18	7.4	456.3	149.78	1265.7	521.5	184.02	6.24	1,222.30	1,028,614.00
MEX	24.19	8.9	64.34	8.17	260.3	149.5	101.79	3.03	143.2	172,318.00
USA	31.12	6.4	545.28	217.13	2128.7	776	222.42	7.3	14,791.40	1,861,103.00
AM	0	0	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566
MA	0.0107	0.0107	0	0	0	0	0	0	0	0
AU	0	0.0107	0	0	0	0	0	0	0	0
UA	0.0107	0	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566
MU	0	0.0107	0	0	0	0	0	0	0	0
UM	0.0107	0	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566

RIE Index Distance to Leader Results - 1990

	M&Teqp +	GFCF_Mch +	TphnMain +	PCs +	Radios +	Tvsets +	Newspap +	ICT_Exp +	AirTptFt +	Air_Pass +
AUS	64.85	83.15	83.68	68.98	59.46	67.20	82.74	85.48	8.26	55.27
MEX	77.73	100.00	11.80	3.76	12.23	19.27	45.76	41.51	0.97	9.26
USA	100.00	71.91	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Weight	0.0107	0.0107	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566

RIE Index Condorcet Results - 1990

	ContPtTf +	RaRdGood +	RailPass +	RdVhcl +	SulphOx -	NitOx -	CarbMon -	CbDioxEm -	CbDxTtEm -	EcoFPt -
Weight	0.003566	0.003566	0.003566	0.003566	0.020266	0.020266	0.020266	0.0304	0.0304	0.020266
AUS	219,182.80	1,155,880.00	839.63	112.94	96	82	336	15.44	1.23	6.91
MEX	15507.2	108,955.20	5,336.30	35.67	11.67	12	110	3.53	1.4	2.51
USA	106515.8	3,074,312.63	39,651.80	24.82	84	91	522	20.04	23.4	9.6
AM	0.003566	0.003566	0	0.003566	0	0	0	0	0.0304	0
MA	0	0	0.003566	0	0.020266	0.020266	0.020266	0.0304	0	0.020266
AU	0.003566	0	0	0.003566	0	0.020266	0.020266	0.0304	0.0304	0.020266
UA	0	0.003566	0.003566	0	0.020266	0	0	0	0	0
MU	0	0	0	0.003566	0.020266	0.020266	0.020266	0.0304	0.0304	0.020266
UM	0.003566	0.003566	0.003566	0	0	0	0	0	0	0

RIE Index Distance to Leader Results - 1990

	ContPtTf +	RaRdGood +	RailPass +	RdVhcl +	SulphOx -	NitOx -	CarbMon -	CbDioxEm -	CbDxTtEm -	EcoFPt -
AUS	100.00	37.60	2.12	100.00	12.16	14.63	32.74	22.86	100.00	36.32
MEX	7.08	3.54	13.46	31.58	100.00	100.00	100.00	100.00	87.86	100.00
USA	48.60	100.00	100.00	21.98	13.89	13.19	21.07	17.61	5.26	26.15
Weight	0.003566	0.003566	0.003566	0.003566	0.020266	0.020266	0.020266	0.0304	0.0304	0.020266

RIE Index Condorcet Results - 1990

	FnConExp +	DefExp -	RoadPvd +	GFCF +	AvNoOcc -	HseStck +	PopAcDg +	PopAcWtr +	PopAcSan +	GpMemb +
Weight	0.020266	0.020266	0.002	0.002	0.002	0.002	0.019633	0.019633	0.019633	0.004088
AUS	80.54	93.03	35	14.7	2.93	0.38	97.5	100	100	2.85
MEX	79.31	54.21	35.1	9	5.09	0.19	87	82	58	0.75
USA	84.55	2140.04	59.14	11	2.66	0.43	97.5	100	100	2.43
AM	0.020266	0	0	0.002	0.002	0.002	0.019633	0.019633	0.019633	0.004088
MA	0	0.020266	0.002	0	0	0	0	0	0	0
AU	0	0.020266	0	0.002	0	0	0.0098165	0.0098165	0.0098165	0.004088
UA	0.020266	0	0.002	0	0.002	0.002	0.0098165	0.0098165	0.0098165	0
MU	0	0.020266	0	0	0	0	0	0	0	0
UM	0.020266	0	0.002	0.002	0.002	0.002	0.019633	0.019633	0.019633	0.004088

RIE Index Distance to Leader Results - 1990

	FnConExp +	DefExp -	RoadPvd +	GFCF +	AvNoOcc -	HseStck +	PopAcDg +	PopAcWtr +	PopAcSan +	GpMemb +
AUS	95.26	58.27	59.18	100.00	90.78	88.37	100.00	100.00	100.00	100.00
MEX	93.80	100.00	59.35	61.22	52.26	44.19	89.23	82.00	58.00	26.32
USA	100.00	2.53	100.00	74.83	100.00	100.00	100.00	100.00	100.00	85.26
Weight	0.020266	0.020266	0.002	0.002	0.002	0.002	0.019633	0.019633	0.019633	0.004088

RIE Index Condorcet Results - 1990

	LifeSat +	HholdWk +	GNI_PPP +	GINI -	YthUnpt -	DivceRt -	P'sners -	ScideRte -	CptnInd +	LawIndex +
Weight	0.004088	0.004088	0.004088	0.004088	0.004088	0.004088	0.004088	0.004088	0.00122	0.00122
AUS	6.84	27.65	15,954	0.303	13.2	36.4	75.3	12.9	2.01	1.9
MEX	7.12	64.42	6,019	0.485	5.4	7.2	44.4	2.3	-0.31	-0.57
USA	7.45	25.24	23,029	0.339	11.2	48.95	393.2	12.4	1.81	1.98
AM	0	0	0.004088	0.004088	0	0	0	0	0.00122	0.00122
MA	0.004088	0.004088	0	0	0.004088	0.004088	0.004088	0.004088	0	0
AU	0	0.004088	0	0.004088	0	0.004088	0.004088	0	0.00122	0
UA	0.004088	0	0.004088	0	0.004088	0	0	0.004088	0	0.00122
MU	0	0.004088	0	0	0.004088	0.004088	0.004088	0.004088	0	0
UM	0.004088	0	0.004088	0.004088	0	0	0	0	0.00122	0.00122

RIE Index Distance to Leader Results - 1990

	LifeSat +	HholdWk +	GNI_PPP +	GINI -	YthUnpt -	DivceRt -	P'sners -	ScideRte -	CptnInd +	LawIndex +
AUS	91.81	42.92	69.28	100.00	40.91	19.78	58.93	17.83	100.00	95.96
MEX	95.57	100.00	26.14	62.47	100.00	100.00	100.00	100.00	-15.42	-28.79
USA	100.00	39.18	100.00	89.38	48.21	14.71	11.28	18.55	90.05	100.00
Weight	0.004088	0.004088	0.004088	0.004088	0.004088	0.004088	0.004088	0.004088	0.00122	0.00122

RIE Index Condorcet Results - 1990

	GovEfInd +	PolStInd +	V&Aind +	EmpRate +	AdUnptRt -	LTUnpt -	O_WkHrs -	JoblessH -	RelPovRt -	RlPovEld -	
Weight	0.00122	0.00122	0.00122	0.006214	0.006214	0.006214	0.006214	0.006214	0.006214	0.006214	
AUS	1.9	1.03	1.99	68.8	5.1	21.6	15	13.01	10.25	19.88	
MEX	0.04	-0.17	-0.77	50.6	2.1	1.6	25.31	3.47	20.99	30.56	
USA	1.82	0.83	1.73	72.3	4.6	5.5	6	6.74	16.91	22.61	
AM	0.00122	0.00122	0.00122	0.006214	0	0	0.006214	0	0.006214	0.006214	**0.5352**
MA	0	0	0	0	0.006214	0.006214	0	0.006214	0	0	**0.4645**
AU	0.00122	0.00122	0.00122	0	0	0	0	0	0.006214	0.006214	**0.6409**
UA	0	0	0	0.006214	0.006214	0.006214	0.006214	0.006214	0	0	**0.3588**
MU	0	0	0	0	0.006214	0.006214	0	0.006214	0	0	**0.5034**
UM	0.00122	0.00122	0.00122	0.006214	0	0	0.006214	0	0.006214	0.006214	**0.4962**

RIE Index Distance to Leader Results - 1990

	GovEfInd +	PolStInd +	V&Aind +	EmpRate +	AdUnptRt -	LTUnpt -	O_WkHrs -	JoblessH -	RelPovRt -	RlPovEld -
AUS	100.00	100.00	100.00	95.16	41.18	7.21	40.00	26.65	100.00	100.00
MEX	2.11	-16.50	-38.69	69.99	100.00	100.00	23.71	100.00	48.83	65.05
USA	95.79	80.58	86.93	100.00	45.65	28.39	100.00	51.45	60.62	87.93
Weight	0.00122	0.00122	0.00122	0.006214	0.006214	0.006214	0.006214	0.006214	0.006214	0.006214

RIE Index Condorcet Results - 1991

	Lexp +	InfMort -	HALE +	Phys +	PopnGwth +	FertRate +	Calories -	FatCons -	SugCons -	SchLexp +
Weight	0.014725	0.014725	0.014725	0.014725	0.0107	0.0107	0.019633	0.019633	0.019633	0.009483
AUS	77.4	7.1	70.2	2.3	1.27	1.86	3174	130.7	48.9	20.35
MEX	71.8	32.2	62.95	1.2	1.87	3.20	3106	83.6	49.9	10.04
USA	75.5	8.9	67.78	2.07	1.34	2.06	3500	139.9	63.5	15.73
AM	0.014725	0.014725	0.014725	0.014725	0	0	0	0	0.019633	0.009483
MA	0	0	0	0	0.0107	0.0107	0.019633	0.019633	0	0
AU	0.014725	0.014725	0.014725	0.014725	0	0	0.019633	0.019633	0.019633	0.009483
UA	0	0	0	0	0.0107	0.0107	0	0	0	0
MU	0	0	0	0	0.0107	0.0107	0.019633	0.019633	0.019633	0
UM	0.014725	0.014725	0.014725	0.014725	0	0	0	0	0	0.009483

E =

	AUS	MEX	USA
AUS	0	0.5345	0.6302
MEX	0.4651	0	0.5186
USA	0.3695	0.4810	0

AMU =	0.5345	0.6302	0.5186	**1.6834**
MUA =	0.5186	0.4651	0.3695	1.3532
UAM =	0.3695	0.4810	0.5345	1.3850
AUM =	0.6302	0.5345	0.4810	1.6458
MAU =	0.4651	0.5186	0.6302	1.6140
UMA =	0.4810	0.3695	0.4651	1.3156

The final Condorcet ranking for RIE index for 1991 is AMU.

RIE Index Distance to Leader Results - 1991

	Lexp +	InfMort -	HALE +	Phys +	PopnGwth +	FertRate +	Calories -	FatCons -	SugCons -	SchLexp +
AUS	100.00	100.00	100.00	100.00	67.91	58.13	97.86	63.96	100.00	100.00
MEX	92.76	22.05	89.62	52.17	100.00	100.00	100.00	100.00	98.00	49.34
USA	97.55	79.78	96.50	90.00	71.66	64.38	88.74	59.76	77.01	77.30
Weight	0.014725	0.014725	0.014725	0.014725	0.0107	0.0107	0.019633	0.019633	0.019633	0.009483

RIE_AUS	70.72
RIE_MEX	69.53
RIE_USA	61.47

The final DTL ranking for RIE index for 1991 is AMU.

RIE Index Condorcet Results - 1991

	NetEnrlt +	PbExpEdn +	TSSM&E +	PupilTch -	PISAsci +	R&Dexp +	R&Drsrch +	HiTechXt +	Patents +	Sci&Tert +	NFBtert +
Weight	0.009483	0.009483	0.009483	0.009483	0.009483	0.00428	0.00428	0.00428	0.00428	0.00428	0.018966
AUS	86.7	4.85	20.78	19.13	526.5	1.45	6.24	12.83	57.34	621.50	14.41
MEX	39.72	5.1	25.01	28.41	413.5	0.18	0.44	8.5	1.52	12.76	-6.12
USA	87.78	5.6	17.48	15.06	495	2.71	8.1	33.91	202.32	766.92	3.55
AM	0.009483	0	0	0.009483	0.009483	0.00428	0.00428	0.00428	0.00428	0.00428	0.018966
MA	0	0.009483	0.009483	0	0	0	0	0	0	0	0
AU	0	0	0.009483	0	0.009483	0	0	0	0	0	0.018966
UA	0.009483	0.009483	0	0.009483	0	0.00428	0.00428	0.00428	0.00428	0.00428	0
MU	0	0	0.009483	0	0	0	0	0	0	0	0
UM	0.009483	0.009483	0	0.009483	0.009483	0.00428	0.00428	0.00428	0.00428	0.00428	0.018966

RIE Index Distance to Leader Results - 1991

	NetEnrlt +	PbExpEdn +	TSSM&E +	PupilTch -	PISAsci +	R&Dexp +	R&Drsrch +	HiTechXt +	Patents +	Sci&Tert +	NFBtert +
AUS	98.77	86.61	83.09	78.72	100.00	53.51	77.04	37.84	28.34	81.04	100.00
MEX	45.25	91.07	100.00	53.01	78.54	6.64	5.43	25.07	0.75	1.66	-42.47
USA	100.00	100.00	69.89	100.00	94.02	100.00	100.00	100.00	100.00	100.00	24.64
Weight	0.009483	0.009483	0.009483	0.009483	0.009483	0.00428	0.00428	0.00428	0.00428	0.00428	0.018966

RIE Index Condorcet Results - 1991

	HSkImm +	NtTyGn +	FstArea +	AgLand +	ArblLand +	IrrigLnd +	FertCons -	TractUse -	AgPdnInd +	FdPdnInd +	GDPEgUse -
Weight	0.018966	0.018966	0.0076	0.0076	0.0076	0.0076	0.0076	0.0076	0.0076	0.0076	0.020266
AUS	28.87	10.14	21.65	60.27	5.95	4.39	281.09	145.2	80.6	74.9	4.02
MEX	1.33	-0.8	35.25	54.49	12.63	22.31	671.95	81.9	93	91.7	5.07
USA	13.86	3.78	32.81	46.62	20.28	11.13	1,011.30	41.3	91.3	90.1	3.64
AM	0.018966	0.018966	0	0.0076	0	0	0.0076	0	0	0	0.020266
MA	0	0	0.0076	0	0.0076	0.0076	0	0.0076	0.0076	0.0076	0
AU	0.018966	0.018966	0	0.0076	0	0	0.0076	0	0	0	0
UA	0	0	0.0076	0	0.0076	0.0076	0	0.0076	0.0076	0.0076	0.020266
MU	0	0	0.0076	0.0076	0	0.0076	0.0076	0	0.0076	0.0076	0
UM	0.018966	0.018966	0	0	0.0076	0	0	0.0076	0	0	0.020266

RIE Index Distance to Leader Results - 1991

	HSkImm +	NtTyGn +	FstArea +	AgLand +	ArblLand +	IrrigLnd +	FertCons -	TractUse -	AgPdnInd +	FdPdnInd +	GDPEgUse -
AUS	100.00	100.00	61.42	100.00	29.34	19.68	100.00	28.44	86.67	81.68	90.55
MEX	4.61	-7.89	100.00	90.41	62.28	100.00	41.83	50.43	100.00	100.00	71.79
USA	48.01	37.28	93.08	77.35	100.00	49.89	27.79	100.00	98.17	98.26	100.00
Weight	0.018966	0.018966	0.0076	0.0076	0.0076	0.0076	0.0076	0.0076	0.0076	0.0076	0.020266

RIE Index Condorcet Results - 1991

	RbleEgSp +	ElecCons -	FWaterAv +	InGdWtAv +	WtrWdls -	OrgWtrPt -	FishCapt -	FishCons -	NBI +	ThtMamm -	ThtBird -
Weight	0.020266	0.020266	0.0152	0.0152	0.0152	0.0152	0.0304	0.0304	0.020266	0.020266	0.020266
AUS	6.2	8,474.89	24.30	4.17	4.9	10.51	0.24	18.95	0.85	20.67	3.96
MEX	11.0	1,289.84	3.75	1.64	19.1	2.05	1.42	12.37	0.93	11.67	4.14
USA	5.4	12,134.17	6.92	5.14	17.1	9.91	5.6	21.6	0.68	7.55	7.12
AM	0	0	0.0152	0.0152	0.0152	0	0.0304	0	0	0	0.020266
MA	0.020266	0.020266	0	0	0	0.0152	0	0.0304	0.020266	0.020266	0
AU	0.020266	0.020266	0.0152	0	0.0152	0	0.0304	0.0304	0.020266	0	0.020266
UA	0	0	0	0.0152	0	0.0152	0	0	0	0.020266	0
MU	0.020266	0.020266	0	0	0	0.0152	0.0304	0.0304	0.020266	0	0.020266
UM	0	0	0.0152	0.0152	0.0152	0	0	0	0	0.020266	0

RIE Index Distance to Leader Results - 1991

	RbleEgSp +	ElecCons -	FWaterAv +	InGdWtAv +	WtrWdls -	OrgWtrPt -	FishCapt -	FishCons -	NBI +	ThtMamm -	ThtBird -
AUS	56.36	15.22	100.00	81.13	100.00	19.51	100.00	65.28	91.40	36.53	100.00
MEX	100.00	100.00	15.43	31.91	25.65	100.00	16.90	100.00	100.00	64.70	95.65
USA	49.09	10.63	28.48	100.00	28.65	20.69	4.29	57.27	73.12	100.00	55.62
Weight	0.020266	0.020266	0.0152	0.0152	0.0152	0.0152	0.0304	0.0304	0.020266	0.020266	0.020266

RIE Index Condorcet Results - 1991

	NtDmCdt +	DmCdtBnk +	FDINInf +	NetLnd +	MktCpt -	StksTd -	Real_IR -	RealXRte +	M&Teqp +	GFCF_Mch +
Weight	0.002675	0.002675	0.002675	0.002675	0.002675	0.002675	0.002675	0.002675	0.0107	0.0107
AUS	16,970	72.14	1.36	-473.47	47.05	14.79	11.91	122.43	19.35	7
MEX	4,084	36.49	1.51	-305.59	31.23	10.09	10.93	86.05	24.76	9.4
USA	18,299	127.59	0.39	-251.01	68.78	36.72	4.8	85.68	31.07	6
AM	0.002675	0.002675	0	0	0	0	0	0.002675	0	0
MA	0	0	0.002675	0.002675	0.002675	0.002675	0.002675	0	0.0107	0.0107
AU	0	0	0.002675	0	0.002675	0.002675	0	0.002675	0	0.0107
UA	0.002675	0.002675	0	0.002675	0	0	0.002675	0	0.0107	0
MU	0	0	0.002675	0	0.002675	0.002675	0	0.002675	0	0.0107
UM	0.002675	0.002675	0	0.002675	0	0	0.002675	0	0.0107	0

RIE Index Distance to Leader Results - 1991

	NtDmCdt +	DmCdtBnk +	FDINInf +	NetLnd +	MktCpt -	StksTd -	Real_IR -	RealXRte +	M&Teqp +	GFCF_Mch +
AUS	92.74	56.54	90.07	53.01	66.38	68.22	40.30	100.00	62.28	74.47
MEX	22.32	28.60	100.00	82.14	100.00	100.00	43.92	70.29	79.69	100.00
USA	100.00	100.00	25.83	100.00	45.41	27.48	100.00	69.98	100.00	63.83
Weight	0.002675	0.002675	0.002675	0.002675	0.002675	0.002675	0.002675	0.002675	0.0107	0.0107

RIE Index Condorcet Results - 1991

	TphnMain +	PCs +	Radios +	Tvsets +	Newspap +	ICT_Exp +	AirTptFt +	Air_Pass +	ContPtTf +	RaRdGood +
Weight	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566
AUS	465.52	160.39	1272.3	543.6	181.69	6.24	1,222.60	1,264,759.00	219,182.80	1159829.62
MEX	71.05	10.61	250.5	145.2	101.03	3.03	162.7	175,734.00	15507.2	124,955.80
USA	551.08	233.22	2125.5	774.4	218	7.42	14,486.20	1,786,758.00	106515.8	3,106,418.50
AM	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566
MA	0	0	0	0	0	0	0	0	0	0
AU	0	0	0	0	0	0	0	0	0.003566	0
UA	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0	0.003566
MU	0	0	0	0	0	0	0	0	0	0
UM	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566

RIE Index Distance to Leader Results - 1991

	TphnMain +	PCs +	Radios +	Tvsets +	Newspap +	ICT_Exp +	AirTptFt +	Air_Pass +	ContPtTf +	RaRdGood +
AUS	84.47	68.77	59.86	70.20	83.34	84.10	8.44	70.79	100.00	37.34
MEX	12.89	4.55	11.79	18.75	46.34	40.84	1.12	9.84	7.08	4.02
USA	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	48.60	100.00
Weight	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566

RIE Index Condorcet Results - 1991

	RailPass +	RdVhcl +	SulphOx -	NitOx -	CarbMon -	CbDioxEm -	CbDxTtEm -	EcoFPt -	FnConExp +	DefExp -
Weight	0.003566	0.003566	0.020266	0.020266	0.020266	0.0304	0.0304	0.020266	0.020266	0.020266
AUS	877.4	110.8	97	80	316	15.27	1.24	6.91	83.07	102.88
MEX	4,686.00	38.29	11.67	12	106.3	3.56	1.44	2.51	81	58.46
USA	38,897.13	24.4	80	89	498	19.59	23.31	9.6	84.67	2242.71
AM	0	0.003566	0	0	0	0	0.0304	0	0.020266	0
MA	0.003566	0	0.020266	0.020266	0.020266	0.0304	0	0.020266	0	0.020266
AU	0	0.003566	0	0.020266	0.020266	0.0304	0.0304	0.020266	0	0.020266
UA	0.003566	0	0.020266	0	0	0	0	0	0.020266	0
MU	0	0.003566	0.020266	0.020266	0.020266	0.0304	0.0304	0.020266	0	0.020266
UM	0.003566	0	0	0	0	0	0	0	0.020266	0

RIE Index Distance to Leader Results - 1991

	RailPass +	RdVhcl +	SulphOx -	NitOx -	CarbMon -	CbDioxEm -	CbDxTtEm -	EcoFPt -	FnConExp +	DefExp -
AUS	2.26	100.00	12.03	15.00	33.64	23.31	100.00	36.32	98.11	56.82
MEX	12.05	34.56	100.00	100.00	100.00	100.00	86.11	100.00	95.67	100.00
USA	100.00	22.02	14.59	13.48	21.35	18.17	5.32	26.15	100.00	2.61
Weight	0.003566	0.003566	0.020266	0.020266	0.020266	0.0304	0.0304	0.020266	0.020266	0.020266

RIE Index Condorcet Results - 1991

	RoadPvd +	GFCF +	AvNoOcc -	HseStck +	PopAcDg +	PopAcWtr +	PopAcSan +	GpMemb +	LifeSat +	HholdWk +
Weight	0.002	0.002	0.002	0.002	0.019633	0.019633	0.019633	0.004088	0.004088	0.004088
AUS	35.7	14.7	2.91	0.39	97.5	100	100	2.85	6.93	27.65
MEX	35.3	9.2	4.98	0.2	87	83.07	59.5	0.75	7.15	64.42
USA	59.14	10.2	2.67	0.43	97.5	100	100	2.43	7.44	25.24
AM	0.002	0.002	0.002	0.002	0.019633	0.019633	0.019633	0.004088	0	0
MA	0	0	0	0	0	0	0	0	0.004088	0.004088
AU	0	0.002	0	0	0.0098165	0.0098165	0.0098165	0.004088	0	0.004088
UA	0.002	0	0.002	0.002	0.0098165	0.0098165	0.0098165	0	0.004088	0
MU	0	0	0	0	0	0	0	0	0	0.004088
UM	0.002	0.002	0.002	0.002	0.019633	0.019633	0.019633	0.004088	0.004088	0

RIE Index Distance to Leader Results - 1991

	RoadPvd +	GFCF +	AvNoOcc -	HseStck +	PopAcDg +	PopAcWtr +	PopAcSan +	GpMemb +	LifeSat +	HholdWk +
AUS	60.37	100.00	91.75	90.70	100.00	100.00	100.00	100.00	93.15	42.92
MEX	59.69	62.59	53.61	46.51	89.23	83.07	59.50	26.32	96.10	100.00
USA	100.00	69.39	100.00	100.00	100.00	100.00	100.00	85.26	100.00	39.18
Weight	0.002	0.002	0.002	0.002	0.019633	0.019633	0.019633	0.004088	0.004088	0.004088

RIE Index Condorcet Results - 1991

	GNI_PPP +	GINI -	YthUnpt -	DivceRt -	P'sners -	ScideRte -	CptnInd +	LawIndex +	GovEfInd +	PolStInd +	V&Aind +
Weight	0.004088	0.004088	0.004088	0.004088	0.004088	0.004088	0.00122	0.00122	0.00122	0.00122	0.00122
AUS	16,344	0.303	17.1	40.32	77.3	13.2	2.01	1.9	1.9	1.06	1.95
MEX	6,373	0.485	5.4	7.13	47.7	2.4	-0.31	-0.55	0.04	-0.17	-0.69
USA	23,472	0.338	13.4	48.95	401.0	12.2	1.81	1.95	1.82	0.87	1.7
AM	0.004088	0.004088	0	0	0	0	0.00122	0.00122	0.00122	0.00122	0.00122
MA	0	0	0.004088	0.004088	0.004088	0.004088	0	0	0	0	0
AU	0	0.004088	0	0.004088	0.004088	0	0.00122	0	0.00122	0.00122	0.00122
UA	0.004088	0	0.004088	0	0	0.004088	0	0.00122	0	0	0
MU	0	0	0.004088	0.004088	0.004088	0.004088	0	0	0	0	0
UM	0.004088	0.004088	0	0	0	0	0.00122	0.00122	0.00122	0.00122	0.00122

RIE Index Distance to Leader Results - 1991

	GNI_PPP +	GINI -	YthUnpt -	DivceRt -	P'sners -	ScideRte -	CptnInd +	LawIndex +	GovEfInd +	PolStInd +	V&Aind +
AUS	69.63	100.00	31.58	17.68	61.65	18.18	100.00	97.44	100.00	100.00	100.00
MEX	27.15	62.47	100.00	100.00	100.00	100.00	-15.42	-28.21	2.11	-16.04	-35.38
USA	100.00	89.64	40.30	14.57	11.89	19.67	90.05	100.00	95.79	82.08	87.18
Weight	0.004088	0.004088	0.004088	0.004088	0.004088	0.004088	0.00122	0.00122	0.00122	0.00122	0.00122

RIE Index Condorcet Results - 1991

	EmpRate +	AdUnptRt -	LTUnpt -	O_WkHrs -	JoblessH -	RelPovRt -	RlPovEld -	
Weight	0.006214	0.006214	0.006214	0.006214	0.006214	0.006214	0.006214	
AUS	66.5	7.3	24.9	2	13.18	10.25	19.88	
MEX	60.5	2.2	1.5	22.68	3.45	20.99	30.56	
USA	70.9	5.7	6.3	-4	6.63	16.91	22.61	
AM	0.006214	0	0	0.006214	0	0.006214	0.006214	**0.5345**
MA	0	0.006214	0.006214	0	0.006214	0	0	**0.4651**
AU	0	0	0	0	0	0.006214	0.006214	**0.6302**
UA	0.006214	0.006214	0.006214	0.006214	0.006214	0	0	**0.3695**
MU	0	0.006214	0.006214	0	0.006214	0	0	**0.5186**
UM	0.006214	0	0	0.006214	0	0.006214	0.006214	**0.4810**

RIE Index Distance to Leader Results - 1991

	EmpRate +	AdUnptRt -	LTUnpt -	O_WkHrs -	JoblessH -	RelPovRt -	RlPovEld -
AUS	93.79	30.14	6.09	-200.00	26.20	100.00	100.00
MEX	85.33	100.00	100.00	-17.64	100.00	48.83	65.05
USA	100.00	38.60	24.29	100.00	52.06	60.62	87.93
Weight	0.006214	0.006214	0.006214	0.006214	0.006214	0.006214	0.006214

RIE Index Condorcet Results - 1992

	Lexp +	InfMort -	HALE +	Phys +	PopnGwth +	FertRate +	Calories -	FatCons -	SugCons -	SchLexp +
Weight	0.014725	0.014725	0.014725	0.014725	0.0107	0.0107	0.019633	0.019633	0.019633	0.009483
AUS	77.5	7	70.3	2.4	1.20	1.90	3098	125.5	51.2	20.35
MEX	72	30.9	63.12	1.4	1.84	3.20	3123	83.5	50.6	10.24
USA	75.7	8.5	67.96	2.09	1.39	2.05	3533	141.2	64.4	15.73
AM	0.014725	0.014725	0.014725	0.014725	0	0	0.019633	0	0	0.009483
MA	0	0	0	0	0.0107	0.0107	0	0.019633	0.019633	0
AU	0.014725	0.014725	0.014725	0.014725	0	0	0.019633	0.019633	0.019633	0.009483
UA	0	0	0	0	0.0107	0.0107	0	0	0	0
MU	0	0	0	0	0.0107	0.0107	0.019633	0.019633	0.019633	0
UM	0.014725	0.014725	0.014725	0.014725	0	0	0	0	0	0.009483

E =

	AUS	**MEX**	**USA**
AUS	0	0.4993	0.6263
MEX	0.5003	0	0.5061
USA	0.3734	0.4936	0

AMU =	0.4993	0.6263	0.5061	1.6317
MUA =	0.5061	0.5003	0.3734	1.3798
UAM =	0.3734	0.4936	0.4993	1.3663
AUM =	0.6263	0.4993	0.4936	1.6192
MAU =	0.5003	0.5061	0.6263	**1.6327**
UMA =	0.4936	0.3734	0.5003	1.3673

The final Condorcet ranking for RIE index for 1992 is MAU.

RIE Index Distance to Leader Results - 1992

	Lexp +	InfMort -	HALE +	Phys +	PopnGwth +	FertRate +	Calories -	FatCons -	SugCons -	SchLexp +
AUS	100.00	100.00	100.00	100.00	65.22	59.38	100.00	66.53	98.83	100.00
MEX	92.90	22.65	89.75	58.33	100.00	100.00	99.20	100.00	100.00	50.32
USA	97.68	82.35	96.63	87.08	75.54	64.06	87.69	59.14	78.57	77.30
Weight	0.014725	0.014725	0.014725	0.014725	0.0107	0.0107	0.019633	0.019633	0.019633	0.009483

RIE_AUS	71.18
RIE_MEX	70.02
RIE_USA	61.85

The final DTL ranking for RIE index for 1992 is AMU.

RIE Index Condorcet Results - 1992

	NetEnrlt +	PbExpEdn +	TSSM&E +	PupilTch -	PISAsci +	R&Dexp +	R&Drsrch +	HiTechXt +	Patents +	Sci&Tert +	NFBtert +
Weight	0.009483	0.009483	0.009483	0.009483	0.009483	0.00428	0.00428	0.00428	0.00428	0.00428	0.018966
AUS	86.7	4.85	20.78	18.92	526.5	1.52	6.7	13.42	52.82	654.59	14.41
MEX	41.59	5.1	25.01	28.27	413.5	0.21	0.46	11.15	3.1	15.47	-6.12
USA	87.78	5.6	17.48	15.06	495	2.64	8.04	34.35	203.71	775.26	3.55
AM	0.009483	0	0	0.009483	0.009483	0.00428	0.00428	0.00428	0.00428	0.00428	0.018966
MA	0	0.009483	0.009483	0	0	0	0	0	0	0	0
AU	0	0	0.009483	0	0.009483	0	0	0	0	0	0.018966
UA	0.009483	0.009483	0	0.009483	0	0.00428	0.00428	0.00428	0.00428	0.00428	0
MU	0	0	0.009483	0	0	0	0	0	0	0	0
UM	0.009483	0.009483	0	0.009483	0.009483	0.00428	0.00428	0.00428	0.00428	0.00428	0.018966

RIE Index Distance to Leader Results - 1992

	NetEnrlt +	PbExpEdn +	TSSM&E +	PupilTch -	PISAsci +	R&Dexp +	R&Drsrch +	HiTechXt +	Patents +	Sci&Tert +	NFBtert +
AUS	98.77	86.61	83.09	79.60	100.00	57.58	83.33	39.07	25.93	84.43	100.00
MEX	47.38	91.07	100.00	53.27	78.54	7.95	5.72	32.46	1.52	2.00	-42.47
USA	100.00	100.00	69.89	100.00	94.02	100.00	100.00	100.00	100.00	100.00	24.64
Weight	0.009483	0.009483	0.009483	0.009483	0.009483	0.00428	0.00428	0.00428	0.00428	0.00428	0.018966

RIE Index Condorcet Results - 1992

	HSkImm +	NtTyGn +	FstArea +	AgLand +	ArblLand +	IrrigLnd +	FertCons -	TractUse -	AgPdnInd +	FdPdnInd +	GDPEgUse -
Weight	0.018966	0.018966	0.0076	0.0076	0.0076	0.0076	0.0076	0.0076	0.0076	0.0076	0.020266
AUS	28.87	10.28	21.65	60.68	6.14	4.37	300.4	150.4	82.8	80.7	4.07
MEX	1.33	-0.9	35.25	54.85	12.68	23.28	667.77	82.1	90.9	91	5.15
USA	13.86	3.96	32.81	46.45	20.1	11.49	1,031.39	41.6	98.3	97.9	3.71
AM	0.018966	0.018966	0	0.0076	0	0	0.0076	0	0	0	0.020266
MA	0	0	0.0076	0	0.0076	0.0076	0	0.0076	0.0076	0.0076	0
AU	0.018966	0.018966	0	0.0076	0	0	0.0076	0	0	0	0
UA	0	0	0.0076	0	0.0076	0.0076	0	0.0076	0.0076	0.0076	0.020266
MU	0	0	0.0076	0.0076	0	0.0076	0.0076	0	0	0	0
UM	0.018966	0.018966	0	0	0.0076	0	0	0.0076	0.0076	0.0076	0.020266

RIE Index Distance to Leader Results - 1992

	HSkImm +	NtTyGn +	FstArea +	AgLand +	ArblLand +	IrrigLnd +	FertCons -	TractUse -	AgPdnInd +	FdPdnInd +	GDPEgUse -
AUS	100.00	100.00	61.42	100.00	30.55	18.77	100.00	27.66	84.23	82.43	91.15
MEX	4.61	-8.75	100.00	90.39	63.08	100.00	44.99	50.67	92.47	92.95	72.04
USA	48.01	38.52	93.08	76.55	100.00	49.36	29.13	100.00	100.00	100.00	100.00
Weight	0.018966	0.018966	0.0076	0.0076	0.0076	0.0076	0.0076	0.0076	0.0076	0.0076	0.020266

RIE Index Condorcet Results - 1992

	RbleEgSp +	ElecCons -	FWaterAv +	InGdWtAv +	WtrWdls -	OrgWtrPt -	FishCapt -	FishCons -	NBI +	ThtMamm -	ThtBird -
Weight	0.020266	0.020266	0.0152	0.0152	0.0152	0.0152	0.0304	0.0304	0.020266	0.020266	0.020266
AUS	5.6	8,519.49	24.01	4.12	4.9	9.9	0.25	19.16	0.85	20.95	4.1
MEX	11.2	1,298.48	3.68	1.61	19.1	1.97	1.17	12.02	0.93	11.95	1.25
USA	5.6	12,014.96	6.83	5.07	17.1	9.89	5.54	21.6	0.68	7.66	7.24
AM	0	0	0.0152	0.0152	0.0152	0	0.0304	0	0	0	0
MA	0.020266	0.020266	0	0	0	0.0152	0	0.0304	0.020266	0.020266	0.020266
AU	0.010133	0.020266	0.0152	0	0.0152	0	0.0304	0.0304	0.020266	0	0.020266
UA	0.010133	0	0	0.0152	0	0.0152	0	0	0	0.020266	0
MU	0.020266	0.020266	0	0	0	0.0152	0.0304	0.0304	0.020266	0	0.020266
UM	0	0	0.0152	0.0152	0.0152	0	0	0	0	0.020266	0

RIE Index Distance to Leader Results - 1992

	RbleEgSp +	ElecCons -	FWaterAv +	InGdWtAv +	WtrWdls -	OrgWtrPt -	FishCapt -	FishCons -	NBI +	ThtMamm -	ThtBird -
AUS	50.00	15.24	100.00	81.26	100.00	19.90	100.00	62.73	91.40	36.56	30.49
MEX	100.00	100.00	15.33	31.76	25.65	100.00	21.37	100.00	100.00	64.10	100.00
USA	50.00	10.81	28.45	100.00	28.65	19.92	4.51	55.65	73.12	100.00	17.27
Weight	0.020266	0.020266	0.0152	0.0152	0.0152	0.0152	0.0304	0.0304	0.020266	0.020266	0.020266

RIE Index Condorcet Results - 1992

	NtDmCdt +	DmCdtBnk +	FDINInf +	NetLnd +	MktCpt -	StksTd -	Real_IR -	RealXRte +	M&Teqp +	GFCF_Mch +
Weight	0.002675	0.002675	0.002675	0.002675	0.002675	0.002675	0.002675	0.002675	0.0107	0.0107
AUS	18,050	74.14	1.82	-607.47	46.35	14.63	9.49	110.59	20.45	7.4
MEX	5,082	39.01	1.21	-458.42	38.23	12.26	10.15	93.26	25.24	10
USA	18,538	130.63	0.32	-546.56	71.42	33.11	3.86	83.88	30.85	6
AM	0.002675	0.002675	0.002675	0	0	0	0.002675	0.002675	0	0
MA	0	0	0	0.002675	0.002675	0.002675	0	0	0.0107	0.0107
AU	0	0	0.002675	0	0.002675	0.002675	0	0.002675	0	0.0107
UA	0.002675	0.002675	0	0.002675	0	0	0.002675	0	0.0107	0
MU	0	0	0.002675	0.002675	0.002675	0.002675	0	0.002675	0	0.0107
UM	0.002675	0.002675	0	0	0	0	0.002675	0	0.0107	0

RIE Index Distance to Leader Results - 1992

	NtDmCdt +	DmCdtBnk +	FDINInf +	NetLnd +	MktCpt -	StksTd -	Real_IR -	RealXRte +	M&Teqp +	GFCF_Mch +
AUS	97.37	56.76	100.00	75.46	82.48	83.80	40.67	100.00	66.29	74.00
MEX	27.41	29.86	66.48	100.00	100.00	100.00	38.03	84.33	81.82	100.00
USA	100.00	100.00	17.58	83.87	53.53	37.03	100.00	75.85	100.00	60.00
Weight	0.002675	0.002675	0.002675	0.002675	0.002675	0.002675	0.002675	0.002675	0.0107	0.0107

RIE Index Condorcet Results - 1992

	TphnMain +	PCs +	Radios +	Tvsets +	Newspap +	ICT_Exp +	AirTptFt +	Air_Pass +	ContPtTf +	RaRdGood +
Weight	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566
AUS	472.04	183.99	1277.9	564.8	179.37	6.24	1,361.50	1,365,339.00	219,182.80	1162325.93
MEX	78.2	15.05	251.3	182	100.27	3.03	158.8	179,835.00	15507.2	134,370.00
USA	558.81	251.45	2120.2	772.8	217.41	7.53	15,617.60	1,820,427.00	106515.8	3,234,679.38
AM	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566
MA	0	0	0	0	0	0	0	0	0	0
AU	0	0	0	0	0	0	0	0	0.003566	0
UA	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0	0.003566
MU	0	0	0	0	0	0	0	0	0	0
UM	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566

RIE Index Distance to Leader Results - 1992

	TphnMain +	PCs +	Radios +	Tvsets +	Newspap +	ICT_Exp +	AirTptFt +	Air_Pass +	ContPtTf +	RaRdGood +
AUS	84.47	73.17	60.27	73.08	82.50	82.87	8.72	75.00	100.00	35.93
MEX	13.99	5.99	11.85	23.55	46.12	40.24	1.02	9.88	7.08	4.15
USA	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	48.60	100.00
Weight	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566

RIE Index Condorcet Results - 1992

	RailPass +	RdVhcl +	SulphOx -	NitOx -	CarbMon -	CbDioxEm -	CbDxTtEm -	EcoFPt -	FnConExp +	DefExp -
Weight	0.003566	0.003566	0.020266	0.020266	0.020266	0.0304	0.0304	0.020266	0.020266	0.020266
AUS	915.17	116.66	102	79	306	15.80	1.3	6.91	81.4	112.74
MEX	4,793.90	40.58	11.67	12	100.29	3.53	1.46	2.51	83.14	62.71
USA	38,901.49	23.57	78	89	476	19.73	23.86	9.6	85.56	2345.39
AM	0	0.003566	0	0	0	0	0.0304	0	0	0
MA	0.003566	0	0.020266	0.020266	0.020266	0.0304	0	0.020266	0.020266	0.020266
AU	0	0.003566	0	0.020266	0.020266	0.0304	0.0304	0.020266	0	0.020266
UA	0.003566	0	0.020266	0	0	0	0	0	0.020266	0
MU	0	0.003566	0.020266	0.020266	0.020266	0.0304	0.0304	0.020266	0	0.020266
UM	0.003566	0	0	0	0	0	0	0	0.020266	0

RIE Index Distance to Leader Results - 1992

	RailPass +	RdVhcl +	SulphOx -	NitOx -	CarbMon -	CbDioxEm -	CbDxTtEm -	EcoFPt -	FnConExp +	DefExp -
AUS	2.35	100.00	11.44	15.19	32.77	22.34	100.00	36.32	95.14	55.62
MEX	12.32	34.78	100.00	100.00	100.00	100.00	89.04	100.00	97.17	100.00
USA	100.00	20.20	14.96	13.48	21.07	17.89	5.45	26.15	100.00	2.67
Weight	0.003566	0.003566	0.020266	0.020266	0.020266	0.0304	0.0304	0.020266	0.020266	0.020266

RIE Index Condorcet Results - 1992

	RoadPvd +	GFCF +	AvNoOcc -	HseStck +	PopAcDg +	PopAcWtr +	PopAcSan +	GpMemb +	LifeSat +	HholdWk +
Weight	0.002	0.002	0.002	0.002	0.019633	0.019633	0.019633	0.004088	0.004088	0.004088
AUS	36.4	14.7	2.89	0.39	97.5	100	100	2.85	7.03	27.65
MEX	35.5	9.6	4.86	0.21	87	84.14	61	0.75	7.23	64.42
USA	59.14	10.2	2.67	0.42	97.5	100	100	2.43	7.43	25.24
AM	0.002	0.002	0.002	0.002	0.019633	0.019633	0.019633	0.004088	0	0
MA	0	0	0	0	0	0	0	0	0.004088	0.004088
AU	0	0.002	0	0	0.0098165	0.0098165	0.0098165	0.004088	0	0.004088
UA	0.002	0	0.002	0.002	0.0098165	0.0098165	0.0098165	0	0.004088	0
MU	0	0	0	0	0	0	0	0	0	0.004088
UM	0.002	0.002	0.002	0.002	0.019633	0.019633	0.019633	0.004088	0.004088	0

RIE Index Distance to Leader Results - 1992

	RoadPvd +	GFCF +	AvNoOcc -	HseStck +	PopAcDg +	PopAcWtr +	PopAcSan +	GpMemb +	LifeSat +	HholdWk +
AUS	61.55	100.00	92.39	92.86	100.00	100.00	100.00	100.00	94.62	42.92
MEX	60.03	65.31	54.94	50.00	89.23	84.14	61.00	26.32	97.31	100.00
USA	100.00	69.39	100.00	100.00	100.00	100.00	100.00	85.26	100.00	39.18
Weight	0.002	0.002	0.002	0.002	0.019633	0.019633	0.019633	0.004088	0.004088	0.004088

RIE Index Condorcet Results - 1992

	GNI_PPP +	GINI -	YthUnpt -	DivceRt -	P'sners -	ScideRte -	CptnInd +	LawIndex +	GovEfInd +	PolStInd +	V&Aind +
Weight	0.004088	0.004088	0.004088	0.004088	0.004088	0.004088	0.00122	0.00122	0.00122	0.00122	0.00122
AUS	17,125	0.303	19.5	41.27	79.3	12.9	2.01	1.9	1.9	1.09	1.91
MEX	6,633	0.485	5.4	7.05	50.4	2.6	-0.31	-0.53	0.04	-0.17	-0.6
USA	24,472	0.346	14.2	48.95	408.8	12	1.81	1.92	1.82	0.92	1.66
AM	0.004088	0.004088	0	0	0	0	0.00122	0.00122	0.00122	0.00122	0.00122
MA	0	0	0.004088	0.004088	0.004088	0.004088	0	0	0	0	0
AU	0	0.004088	0	0.004088	0.004088	0	0.00122	0	0.00122	0.00122	0.00122
UA	0.004088	0	0.004088	0	0	0.004088	0	0.00122	0	0	0
MU	0	0	0.004088	0.004088	0.004088	0.004088	0	0	0	0	0
UM	0.004088	0.004088	0	0	0	0	0.00122	0.00122	0.00122	0.00122	0.00122

RIE Index Distance to Leader Results - 1992

	GNI_PPP +	GINI -	YthUnpt -	DivceRt -	P'sners -	ScideRte -	CptnInd +	LawIndex +	GovEfInd +	PolStInd +	V&Aind +
AUS	69.98	100.00	27.69	17.08	63.55	20.16	100.00	98.96	100.00	100.00	100.00
MEX	27.10	62.47	100.00	100.00	100.00	100.00	-15.42	-27.60	2.11	-15.60	-31.41
USA	100.00	87.57	38.03	14.40	12.33	21.67	90.05	100.00	95.79	84.40	86.91
Weight	0.004088	0.004088	0.004088	0.004088	0.004088	0.004088	0.00122	0.00122	0.00122	0.00122	0.00122

RIE Index Condorcet Results - 1992

	EmpRate +	AdUnptRt -	LTUnpt -	O_WkHrs -	JoblessH -	RelPovRt -	RlPovEld -	
Weight	0.006214	0.006214	0.006214	0.006214	0.006214	0.006214	0.006214	
AUS	65.4	8.3	34.5	-6	13.35	10.25	19.88	
MEX	61.4	2.3	1.5	20.06	3.44	20.99	30.56	
USA	70.6	6.4	11.1	-2	6.53	16.91	22.61	
AM	0.006214	0	0	0.006214	0	0.006214	0.006214	**0.4993**
MA	0	0.006214	0.006214	0	0.006214	0	0	**0.5003**
AU	0	0	0	0.006214	0	0.006214	0.006214	**0.6263**
UA	0.006214	0.006214	0.006214	0	0.006214	0	0	**0.3734**
MU	0	0.006214	0.006214	0	0.006214	0	0	**0.5061**
UM	0.006214	0	0	0.006214	0	0.006214	0.006214	**0.4936**

RIE Index Distance to Leader Results - 1992

	EmpRate +	AdUnptRt -	LTUnpt -	O_WkHrs -	JoblessH -	RelPovRt -	RlPovEld -
AUS	92.63	27.71	4.29	100.00	25.76	100.00	100.00
MEX	86.97	100.00	100.00	-29.91	100.00	48.83	65.05
USA	100.00	35.94	13.38	300.00	52.69	60.62	87.93
Weight	0.006214	0.006214	0.006214	0.006214	0.006214	0.006214	0.006214

RIE Index Condorcet Results - 1993

	Lexp +	InfMort -	HALE +	Phys +	PopnGwth +	FertRate +	Calories -	FatCons -	SugCons -	SchLexp +
Weight	0.014725	0.014725	0.014725	0.014725	0.0107	0.0107	0.019633	0.019633	0.019633	0.009483
AUS	78	6.1	70.8	2.4	0.97	1.87	3073	128.2	46.2	20.35
MEX	72.3	29.6	63.39	1.4	1.82	2.99	3140	85.3	51.4	10.44
USA	75.5	8.4	67.78	2.1	1.32	2.02	3576	142.2	65.5	15.73
AM	0.014725	0.014725	0.014725	0.014725	0	0	0.019633	0	0.019633	0.009483
MA	0	0	0	0	0.0107	0.0107	0	0.019633	0	0
AU	0.014725	0.014725	0.014725	0.014725	0	0	0.019633	0.019633	0.019633	0.009483
UA	0	0	0	0	0.0107	0.0107	0	0	0	0
MU	0	0	0	0	0.0107	0.0107	0.019633	0.019633	0.019633	0
UM	0.014725	0.014725	0.014725	0.014725	0	0	0	0	0	0.009483

E =

	AUS	**MEX**	**USA**
AUS	0	0.5101	0.6534
MEX	0.4896	0	0.5213
USA	0.3463	0.4784	0

AMU =	0.5101	0.6534	0.5213	**1.6848**
MUA =	0.5213	0.4896	0.3463	1.3572
UAM =	0.3463	0.4784	0.5101	1.3347
AUM =	0.6534	0.5101	0.4784	1.6418
MAU =	0.4896	0.5213	0.6534	1.6643
UMA =	0.4784	0.3463	0.4896	1.3142

The final Condorcet ranking for RIE index for 1993 is AMU.

RIE Index Distance to Leader Results - 1993

	Lexp +	InfMort -	HALE +	Phys +	PopnGwth +	FertRate +	Calories -	FatCons -	SugCons -	SchLexp +
AUS	100.00	100.00	100.00	100.00	53.30	62.54	100.00	66.54	100.00	100.00
MEX	92.69	20.61	89.55	58.33	100.00	100.00	97.87	100.00	89.88	51.30
USA	96.79	72.62	95.75	87.50	72.53	67.56	85.93	59.99	70.53	77.30
Weight	0.014725	0.014725	0.014725	0.014725	0.0107	0.0107	0.019633	0.019633	0.019633	0.009483

RIE_AUS	71.27
RIE_MEX	70.47
RIE_USA	60.39

The final DTL ranking for RIE index for 1993 is AMU.

RIE Index Condorcet Results - 1993

	NetEnrlt +	PbExpEdn +	TSSM&E +	PupilTch -	PISAsci +	R&Dexp +	R&Drsrch +	HiTechXt +	Patents +	Sci&Tert +	NFBtert +
Weight	0.009483	0.009483	0.009483	0.009483	0.009483	0.00428	0.00428	0.00428	0.00428	0.00428	0.018966
AUS	86.7	4.85	20.78	18.71	526.5	1.49	6.54	14.45	54.98	675.40	14.41
MEX	43.45	5.1	25.01	28.12	413.5	0.22	0.4	11.51	3.9	17.08	-6.12
USA	87.78	5.6	17.48	15.06	495	2.52	8.2	33.19	204.82	759.46	3.55
AM	0.009483	0	0	0.009483	0.009483	0.00428	0.00428	0.00428	0.00428	0.00428	0.018966
MA	0	0.009483	0.009483	0	0	0	0	0	0	0	0
AU	0	0	0.009483	0	0.009483	0	0	0	0	0	0.018966
UA	0.009483	0.009483	0	0.009483	0	0.00428	0.00428	0.00428	0.00428	0.00428	0
MU	0	0	0.009483	0	0	0	0	0	0	0	0
UM	0.009483	0.009483	0	0.009483	0.009483	0.00428	0.00428	0.00428	0.00428	0.00428	0.018966

RIE Index Distance to Leader Results - 1993

	NetEnrlt +	PbExpEdn +	TSSM&E +	PupilTch -	PISAsci +	R&Dexp +	R&Drsrch +	HiTechXt +	Patents +	Sci&Tert +	NFBtert +
AUS	98.77	86.61	83.09	80.49	100.00	59.13	79.76	43.54	26.84	88.93	100.00
MEX	49.50	91.07	100.00	53.56	78.54	8.73	4.88	34.68	1.90	2.25	-42.47
USA	100.00	100.00	69.89	100.00	94.02	100.00	100.00	100.00	100.00	100.00	24.64
Weight	0.009483	0.009483	0.009483	0.009483	0.009483	0.00428	0.00428	0.00428	0.00428	0.00428	0.018966

RIE Index Condorcet Results - 1993

	HSkImm +	NtTyGn +	FstArea +	AgLand +	ArblLand +	IrrigLnd +	FertCons -	TractUse -	AgPdnInd +	FdPdnInd +	GDPEgUse -
Weight	0.018966	0.018966	0.0076	0.0076	0.0076	0.0076	0.0076	0.0076	0.0076	0.0076	0.020266
AUS	28.87	10.42	21.65	59.92	6.03	4.53	326.46	147.6	85.3	84.1	4.01
MEX	1.33	-1	35.25	55.38	12.94	22.98	644.49	83.3	91.2	91.1	5.25
USA	13.86	4.14	32.81	46.18	19.97	11.62	1,112.62	41.2	89.1	88.4	3.75
AM	0.018966	0.018966	0	0.0076	0	0	0.0076	0	0	0	0.020266
MA	0	0	0.0076	0	0.0076	0.0076	0	0.0076	0.0076	0.0076	0
AU	0.018966	0.018966	0	0.0076	0	0	0.0076	0	0	0	0
UA	0	0	0.0076	0	0.0076	0.0076	0	0.0076	0.0076	0.0076	0.020266
MU	0	0	0.0076	0.0076	0	0.0076	0.0076	0	0.0076	0.0076	0
UM	0.018966	0.018966	0	0	0.0076	0	0	0.0076	0	0	0.020266

RIE Index Distance to Leader Results - 1993

	HSkImm +	NtTyGn +	FstArea +	AgLand +	ArblLand +	IrrigLnd +	FertCons -	TractUse -	AgPdnInd +	FdPdnInd +	GDPEgUse -
AUS	100.00	100.00	61.42	100.00	30.20	19.71	100.00	27.91	93.53	92.32	93.52
MEX	4.61	-9.60	100.00	92.42	64.80	100.00	50.65	49.46	100.00	100.00	71.43
USA	48.01	39.73	93.08	77.07	100.00	50.57	29.34	100.00	97.70	97.04	100.00
Weight	0.018966	0.018966	0.0076	0.0076	0.0076	0.0076	0.0076	0.0076	0.0076	0.0076	0.020266

RIE Index Condorcet Results - 1993

	RbleEgSp +	ElecCons -	FWaterAv +	InGdWtAv +	WtrWdls -	OrgWtrPt -	FishCapt -	FishCons -	NBI +	ThtMamm -	ThtBird -
Weight	0.020266	0.020266	0.0152	0.0152	0.0152	0.0152	0.0304	0.0304	0.020266	0.020266	0.020266
AUS	6.1	8,667.71	23.78	4.08	4.9	5.64	0.24	19.37	0.85	21.22	4.24
MEX	11.4	1,324.87	3.62	1.58	19.1	1.78	1.08	11.67	0.93	12.22	1.36
USA	5.3	12,261.52	6.74	5	17.1	9.81	5.67	21.6	0.68	7.78	7.36
AM	0	0	0.0152	0.0152	0.0152	0	0.0304	0	0	0	0
MA	0.020266	0.020266	0	0	0	0.0152	0	0.0304	0.020266	0.020266	0.020266
AU	0.020266	0.020266	0.0152	0	0.0152	0.0152	0.0304	0.0304	0.020266	0	0.020266
UA	0	0	0	0.0152	0	0	0	0	0	0.020266	0
MU	0.020266	0.020266	0	0	0	0.0152	0.0304	0.0304	0.020266	0	0.020266
UM	0	0	0.0152	0.0152	0.0152	0	0	0	0	0.020266	0

RIE Index Distance to Leader Results - 1993

	RbleEgSp +	ElecCons -	FWaterAv +	InGdWtAv +	WtrWdls -	OrgWtrPt -	FishCapt -	FishCons -	NBI +	ThtMamm -	ThtBird -
AUS	53.51	15.29	100.00	81.60	100.00	31.56	100.00	60.25	91.40	36.66	32.08
MEX	100.00	100.00	15.22	31.60	25.65	100.00	22.22	100.00	100.00	63.67	100.00
USA	46.49	10.81	28.34	100.00	28.65	18.14	4.23	54.03	73.12	100.00	18.48
Weight	0.020266	0.020266	0.0152	0.0152	0.0152	0.0152	0.0304	0.0304	0.020266	0.020266	0.020266

RIE Index Condorcet Results - 1993

	NtDmCdt +	DmCdtBnk +	FDIInf +	NetLnd +	MktCpt -	StksTd -	Real_IR -	RealXRte +	M&Teqp +	GFCF_Mch +
Weight	0.002675	0.002675	0.002675	0.002675	0.002675	0.002675	0.002675	0.002675	0.0107	0.0107
AUS	18,889	74.74	1.42	-658.66	67.5	22.31	8.48	102.12	20.89	7.6
MEX	5,615	39.31	1.09	-411.64	49.85	15.49	7.52	99.67	23.48	8.6
USA	19,001	135.81	0.78	-812.56	77.77	50.8	3.62	85.08	31.36	6.4
AM	0.002675	0.002675	0.002675	0	0	0	0	0.002675	0	0
MA	0	0	0	0.002675	0.002675	0.002675	0.002675	0	0.0107	0.0107
AU	0	0	0.002675	0.002675	0.002675	0.002675	0	0.002675	0	0.0107
UA	0.002675	0.002675	0	0	0	0	0.002675	0	0.0107	0
MU	0	0	0.002675	0.002675	0.002675	0.002675	0	0.002675	0	0.0107
UM	0.002675	0.002675	0	0	0	0	0.002675	0	0.0107	0

RIE Index Distance to Leader Results - 1993

	NtDmCdt +	DmCdtBnk +	FDIInf +	NetLnd +	MktCpt -	StksTd -	Real_IR -	RealXRte +	M&Teqp +	GFCF_Mch +
AUS	99.41	55.03	100.00	62.50	73.85	69.43	42.69	100.00	66.61	88.37
MEX	29.55	28.94	76.76	100.00	100.00	100.00	48.14	97.60	74.87	100.00
USA	100.00	100.00	54.93	50.66	64.10	30.49	100.00	83.31	100.00	74.42
Weight	0.002675	0.002675	0.002675	0.002675	0.002675	0.002675	0.002675	0.002675	0.0107	0.0107

RIE Index Condorcet Results - 1993

	TphnMain +	PCs +	Radios +	Tvsets +	Newspap +	ICT_Exp +	AirTptFt +	Air_Pass +	ContPtTf +	RaRdGood +
Weight	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566
AUS	483.52	207.52	1287.4	594.7	177.04	6.24	1,525.80	1,524,703.00	219,182.80	1164822.24
MEX	86.65	18.19	252.2	184.2	99.51	3.03	150.9	187,426.00	15507.2	139,747.30
USA	569.82	270.08	2118.6	778.8	214.91	7.65	16,343.00	1,807,971.00	106515.8	3,372,798.25
AM	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566
MA	0	0	0	0	0	0	0	0	0	0
AU	0	0	0	0	0	0	0	0	0.003566	0
UA	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0	0.003566
MU	0	0	0	0	0	0	0	0	0	0
UM	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566

RIE Index Distance to Leader Results - 1993

	TphnMain +	PCs +	Radios +	Tvsets +	Newspap +	ICT_Exp +	AirTptFt +	Air_Pass +	ContPtTf +	RaRdGood +
AUS	84.85	76.84	60.77	76.36	82.38	81.57	9.34	84.33	100.00	34.54
MEX	15.21	6.74	11.90	23.65	46.30	39.61	0.92	10.37	7.08	4.14
USA	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	48.60	100.00
Weight	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566

RIE Index Condorcet Results - 1993

	RailPass +	RdVhcl +	SulphOx -	NitOx -	CarbMon -	CbDioxEm -	CbDxTtEm -	EcoFPt -	FnConExp +	DefExp -
Weight	0.003566	0.003566	0.020266	0.020266	0.020266	0.0304	0.0304	0.020266	0.020266	0.020266
AUS	952.93	109.61	104	79	301	15.89	1.31	6.91	84.17	120.34
MEX	3,219.30	41.77	11.67	12	94.27	3.50	1.46	2.51	84.59	66.96
USA	39,473.97	23.42	76	88	452	19.86	24.04	9.6	85.86	2443.44
AM	0	0.003566	0	0	0	0	0.0304	0	0	0
MA	0.003566	0	0.020266	0.020266	0.020266	0.0304	0	0.020266	0.020266	0.020266
AU	0	0.003566	0	0.020266	0.020266	0.0304	0.0304	0.020266	0	0.020266
UA	0.003566	0	0.020266	0	0	0	0	0	0.020266	0
MU	0	0.003566	0.020266	0.020266	0.020266	0.0304	0.0304	0.020266	0	0.020266
UM	0.003566	0	0	0	0	0	0	0	0.020266	0

RIE Index Distance to Leader Results - 1993

	RailPass +	RdVhcl +	SulphOx -	NitOx -	CarbMon -	CbDioxEm -	CbDxTtEm -	EcoFPt -	FnConExp +	DefExp -
AUS	2.41	100.00	11.22	15.19	31.32	22.03	100.00	36.32	98.03	55.64
MEX	8.16	38.11	100.00	100.00	100.00	100.00	89.73	100.00	98.52	100.00
USA	100.00	21.37	15.36	13.64	20.86	17.62	5.45	26.15	100.00	2.74
Weight	0.003566	0.003566	0.020266	0.020266	0.020266	0.0304	0.0304	0.020266	0.020266	0.020266

RIE Index Condorcet Results - 1993

	RoadPvd +	GFCF +	AvNoOcc -	HseStck +	PopAcDg +	PopAcWtr +	PopAcSan +	GpMemb +	LifeSat +	HholdWk +
Weight	0.002	0.002	0.002	0.002	0.019633	0.019633	0.019633	0.004088	0.004088	0.004088
AUS	37.1	14.7	2.85	0.39	97.5	100	100	2.85	7.12	27.65
MEX	36	10	4.76	0.21	87	85.21	62.5	0.75	7.31	64.42
USA	59.14	10.3	2.67	0.43	97.5	100	100	2.43	7.43	25.24
AM	0.002	0.002	0.002	0.002	0.019633	0.019633	0.019633	0.004088	0	0
MA	0	0	0	0	0	0	0	0	0.004088	0.004088
AU	0	0.002	0	0	0.0098165	0.0098165	0.0098165	0.004088	0	0.004088
UA	0.002	0	0.002	0.002	0.0098165	0.0098165	0.0098165	0	0.004088	0
MU	0	0	0	0	0	0	0	0	0	0.004088
UM	0.002	0.002	0.002	0.002	0.019633	0.019633	0.019633	0.004088	0.004088	0

RIE Index Distance to Leader Results - 1993

	RoadPvd +	GFCF +	AvNoOcc -	HseStck +	PopAcDg +	PopAcWtr +	PopAcSan +	GpMemb +	LifeSat +	HholdWk +
AUS	62.73	100.00	93.68	90.70	100.00	100.00	100.00	100.00	95.83	42.92
MEX	60.87	68.03	56.09	48.84	89.23	85.21	62.50	26.32	98.38	100.00
USA	100.00	70.07	100.00	100.00	100.00	100.00	100.00	85.26	100.00	39.18
Weight	0.002	0.002	0.002	0.002	0.019633	0.019633	0.019633	0.004088	0.004088	0.004088

RIE Index Condorcet Results - 1993

	GNI_PPP +	GINI -	YthUnpt -	DivceRt -	P'sners -	ScideRte -	CptnInd +	LawIndex +	GovEfInd +	PolStInd +	V&Aind +
Weight	0.004088	0.004088	0.004088	0.004088	0.004088	0.004088	0.00122	0.00122	0.00122	0.00122	0.00122
AUS	18,026	0.303	18.6	42.22	81.3	11.5	2.01	1.9	1.9	1.12	1.87
MEX	6,793	0.485	5.4	6.98	51.3	2.7	-0.31	-0.5	0.04	-0.17	-0.52
USA	25,371	0.35	13.4	48.95	416.6	12.1	1.81	1.89	1.82	0.96	1.62
AM	0.004088	0.004088	0	0	0	0	0.00122	0.00122	0.00122	0.00122	0.00122
MA	0	0	0.004088	0.004088	0.004088	0.004088	0	0	0	0	0
AU	0	0.004088	0	0.004088	0.004088	0.004088	0.00122	0.00122	0.00122	0.00122	0.00122
UA	0.004088	0	0.004088	0	0	0	0	0	0	0	0
MU	0	0	0.004088	0.004088	0.004088	0.004088	0	0	0	0	0
UM	0.004088	0.004088	0	0	0	0	0.00122	0.00122	0.00122	0.00122	0.00122

RIE Index Distance to Leader Results - 1993

	GNI_PPP +	GINI -	YthUnpt -	DivceRt -	P'sners -	ScideRte -	CptnInd +	LawIndex +	GovEfInd +	PolStInd +	V&Aind +
AUS	71.05	100.00	29.03	16.53	63.12	23.48	100.00	100.00	100.00	100.00	100.00
MEX	26.77	62.47	100.00	100.00	100.00	100.00	-15.42	-26.32	2.11	-15.18	-27.81
USA	100.00	86.57	40.30	14.26	12.32	22.31	90.05	99.47	95.79	85.71	86.63
Weight	0.004088	0.004088	0.004088	0.004088	0.004088	0.004088	0.00122	0.00122	0.00122	0.00122	0.00122

RIE Index Condorcet Results - 1993

	EmpRate +	AdUnptRt -	LTUnpt -	O_WkHrs -	JoblessH -	RelPovRt -	RlPovEld -	
Weight	0.006214	0.006214	0.006214	0.006214	0.006214	0.006214	0.006214	
AUS	65.2	8.6	36.5	19	13.52	10.25	19.88	
MEX	62.2	2.5	1.4	17.43	3.42	20.99	30.56	
USA	70.8	5.8	11.5	5	6.42	16.91	22.61	
AM	0.006214	0	0	0	0	0.006214	0.006214	**0.5101**
MA	0	0.006214	0.006214	0.006214	0.006214	0	0	**0.4896**
AU	0	0	0	0	0	0.006214	0.006214	**0.6534**
UA	0.006214	0.006214	0.006214	0.006214	0.006214	0	0	**0.3463**
MU	0	0.006214	0.006214	0	0.006214	0	0	**0.5213**
UM	0.006214	0	0	0.006214	0	0.006214	0.006214	**0.4784**

RIE Index Distance to Leader Results - 1993

	EmpRate +	AdUnptRt -	LTUnpt -	O_WkHrs -	JoblessH -	RelPovRt -	RlPovEld -
AUS	92.09	29.07	3.94	26.32	25.33	100.00	100.00
MEX	87.85	100.00	100.00	28.69	100.00	48.83	65.05
USA	100.00	43.10	12.52	100.00	53.34	60.62	87.93
Weight	0.006214	0.006214	0.006214	0.006214	0.006214	0.006214	0.006214

RIE Index Condorcet Results - 1994

	Lexp +	InfMort -	HALE +	Phys +	PopnGwth +	FertRate +	Calories -	FatCons -	SugCons -	SchLexp +
Weight	0.014725	0.014725	0.014725	0.014725	0.0107	0.0107	0.019633	0.019633	0.019633	0.009483
AUS	78	5.9	70.8	2.4	1.65	1.85	3079	127	44.7	20.35
MEX	72.6	28.5	63.65	1.5	1.79	2.95	3141	86	50.3	10.64
USA	75.7	8	67.96	2.1	1.23	2.00	3635	144	66.4	15.73
AM	0.014725	0.014725	0.014725	0.014725	0	0	0.019633	0	0.019633	0.009483
MA	0	0	0	0	0.0107	0.0107	0	0.019633	0	0
AU	0.014725	0.014725	0.014725	0.014725	0.0107	0	0.019633	0.019633	0.019633	0.009483
UA	0	0	0	0	0	0.0107	0	0	0	0
MU	0	0	0	0	0.0107	0.0107	0.019633	0.019633	0.019633	0
UM	0.014725	0.014725	0.014725	0.014725	0	0	0	0	0	0.009483

E =

	AUS	**MEX**	**USA**
AUS	0	0.5101	0.6600
MEX	0.4896	0	0.5071
USA	0.3397	0.4926	0

AMU =	0.5101	0.6600	0.5071	**1.6772**
MUA =	0.5071	0.4896	0.3397	1.3363
UAM =	0.3397	0.4926	0.5101	1.3423
AUM =	0.6600	0.5101	0.4926	1.6627
MAU =	0.4896	0.5071	0.6600	1.6567
UMA =	0.4926	0.3397	0.4896	1.3218

The final Condorcet ranking for RIE index for 1994 is AMU.

RIE Index Distance to Leader Results - 1994

	Lexp +	InfMort -	HALE +	Phys +	PopnGwth +	FertRate +	Calories -	FatCons -	SugCons -	SchLexp +
AUS	100.00	100.00	100.00	100.00	92.18	62.71	100.00	67.72	100.00	100.00
MEX	93.08	20.70	89.91	62.50	100.00	100.00	98.03	100.00	88.87	52.29
USA	97.05	73.75	96.00	87.50	68.72	67.80	84.70	59.72	67.32	77.30
Weight	0.014725	0.014725	0.014725	0.014725	0.0107	0.0107	0.019633	0.019633	0.019633	0.009483

RIE_AUS	71.95
RIE_MEX	70.47
RIE_USA	60.79

The final DTL ranking for RIE index for 1994 is AMU.

RIE Index Condorcet Results - 1994

	NetEnrlt +	PbExpEdn +	TSSM&E +	PupilTch -	PISAsci +	R&Dexp +	R&Drsrch +	HiTechXt +	Patents +	Sci&Tert +	NFBtert +
Weight	0.009483	0.009483	0.009483	0.009483	0.009483	0.00428	0.00428	0.00428	0.00428	0.00428	0.018966
AUS	86.7	4.85	20.78	18.5	526.5	1.59	7	15.97	58.86	711.01	14.41
MEX	45.31	5.1	25.01	27.98	413.5	0.29	0.5	13.84	3.22	18.57	-6.12
USA	87.78	5.6	17.48	15.06	495	2.42	8.35	33.06	213.08	759.21	3.55
AM	0.009483	0	0	0.009483	0.009483	0.00428	0.00428	0.00428	0.00428	0.00428	0.018966
MA	0	0.009483	0.009483	0	0	0	0	0	0	0	0
AU	0	0	0.009483	0	0.009483	0	0	0	0	0	0.018966
UA	0.009483	0.009483	0	0.009483	0	0.00428	0.00428	0.00428	0.00428	0.00428	0
MU	0	0	0.009483	0	0	0	0	0	0	0	0
UM	0.009483	0.009483	0	0.009483	0.009483	0.00428	0.00428	0.00428	0.00428	0.00428	0.018966

RIE Index Distance to Leader Results - 1994

	NetEnrlt +	PbExpEdn +	TSSM&E +	PupilTch -	PISAsci +	R&Dexp +	R&Drsrch +	HiTechXt +	Patents +	Sci&Tert +	NFBtert +
AUS	98.77	86.61	83.09	81.41	100.00	65.70	83.83	48.31	27.62	93.65	100.00
MEX	51.62	91.07	100.00	53.82	78.54	11.98	5.99	41.86	1.51	2.45	-42.47
USA	100.00	100.00	69.89	100.00	94.02	100.00	100.00	100.00	100.00	100.00	24.64
Weight	0.009483	0.009483	0.009483	0.009483	0.009483	0.00428	0.00428	0.00428	0.00428	0.00428	0.018966

RIE Index Condorcet
Results - 1994

	HSkImm +	NtTyGn +	FstArea +	AgLand +	ArblLand +	IrrigLnd +	FertCons -	TractUse -	AgPdnInd +	FdPdnInd +	GDPEgUse -
Weight	0.018966	0.018966	0.0076	0.0076	0.0076	0.0076	0.0076	0.0076	0.0076	0.0076	0.020266
AUS	28.87	10.56	21.65	61.06	6.76	4.62	332.47	165.4	76.8	75.1	4.2
MEX	1.33	-1.1	35.25	55.8	13.07	22.85	660.48	83.7	94.1	93.4	5.33
USA	13.86	4.32	32.81	45.98	19.88	11.78	1,059.77	40.9	101.6	100.7	3.83
AM	0.018966	0.018966	0	0.0076	0	0	0.0076	0	0	0	0.020266
MA	0	0	0.0076	0	0.0076	0.0076	0	0.0076	0.0076	0.0076	0
AU	0.018966	0.018966	0	0.0076	0	0	0.0076	0	0	0	0
UA	0	0	0.0076	0	0.0076	0.0076	0	0.0076	0.0076	0.0076	0.020266
MU	0	0	0.0076	0.0076	0	0.0076	0.0076	0	0	0	0
UM	0.018966	0.018966	0	0	0.0076	0	0	0.0076	0.0076	0.0076	0.020266

RIE Index Distance to
Leader Results - 1994

	HSkImm +	NtTyGn +	FstArea +	AgLand +	ArblLand +	IrrigLnd +	FertCons -	TractUse -	AgPdnInd +	FdPdnInd +	GDPEgUse -
AUS	100.00	100.00	61.42	100.00	34.00	20.22	100.00	24.73	75.59	74.58	91.19
MEX	4.61	-10.42	100.00	91.39	65.74	100.00	50.34	48.86	92.62	92.75	71.86
USA	48.01	40.91	93.08	75.30	100.00	51.55	31.37	100.00	100.00	100.00	100.00
Weight	0.018966	0.018966	0.0076	0.0076	0.0076	0.0076	0.0076	0.0076	0.0076	0.0076	0.020266

RIE Index Condorcet Results - 1994

	RbleEgSp +	ElecCons -	FWaterAv +	InGdWtAv +	WtrWdls -	OrgWtrPt -	FishCapt -	FishCons -	NBI +	ThtMamm -	ThtBird -
Weight	0.020266	0.020266	0.0152	0.0152	0.0152	0.0152	0.0304	0.0304	0.020266	0.020266	0.020266
AUS	6.0	8,724.64	23.39	4.01	4.9	5.63	0.2	19.58	0.85	21.5	4.39
MEX	10.3	1,407.99	3.55	1.55	19.1	3.21	1.08	11.32	0.93	12.49	1.47
USA	5.2	12,455.16	6.65	4.94	17.1	9.72	5.25	21.6	0.68	7.9	7.48
AM	0	0	0.0152	0.0152	0.0152	0	0.0304	0	0	0	0
MA	0.020266	0.020266	0	0	0	0.0152	0	0.0304	0.020266	0.020266	0.020266
AU	0.020266	0.020266	0.0152	0	0.0152	0.0152	0.0304	0.0304	0.020266	0	0.020266
UA	0	0	0	0.0152	0	0	0	0	0	0.020266	0
MU	0.020266	0.020266	0	0	0	0.0152	0.0304	0.0304	0.020266	0	0.020266
UM	0	0	0.0152	0.0152	0.0152	0	0	0	0	0.020266	0

RIE Index Distance to Leader Results - 1994

	RbleEgSp +	ElecCons -	FWaterAv +	InGdWtAv +	WtrWdls -	OrgWtrPt -	FishCapt -	FishCons -	NBI +	ThtMamm -	ThtBird -
AUS	58.25	16.14	100.00	81.17	100.00	57.02	100.00	57.81	91.40	36.74	33.49
MEX	100.00	100.00	15.18	31.38	25.65	100.00	18.52	100.00	100.00	63.25	100.00
USA	50.49	11.30	28.43	100.00	28.65	33.02	3.81	52.41	73.12	100.00	19.65
Weight	0.020266	0.020266	0.0152	0.0152	0.0152	0.0152	0.0304	0.0304	0.020266	0.020266	0.020266

RIE Index Condorcet Results - 1994

	NtDmCdt +	DmCdtBnk +	FDINInf +	NetLnd +	MktCpt -	StksTd -	Real_IR -	RealXRte +	M&Teqp +	GFCF_Mch +
Weight	0.002675	0.002675	0.002675	0.002675	0.002675	0.002675	0.002675	0.002675	0.0107	0.0107
AUS	20,232	76.83	1.45	-1,172.56	63.67	27.56	8.07	107.19	21.33	8.5
MEX	7,322	46.06	2.6	-506.84	30.83	19.67	9.98	95.27	22.56	8.9
USA	19,763	136.05	0.66	-947.83	72.21	50.79	4.93	85.22	32.2	6.7
AM	0.002675	0.002675	0	0	0	0	0.002675	0.002675	0	0
MA	0	0	0.002675	0.002675	0.002675	0.002675	0	0	0.0107	0.0107
AU	0.002675	0	0.002675	0	0.002675	0.002675	0	0.002675	0	0.0107
UA	0	0.002675	0	0.002675	0	0	0.002675	0	0.0107	0
MU	0	0	0.002675	0.002675	0.002675	0.002675	0	0.002675	0	0.0107
UM	0.002675	0.002675	0	0	0	0	0.002675	0	0.0107	0

RIE Index Distance to Leader Results - 1994

	NtDmCdt +	DmCdtBnk +	FDINInf +	NetLnd +	MktCpt -	StksTd -	Real_IR -	RealXRte +	M&Teqp +	GFCF_Mch +
AUS	100.00	56.47	55.77	43.23	48.42	71.37	61.09	100.00	66.24	95.51
MEX	36.19	33.86	100.00	100.00	100.00	100.00	49.40	88.88	70.06	100.00
USA	97.68	100.00	25.38	53.47	42.69	38.73	100.00	79.50	100.00	75.28
Weight	0.002675	0.002675	0.002675	0.002675	0.002675	0.002675	0.002675	0.002675	0.0107	0.0107

RIE Index Condorcet Results - 1994

	TphnMain +	PCs +	Radios +	Tvsets +	Newspap +	ICT_Exp +	AirTptFt +	Air_Pass +	ContPtTf +	RaRdGood +
Weight	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566
AUS	492.9	238.77	1289.4	622.3	174.72	6.24	1,645.50	1,505,937.00	219,182.80	1167318.55
MEX	94.84	23.45	254.1	187.1	98.75	3.03	225.2	209,852.00	15507.2	158,392.60
USA	583.17	294.54	2117.8	808	212.4	7.77	19,083.80	1,956,948.00	106515.8	3,602,601.25
AM	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566
MA	0	0	0	0	0	0	0	0	0	0
AU	0	0	0	0	0	0	0	0	0.003566	0
UA	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0	0.003566
MU	0	0	0	0	0	0	0	0	0	0
UM	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566

RIE Index Distance to Leader Results - 1994

	TphnMain +	PCs +	Radios +	Tvsets +	Newspap +	ICT_Exp +	AirTptFt +	Air_Pass +	ContPtTf +	RaRdGood +
AUS	84.52	81.07	60.88	77.02	82.26	80.31	8.62	76.95	100.00	32.40
MEX	16.26	7.96	12.00	23.16	46.49	39.00	1.18	10.72	7.08	4.40
USA	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	48.60	100.00
Weight	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566

RIE Index Condorcet Results - 1994

	RailPass +	RdVhcl +	SulphOx -	NitOx -	CarbMon -	CbDioxEm -	CbDxTtEm -	EcoFPt -	FnConExp +	DefExp -
Weight	0.003566	0.003566	0.020266	0.020266	0.020266	0.0304	0.0304	0.020266	0.020266	0.020266
AUS	990.71	112.01	106	80	295	15.59	1.29	6.91	80.81	136.05
MEX	1,855.10	42.87	11.67	12	93	3.65	1.54	2.51	84.89	71.21
USA	39,498.75	25.04	74	86	429	19.88	24.19	9.6	85.09	2555.95
AM	0	0.003566	0	0	0	0	0.0304	0	0	0
MA	0.003566	0	0.020266	0.020266	0.020266	0.0304	0	0.020266	0.020266	0.020266
AU	0	0.003566	0	0.020266	0.020266	0.0304	0.0304	0.020266	0	0.020266
UA	0.003566	0	0.020266	0	0	0	0	0	0.020266	0
MU	0	0.003566	0.020266	0.020266	0.020266	0.0304	0.0304	0.020266	0	0.020266
UM	0.003566	0	0	0	0	0	0	0	0.020266	0

RIE Index Distance to Leader Results - 1994

	RailPass +	RdVhcl +	SulphOx -	NitOx -	CarbMon -	CbDioxEm -	CbDxTtEm -	EcoFPt -	FnConExp +	DefExp -
AUS	2.51	100.00	11.01	15.00	31.53	23.41	100.00	36.32	94.97	52.34
MEX	4.70	38.27	100.00	100.00	100.00	100.00	83.77	100.00	99.76	100.00
USA	100.00	22.36	15.77	13.95	21.68	18.36	5.33	26.15	100.00	2.79
Weight	0.003566	0.003566	0.020266	0.020266	0.020266	0.0304	0.0304	0.020266	0.020266	0.020266

RIE Index Condorcet Results - 1994

	RoadPvd +	GFCF +	AvNoOcc -	HseStck +	PopAcDg +	PopAcWtr +	PopAcSan +	GpMemb +	LifeSat +	HholdWk +	GNI_PPP +
Weight	0.002	0.002	0.002	0.002	0.019633	0.019633	0.019633	0.004088	0.004088	0.004088	0.004088
AUS	37.9	14.7	2.82	0.39	97.5	100	100	2.85	7.21	27.65	18,868
MEX	31	10.5	4.66	0.21	87	86.29	64	0.75	7.39	64.42	7,117
USA	59.14	10.5	2.68	0.43	97.5	100	100	2.43	7.42	25.24	26,630
AM	0.002	0.002	0.002	0.002	0.019633	0.019633	0.019633	0.004088	0	0	0.004088
MA	0	0	0	0	0	0	0	0	0.004088	0.004088	0
AU	0	0.002	0	0	0.0098165	0.0098165	0.0098165	0.004088	0	0.004088	0
UA	0.002	0	0.002	0.002	0.0098165	0.0098165	0.0098165	0	0.004088	0	0.004088
MU	0	0.001	0	0	0	0	0	0	0	0.004088	0
UM	0.002	0.001	0.002	0.002	0.019633	0.019633	0.019633	0.004088	0.004088	0	0.004088

RIE Index Distance to Leader Results - 1994

	RoadPvd +	GFCF +	AvNoOcc -	HseStck +	PopAcDg +	PopAcWtr +	PopAcSan +	GpMemb +	LifeSat +	HholdWk +	GNI_PPP +
AUS	64.09	100.00	95.04	90.70	100.00	100.00	100.00	100.00	97.17	42.92	70.85
MEX	52.42	71.43	57.51	48.84	89.23	86.29	64.00	26.32	99.60	100.00	26.73
USA	100.00	71.43	100.00	100.00	100.00	100.00	100.00	85.26	100.00	39.18	100.00
Weight	0.002	0.002	0.002	0.002	0.019633	0.019633	0.019633	0.004088	0.004088	0.004088	0.004088

RIE Index Condorcet Results - 1994

	GINI -	YthUnpt -	DivceRt -	P'sners -	ScideRte -	CptnInd +	LawIndex +	GovEfInd +	PolStInd +	V&Aind +	EmpRate +
Weight	0.004088	0.004088	0.004088	0.004088	0.004088	0.00122	0.00122	0.00122	0.00122	0.00122	0.006214
AUS	0.303	16.2	43.4	83.4	12.8	2.01	1.9	1.9	1.15	1.83	66.6
MEX	0.485	7.1	6.9	50.2	2.9	-0.31	-0.48	0.04	-0.17	-0.43	62.9
USA	0.355	12.5	48.95	424.4	11.9	1.81	1.86	1.82	1	1.59	71.5
AM	0.004088	0	0	0	0	0.00122	0.00122	0.00122	0.00122	0.00122	0.006214
MA	0	0.004088	0.004088	0.004088	0.004088	0	0	0	0	0	0
AU	0.004088	0	0.004088	0.004088	0	0.00122	0.00122	0.00122	0.00122	0.00122	0
UA	0	0.004088	0	0	0.004088	0	0	0	0	0	0.006214
MU	0	0.004088	0.004088	0.004088	0.004088	0	0	0	0	0	0
UM	0.004088	0	0	0	0	0.00122	0.00122	0.00122	0.00122	0.00122	0.006214

RIE Index Distance to Leader Results - 1994

	GINI -	YthUnpt -	DivceRt -	P'sners -	ScideRte -	CptnInd +	LawIndex +	GovEfInd +	PolStInd +	V&Aind +	EmpRate +
AUS	100.00	43.83	15.90	60.22	22.66	100.00	100.00	100.00	100.00	100.00	93.15
MEX	62.47	100.00	100.00	100.00	100.00	-15.42	-25.26	2.11	-14.78	-23.50	87.97
USA	85.35	56.80	14.10	11.83	24.37	90.05	97.89	95.79	86.96	86.89	100.00
Weight	0.004088	0.004088	0.004088	0.004088	0.004088	0.00122	0.00122	0.00122	0.00122	0.00122	0.006214

RIE Index Condorcet Results - 1994

	AdUnptRt -	LTUnpt -	O_WkHrs -	JoblessH -	RelPovRt -	RlPovEld -	
Weight	0.006214	0.006214	0.006214	0.006214	0.006214	0.006214	
AUS	7.6	36.3	24	13.68	10.25	19.88	
MEX	3.3	1.4	14.8	3.41	20.99	30.56	
USA	5	12.2	9	6.31	16.91	22.61	
AM	0	0	0	0	0.006214	0.006214	**0.5101**
MA	0.006214	0.006214	0.006214	0.006214	0	0	**0.4896**
AU	0	0	0	0	0.006214	0.006214	**0.6600**
UA	0.006214	0.006214	0.006214	0.006214	0	0	**0.3397**
MU	0.006214	0.006214	0	0.006214	0	0	**0.5071**
UM	0	0	0.006214	0	0.006214	0.006214	**0.4926**

RIE Index Distance to Leader Results - 1994

	AdUnptRt -	LTUnpt -	O_WkHrs -	JoblessH -	RelPovRt -	RlPovEld -
AUS	43.42	3.85	37.50	24.91	100.00	100.00
MEX	100.00	100.00	60.81	100.00	48.83	65.05
USA	66.00	11.44	100.00	54.02	60.62	87.93
Weight	0.006214	0.006214	0.006214	0.006214	0.006214	0.006214

RIE Index Condorcet Results - 1995

	Lexp +	InfMort -	HALE +	Phys +	PopnGwth +	FertRate +	Calories -	FatCons -	SugCons -	SchLexp +
Weight	0.014725	0.014725	0.014725	0.014725	0.0107	0.0107	0.019633	0.019633	0.019633	0.009483
AUS	77.9	5.7	70.7	2.5	0.65	1.82	3137	128.1	48.3	20.35
MEX	72.7	27.6	63.74	1.5	1.77	2.88	3111	84.3	49.5	10.84
USA	75.7	7.6	67.96	2.2	1.19	1.98	3580	141	67.2	15.73
AM	0.014725	0.014725	0.014725	0.014725	0	0	0	0	0.019633	0.009483
MA	0	0	0	0	0.0107	0.0107	0.019633	0.019633	0	0
AU	0.014725	0.014725	0.014725	0.014725	0	0	0.019633	0.019633	0.019633	0.009483
UA	0	0	0	0	0.0107	0.0107	0	0	0	0
MU	0	0	0	0	0.0107	0.0107	0.019633	0.019633	0.019633	0
UM	0.014725	0.014725	0.014725	0.014725	0	0	0	0	0	0.009483

E =

	AUS	**MEX**	**USA**
AUS	0	0.5390	0.6493
MEX	0.4607	0	0.5289
USA	0.3504	0.4707	0

AMU =	0.5390	0.6493	0.5289	**1.7172**
MUA =	0.5289	0.4607	0.3504	1.3399
UAM =	0.3504	0.4707	0.5390	1.3601
AUM =	0.6493	0.5390	0.4707	1.6591
MAU =	0.4607	0.5289	0.6493	1.6389
UMA =	0.4707	0.3504	0.4607	1.2818

The final Condorcet ranking for RIE index for 1995 is AMU.

RIE Index Distance to Leader Results - 1995

	Lexp +	InfMort -	HALE +	Phys +	PopnGwth +	FertRate +	Calories -	FatCons -	SugCons -	SchLexp +
AUS	100.00	100.00	100.00	100.00	36.72	63.19	99.17	65.81	100.00	100.00
MEX	93.32	20.65	90.17	60.00	100.00	100.00	100.00	100.00	97.58	53.27
USA	97.18	75.00	96.14	88.00	67.23	68.75	86.90	59.79	71.88	77.30
Weight	0.014725	0.014725	0.014725	0.014725	0.0107	0.0107	0.019633	0.019633	0.019633	0.009483

RIE_AUS	71.92
RIE_MEX	71.07
RIE_USA	60.68

The final DTL ranking for RIE index for 1995 is AMU.

RIE Index Condorcet Results - 1995

	NetEnrlt +	PbExpEdn +	TSSM&E +	PupilTch -	PISAsci +	R&Dexp +	R&Drsrch +	HiTechXt +	Patents +	Sci&Tert +	NFBtert +
Weight	0.009483	0.009483	0.009483	0.009483	0.009483	0.00428	0.00428	0.00428	0.00428	0.00428	0.018966
AUS	86.7	4.85	20.78	18.2	526.5	1.53	6.84	15.68	48.09	740.76	14.41
MEX	47.18	5.1	25.01	27.84	413.5	0.31	0.6	15.08	1.62	20.86	-6.12
USA	87.78	5.6	17.48	15.06	495	2.51	8.1	32.8	209.33	761.94	3.55
AM	0.009483	0	0	0.009483	0.009483	0.00428	0.00428	0.00428	0.00428	0.00428	0.018966
MA	0	0.009483	0.009483	0	0	0	0	0	0	0	0
AU	0	0	0.009483	0	0.009483	0	0	0	0	0	0.018966
UA	0.009483	0.009483	0	0.009483	0	0.00428	0.00428	0.00428	0.00428	0.00428	0
MU	0	0	0.009483	0	0	0	0	0	0	0	0
UM	0.009483	0.009483	0	0.009483	0.009483	0.00428	0.00428	0.00428	0.00428	0.00428	0.018966

RIE Index Distance to Leader Results - 1995

	NetEnrlt +	PbExpEdn +	TSSM&E +	PupilTch -	PISAsci +	R&Dexp +	R&Drsrch +	HiTechXt +	Patents +	Sci&Tert +	NFBtert +
AUS	98.77	86.61	83.09	82.75	100.00	60.96	84.44	47.80	22.97	97.22	100.00
MEX	53.75	91.07	100.00	54.09	78.54	12.35	7.41	45.98	0.77	2.74	-42.47
USA	100.00	100.00	69.89	100.00	94.02	100.00	100.00	100.00	100.00	100.00	24.64
Weight	0.009483	0.009483	0.009483	0.009483	0.009483	0.00428	0.00428	0.00428	0.00428	0.00428	0.018966

RIE Index Condorcet Results - 1995

	HSkImm +	NtTyGn +	FstArea +	AgLand +	ArblLand +	IrrigLnd +	FertCons -	TractUse -	AgPdnInd +	FdPdnInd +	GDPEgUse -
Weight	0.018966	0.018966	0.0076	0.0076	0.0076	0.0076	0.0076	0.0076	0.0076	0.0076	0.020266
AUS	28.87	10.7	21.65	60.31	6.01	5.18	404.68	147.1	84.3	83.9	4.32
MEX	1.33	-1.2	35.25	56.16	13.2	22.73	677.13	84.1	98.9	97.9	5.23
USA	13.86	4.5	32.81	45.87	19.88	11.84	1,100.45	40.8	94.6	94.1	3.85
AM	0.018966	0.018966	0	0.0076	0	0	0.0076	0	0	0	0.020266
MA	0	0	0.0076	0	0.0076	0.0076	0	0.0076	0.0076	0.0076	0
AU	0.018966	0.018966	0	0.0076	0	0	0.0076	0	0	0	0
UA	0	0	0.0076	0	0.0076	0.0076	0	0.0076	0.0076	0.0076	0.020266
MU	0	0	0.0076	0.0076	0	0.0076	0.0076	0	0.0076	0.0076	0
UM	0.018966	0.018966	0	0	0.0076	0	0	0.0076	0	0	0.020266

RIE Index Distance to Leader Results - 1995

	HSkImm +	NtTyGn +	FstArea +	AgLand +	ArblLand +	IrrigLnd +	FertCons -	TractUse -	AgPdnInd +	FdPdnInd +	GDPEgUse -
AUS	100.00	100.00	61.42	100.00	30.23	22.79	100.00	27.74	85.24	85.70	89.12
MEX	4.61	-11.21	100.00	93.12	66.40	100.00	59.76	48.51	100.00	100.00	73.61
USA	48.01	42.06	93.08	76.06	100.00	52.09	36.77	100.00	95.65	96.12	100.00
Weight	0.018966	0.018966	0.0076	0.0076	0.0076	0.0076	0.0076	0.0076	0.0076	0.0076	0.020266

RIE Index Condorcet Results - 1995

	RbleEgSp +	ElecCons -	FWaterAv +	InGdWtAv +	WtrWdls -	OrgWtrPt -	FishCapt -	FishCons -	NBI +	ThtMamm -	ThtBird -
Weight	0.020266	0.020266	0.0152	0.0152	0.0152	0.0152	0.0304	0.0304	0.020266	0.020266	0.020266
AUS	6.1	8,956.06	23.24	3.98	4.9	5.59	0.2	19.5	0.85	21.78	4.53
MEX	11.4	1,426.29	3.49	1.53	19.1	2.98	1.16	10.2	0.93	12.76	4.58
USA	5.3	12,659.61	6.58	4.88	17.1	9.78	4.83	21.6	0.68	8.02	7.61
AM	0	0	0.0152	0.0152	0.0152	0	0.0304	0	0	0	0.020266
MA	0.020266	0.020266	0	0	0	0.0152	0	0.0304	0.020266	0.020266	0
AU	0.020266	0.020266	0.0152	0	0.0152	0.0152	0.0304	0.0304	0.020266	0	0.020266
UA	0	0	0	0.0152	0	0	0	0	0	0.020266	0
MU	0.020266	0.020266	0	0	0	0.0152	0.0304	0.0304	0.020266	0	0.020266
UM	0	0	0.0152	0.0152	0.0152	0	0	0	0	0.020266	0

RIE Index Distance to Leader Results - 1995

	RbleEgSp +	ElecCons -	FWaterAv +	InGdWtAv +	WtrWdls -	OrgWtrPt -	FishCapt -	FishCons -	NBI +	ThtMamm -	ThtBird -
AUS	53.51	15.93	100.00	81.56	100.00	53.31	100.00	52.31	91.40	36.82	100.00
MEX	100.00	100.00	15.02	31.35	25.65	100.00	17.24	100.00	100.00	62.85	98.91
USA	46.49	11.27	28.31	100.00	28.65	30.47	4.14	47.22	73.12	100.00	59.53
Weight	0.020266	0.020266	0.0152	0.0152	0.0152	0.0152	0.0304	0.0304	0.020266	0.020266	0.020266

RIE Index Condorcet Results - 1995

	NtDmCdt +	DmCdtBnk +	FDINInf +	NetLnd +	MktCpt -	StksTd -	Real_IR -	RealXRte +	M&Teqp +	GFCF_Mch +
Weight	0.002675	0.002675	0.002675	0.002675	0.002675	0.002675	0.002675	0.002675	0.0107	0.0107
AUS	22,028	79.42	3.24	-851.12	65.99	26.55	8.27	105.38	21.76	8.4
MEX	8,390	41.55	3.32	-36.57	31.63	11.99	7.80	64.55	22.62	7.6
USA	20,946	144.83	0.79	-725.18	93.4	69.58	6.65	83.95	32.41	7.1
AM	0.002675	0.002675	0	0	0	0	0	0.002675	0	0.0107
MA	0	0	0.002675	0.002675	0.002675	0.002675	0.002675	0	0.0107	0
AU	0.002675	0	0.002675	0	0.002675	0.002675	0	0.002675	0	0.0107
UA	0	0.002675	0	0.002675	0	0	0.002675	0	0.0107	0
MU	0	0	0.002675	0.002675	0.002675	0.002675	0	0	0	0.0107
UM	0.002675	0.002675	0	0	0	0	0.002675	0.002675	0.0107	0

RIE Index Distance to Leader Results - 1995

	NtDmCdt +	DmCdtBnk +	FDINInf +	NetLnd +	MktCpt -	StksTd -	Real_IR -	RealXRte +	M&Teqp +	GFCF_Mch +
AUS	100.00	54.84	97.59	4.30	47.93	45.16	80.41	100.00	67.14	100.00
MEX	38.09	28.69	100.00	100.00	100.00	100.00	85.26	61.25	69.79	90.48
USA	95.09	100.00	23.80	5.04	33.87	17.23	100.00	79.66	100.00	84.52
Weight	0.002675	0.002675	0.002675	0.002675	0.002675	0.002675	0.002675	0.002675	0.0107	0.0107

RIE Index Condorcet Results - 1995

	TphnMain +	PCs +	Radios +	Tvsets +	Newspap +	ICT_Exp +	AirTptFt +	Air_Pass +	ContPtTf +	RaRdGood +
Weight	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566
AUS	492.47	275.5	1289.9	697.6	172.39	6.24	1,737.50	1,595,363.00	219,182.80	1169814.86
MEX	96.56	26.33	255.9	213.3	97.98	3.03	155.9	164,231.00	15507.2	162,899.70
USA	599.88	324.1	2099.3	814.9	209.9	7.89	19,622.90	2,003,591.00	106515.8	3,685,103.25
AM	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566
MA	0	0	0	0	0	0	0	0	0	0
AU	0	0	0	0	0	0	0	0	0.003566	0
UA	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0	0.003566
MU	0	0	0	0	0	0	0	0	0	0
UM	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566

RIE Index Distance to Leader Results - 1995

	TphnMain +	PCs +	Radios +	Tvsets +	Newspap +	ICT_Exp +	AirTptFt +	Air_Pass +	ContPtTf +	RaRdGood +
AUS	82.09	85.00	61.44	85.61	82.13	79.09	8.85	79.63	100.00	31.74
MEX	16.10	8.12	12.19	26.17	46.68	38.40	0.79	8.20	7.08	4.42
USA	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	48.60	100.00
Weight	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566

RIE Index Condorcet Results - 1995

	RailPass +	RdVhcl +	SulphOx -	NitOx -	CarbMon -	CbDioxEm -	CbDxTtEm -	EcoFPt -	FnConExp +	DefExp -
Weight	0.003566	0.003566	0.020266	0.020266	0.020266	0.0304	0.0304	0.020266	0.020266	0.020266
AUS	1028.48	111.89	99	79	291	15.72	1.29	6.91	80.54	140.19
MEX	1,898.60	42.49	11.67	12	82.24	3.43	1.45	2.51	80.07	53.73
USA	39,202.38	25.23	63	84	409	19.86	24.02	9.6	84.25	2656.92
AM	0	0.003566	0	0	0	0	0.0304	0	0.020266	0
MA	0.003566	0	0.020266	0.020266	0.020266	0.0304	0	0.020266	0	0.020266
AU	0	0.003566	0	0.020266	0.020266	0.0304	0.0304	0.020266	0	0.020266
UA	0.003566	0	0.020266	0	0	0	0	0	0.020266	0
MU	0	0.003566	0.020266	0.020266	0.020266	0.0304	0.0304	0.020266	0	0.020266
UM	0.003566	0	0	0	0	0	0	0	0.020266	0

RIE Index Distance to Leader Results - 1995

	RailPass +	RdVhcl +	SulphOx -	NitOx -	CarbMon -	CbDioxEm -	CbDxTtEm -	EcoFPt -	FnConExp +	DefExp -
AUS	2.62	100.00	11.79	15.19	28.26	21.82	100.00	36.32	95.60	38.33
MEX	4.84	37.97	100.00	100.00	100.00	100.00	88.97	100.00	95.04	100.00
USA	100.00	22.55	18.52	14.29	20.11	17.27	5.37	26.15	100.00	2.02
Weight	0.003566	0.003566	0.020266	0.020266	0.020266	0.0304	0.0304	0.020266	0.020266	0.020266

RIE Index Condorcet Results - 1995

	RoadPvd +	GFCF +	AvNoOcc -	HseStck +	PopAcDg +	PopAcWtr +	PopAcSan +	GpMemb +	LifeSat +	HholdWk +
Weight	0.002	0.002	0.002	0.002	0.019633	0.019633	0.019633	0.004088	0.004088	0.004088
AUS	38.6	14.7	2.81	0.39	97.5	100	100	2.85	7.28	27.65
MEX	31.3	8.5	4.55	0.21	87	87.36	65.5	0.75	7.46	64.42
USA	59.14	10.6	2.65	0.43	97.5	100	100	2.43	7.41	25.24
AM	0.002	0.002	0.002	0.002	0.019633	0.019633	0.019633	0.004088	0	0
MA	0	0	0	0	0	0	0	0	0.004088	0.004088
AU	0	0.002	0	0	0.0098165	0.0098165	0.0098165	0.004088	0	0.004088
UA	0.002	0	0.002	0.002	0.0098165	0.0098165	0.0098165	0	0.004088	0
MU	0	0	0	0	0	0	0	0	0.004088	0.004088
UM	0.002	0.002	0.002	0.002	0.019633	0.019633	0.019633	0.004088	0	0

RIE Index Distance to Leader Results - 1995

	RoadPvd +	GFCF +	AvNoOcc -	HseStck +	PopAcDg +	PopAcWtr +	PopAcSan +	GpMemb +	LifeSat +	HholdWk +
AUS	65.27	100.00	94.31	90.70	100.00	100.00	100.00	100.00	97.59	42.92
MEX	52.93	57.82	58.24	48.84	89.23	87.36	65.50	26.32	100.00	100.00
USA	100.00	72.11	100.00	100.00	100.00	100.00	100.00	85.26	99.33	39.18
Weight	0.002	0.002	0.002	0.002	0.019633	0.019633	0.019633	0.004088	0.004088	0.004088

RIE Index Condorcet Results - 1995

	GNI_PPP +	GINI -	YthUnpt -	DivceRt -	P'sners -	ScideRte -	CptnInd +	LawIndex +	GovEfInd +	PolStInd +	V&Aind +
Weight	0.004088	0.004088	0.004088	0.004088	0.004088	0.004088	0.00122	0.00122	0.00122	0.00122	0.00122
AUS	19,944	0.303	14.4	45.4	85.4	12	2.01	1.9	1.9	1.18	1.79
MEX	6,691	0.485	9.6	6.83	57.1	3.2	-0.31	-0.46	0.04	-0.17	-0.35
USA	27,533	0.357	12.1	48.95	432.2	11.6	1.81	1.83	1.82	1.04	1.55
AM	0.004088	0.004088	0	0	0	0	0.00122	0.00122	0.00122	0.00122	0.00122
MA	0	0	0.004088	0.004088	0.004088	0.004088	0	0	0	0	0
AU	0	0.004088	0	0.004088	0.004088	0	0.00122	0.00122	0.00122	0.00122	0.00122
UA	0.004088	0	0.004088	0	0	0.004088	0	0	0	0	0
MU	0	0	0.004088	0.004088	0.004088	0.004088	0	0	0	0	0
UM	0.004088	0.004088	0	0	0	0	0.00122	0.00122	0.00122	0.00122	0.00122

RIE Index Distance to Leader Results - 1995

	GNI_PPP +	GINI -	YthUnpt -	DivceRt -	P'sners -	ScideRte -	CptnInd +	LawIndex +	GovEfInd +	PolStInd +	V&Aind +
AUS	72.44	100.00	66.67	15.04	66.85	26.67	100.00	100.00	100.00	100.00	100.00
MEX	24.30	62.47	100.00	100.00	100.00	100.00	-15.42	-24.21	2.11	-14.41	-19.55
USA	100.00	84.87	79.34	13.95	13.21	27.59	90.05	96.32	95.79	88.14	86.59
Weight	0.004088	0.004088	0.004088	0.004088	0.004088	0.004088	0.00122	0.00122	0.00122	0.00122	0.00122

RIE Index Condorcet Results - 1995

	EmpRate +	AdUnptRt -	LTUnpt -	O_WkHrs -	JoblessH -	RelPovRt -	RlPovEld -	
Weight	0.006214	0.006214	0.006214	0.006214	0.006214	0.006214	0.006214	
AUS	68.4	6.6	30.8	21	13.64	10.25	19.88	
MEX	60.7	4.4	1.3	-11	3.43	20.99	30.56	
USA	71.7	4.5	9.7	18	6.20	16.91	22.61	
AM	0.006214	0	0	0	0	0.006214	0.006214	**0.5390**
MA	0	0.006214	0.006214	0.006214	0.006214	0	0	**0.4607**
AU	0	0	0	0	0	0.006214	0.006214	**0.6493**
UA	0.006214	0.006214	0.006214	0.006214	0.006214	0	0	**0.3504**
MU	0	0.006214	0.006214	0.006214	0.006214	0	0	**0.5289**
UM	0.006214	0	0	0	0	0.006214	0.006214	**0.4707**

RIE Index Distance to Leader Results - 1995

	EmpRate +	AdUnptRt -	LTUnpt -	O_WkHrs -	JoblessH -	RelPovRt -	RlPovEld -
AUS	95.40	66.67	4.29	-52.38	25.19	100.00	100.00
MEX	84.66	100.00	100.00	100.00	100.00	48.83	65.05
USA	100.00	97.78	13.63	-61.11	55.37	60.62	87.93
Weight	0.006214	0.006214	0.006214	0.006214	0.006214	0.006214	0.006214

RIE Index Condorcet Results - 1996

	Lexp +	InfMort -	HALE +	Phys +	PopnGwth +	FertRate +	Calories -	FatCons -	SugCons -	SchLexp +
Weight	0.014725	0.014725	0.014725	0.014725	0.0107	0.0107	0.019633	0.019633	0.019633	0.009483
AUS	78.2	5.8	71.0	2.4	1.31	1.80	3124	130.5	45.3	20.35
MEX	72.8	26.7	63.82	1.5	1.55	2.75	3142	86.9	50.2	11.03
USA	76.1	7.3	68.31	2.2	1.16	1.98	3593	138.4	68.6	15.73
AM	0.014725	0.014725	0.014725	0.014725	0	0	0.019633	0	0.019633	0.009483
MA	0	0	0	0	0.0107	0.0107	0	0.019633	0	0
AU	0.014725	0.014725	0.014725	0.014725	0.0107	0	0.019633	0.019633	0.019633	0.009483
UA	0	0	0	0	0	0.0107	0	0	0	0
MU	0	0	0	0	0.0107	0.0107	0.019633	0.019633	0.019633	0
UM	0.014725	0.014725	0.014725	0.014725	0	0	0	0	0	0.009483

E =

	AUS	**MEX**	**USA**
AUS	0	0.5296	0.6629
MEX	0.4701	0	0.5102
USA	0.3368	0.4895	0

AMU =	0.5296	0.6629	0.5102	**1.7027**
MUA =	0.5102	0.4701	0.3368	1.3170
UAM =	0.3368	0.4895	0.5296	1.3559
AUM =	0.6629	0.5296	0.4895	1.6820
MAU =	0.4701	0.5102	0.6629	1.6431
UMA =	0.4895	0.3368	0.4701	1.2963

The final Condorcet ranking for RIE index for 1996 is AMU.

RIE Index Distance to Leader Results - 1996

	Lexp +	InfMort -	HALE +	Phys +	PopnGwth +	FertRate +	Calories -	FatCons -	SugCons -	SchLexp +
AUS	100.00	100.00	100.00	100.00	84.52	65.45	100.00	66.59	100.00	100.00
MEX	93.09	21.72	89.93	62.50	100.00	100.00	99.43	100.00	90.24	54.20
USA	97.31	79.45	96.25	91.67	74.84	72.00	86.95	62.79	66.03	77.30
Weight	0.014725	0.014725	0.014725	0.014725	0.0107	0.0107	0.019633	0.019633	0.019633	0.009483

RIE_AUS	73.12
RIE_MEX	70.71
RIE_USA	61.79

The final DTL ranking for RIE index for 1996 is AMU.

RIE Index Condorcet Results - 1996

	NetEnrlt +	PbExpEdn +	TSSM&E +	PupilTch -	PISAsci +	R&Dexp +	R&Drsrch +	HiTechXt +	Patents +	Sci&Tert +	NFBtert +
Weight	0.009483	0.009483	0.009483	0.009483	0.009483	0.00428	0.00428	0.00428	0.00428	0.00428	0.018966
AUS	86.7	4.85	20.78	18.1	526.5	1.67	7.3	15.62	45.11	759.71	14.41
MEX	49.04	5.1	25.01	27.7	413.5	0.31	0.6	15.72	1.25	22.94	-6.12
USA	87.78	5.6	17.48	15.06	495	2.55	8.67	33.22	226.82	749.08	3.55
AM	0.009483	0	0	0.009483	0.009483	0.00428	0.00428	0	0.00428	0.00428	0.018966
MA	0	0.009483	0.009483	0	0	0	0	0.00428	0	0	0
AU	0	0	0.009483	0	0.009483	0	0	0	0	0.00428	0.018966
UA	0.009483	0.009483	0	0.009483	0	0.00428	0.00428	0.00428	0.00428	0	0
MU	0	0	0.009483	0	0	0	0	0	0	0	0
UM	0.009483	0.009483	0	0.009483	0.009483	0.00428	0.00428	0.00428	0.00428	0.00428	0.018966

RIE Index Distance to Leader Results - 1996

	NetEnrlt +	PbExpEdn +	TSSM&E +	PupilTch -	PISAsci +	R&Dexp +	R&Drsrch +	HiTechXt +	Patents +	Sci&Tert +	NFBtert +
AUS	98.77	86.61	83.09	83.20	100.00	65.49	84.20	47.02	19.89	100.00	100.00
MEX	55.87	91.07	100.00	54.37	78.54	12.16	6.92	47.32	0.55	3.02	-42.47
USA	100.00	100.00	69.89	100.00	94.02	100.00	100.00	100.00	100.00	98.60	24.64
Weight	0.009483	0.009483	0.009483	0.009483	0.009483	0.00428	0.00428	0.00428	0.00428	0.00428	0.018966

RIE Index Condorcet Results - 1996

	HSkImm +	NtTyGn +	FstArea +	AgLand +	ArblLand +	IrrigLnd +	FertCons -	TractUse -	AgPdnInd +	FdPdnInd +	GDPEgUse -
Weight	0.018966	0.018966	0.0076	0.0076	0.0076	0.0076	0.0076	0.0076	0.0076	0.0076	0.020266
AUS	28.87	10.84	21.65	60.56	6.77	4.58	387.64	165.8	94.1	93.8	4.18
MEX	1.33	-1.3	35.25	56.16	13.18	22.49	650.66	84.1	95.8	94	5.32
USA	13.86	4.68	32.81	45.45	19.57	12.13	1,133.03	40	98	97.3	3.89
AM	0.018966	0.018966	0	0.0076	0	0	0.0076	0	0	0	0.020266
MA	0	0	0.0076	0	0.0076	0.0076	0	0.0076	0.0076	0.0076	0
AU	0.018966	0.018966	0	0.0076	0	0	0.0076	0	0	0	0
UA	0	0	0.0076	0	0.0076	0.0076	0	0.0076	0.0076	0.0076	0.020266
MU	0	0	0.0076	0.0076	0	0.0076	0.0076	0	0	0	0
UM	0.018966	0.018966	0	0	0.0076	0	0	0.0076	0.0076	0.0076	0.020266

RIE Index Distance to Leader Results - 1996

	HSkImm +	NtTyGn +	FstArea +	AgLand +	ArblLand +	IrrigLnd +	FertCons -	TractUse -	AgPdnInd +	FdPdnInd +	GDPEgUse -
AUS	100.00	100.00	61.42	100.00	34.59	20.36	100.00	24.13	96.02	96.40	93.06
MEX	4.61	-11.99	100.00	92.73	67.35	100.00	59.58	47.56	97.76	96.61	73.12
USA	48.01	43.17	93.08	75.05	100.00	53.94	34.21	100.00	100.00	100.00	100.00
Weight	0.018966	0.018966	0.0076	0.0076	0.0076	0.0076	0.0076	0.0076	0.0076	0.0076	0.020266

RIE Index Condorcet Results - 1996

	RbleEgSp +	ElecCons -	FWaterAv +	InGdWtAv +	WtrWdls -	OrgWtrPt -	FishCapt -	FishCons -	NBI +	ThtMamm -	ThtBird -
Weight	0.020266	0.020266	0.0152	0.0152	0.0152	0.0152	0.0304	0.0304	0.020266	0.020266	0.020266
AUS	6.3	9,072.36	22.94	3.93	4.9	5.41	0.19	20.01	0.85	22.31	4.67
MEX	11.3	1,505.81	3.44	1.5	19.1	2.97	1.24	10.6	0.93	13.03	4.66
USA	5.4	12,845.92	6.5	4.83	17.1	9.64	4.48	21.6	0.68	8.1	7.69
AM	0	0	0.0152	0.0152	0.0152	0	0.0304	0	0	0	0
MA	0.020266	0.020266	0	0	0	0.0152	0	0.0304	0.020266	0.020266	0.020266
AU	0.020266	0.020266	0.0152	0	0.0152	0.0152	0.0304	0.0304	0.020266	0	0.020266
UA	0	0	0	0.0152	0	0	0	0	0	0.020266	0
MU	0.020266	0.020266	0	0	0	0.0152	0.0304	0.0304	0.020266	0	0.020266
UM	0	0	0.0152	0.0152	0.0152	0	0	0	0	0.020266	0

RIE Index Distance to Leader Results - 1996

	RbleEgSp +	ElecCons -	FWaterAv +	InGdWtAv +	WtrWdls -	OrgWtrPt -	FishCapt -	FishCons -	NBI +	ThtMamm -	ThtBird -
AUS	55.75	16.60	100.00	81.37	100.00	54.90	100.00	52.97	91.40	36.31	99.79
MEX	100.00	100.00	15.00	31.06	25.65	100.00	15.32	100.00	100.00	62.16	100.00
USA	47.79	11.72	28.33	100.00	28.65	30.81	4.24	49.07	73.12	100.00	60.60
Weight	0.020266	0.020266	0.0152	0.0152	0.0152	0.0152	0.0304	0.0304	0.020266	0.020266	0.020266

RIE Index Condorcet Results - 1996

	NtDmCdt +	DmCdtBnk +	FDINInf +	NetLnd +	MktCpt -	StksTd -	Real_IR -	RealXRte +	M&Teqp +	GFCF_Mch +
Weight	0.002675	0.002675	0.002675	0.002675	0.002675	0.002675	0.002675	0.002675	0.0107	0.0107
AUS	24,076	83.5	1.5	-666.09	75.51	35.19	8.88	115.32	22.2	8.2
MEX	7,175	26.25	2.76	-51.47	32	12.93	4.32	72.07	24.68	8.9
USA	21,842	150.57	1.11	-722.73	109.3	91.74	6.25	86.57	32.04	7.2
AM	0.002675	0.002675	0	0	0	0	0	0.002675	0	0
MA	0	0	0.002675	0.002675	0.002675	0.002675	0.002675	0	0.0107	0.0107
AU	0.002675	0	0.002675	0.002675	0.002675	0.002675	0	0.002675	0	0.0107
UA	0	0.002675	0	0	0	0	0.002675	0	0.0107	0
MU	0	0	0.002675	0.002675	0.002675	0.002675	0.002675	0	0	0.0107
UM	0.002675	0.002675	0	0	0	0	0	0.002675	0.0107	0

RIE Index Distance to Leader Results - 1996

	NtDmCdt +	DmCdtBnk +	FDINInf +	NetLnd +	MktCpt -	StksTd -	Real_IR -	RealXRte +	M&Teqp +	GFCF_Mch +
AUS	100.00	55.46	54.35	7.73	42.38	36.74	48.65	100.00	69.29	92.13
MEX	29.80	17.43	100.00	100.00	100.00	100.00	100.00	62.50	77.03	100.00
USA	90.72	100.00	40.22	7.12	29.28	14.09	69.12	75.07	100.00	80.90
Weight	0.002675	0.002675	0.002675	0.002675	0.002675	0.002675	0.002675	0.002675	0.0107	0.0107

RIE Index Condorcet Results - 1996

	TphnMain +	PCs +	Radios +	Tvsets +	Newspap +	ICT_Exp +	AirTptFt +	Air_Pass +	ContPtTf +	RaRdGood +
Weight	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566
AUS	500.79	289.44	1365.3	699	170.07	6.24	1,833.70	1,642,461.00	219,182.80	1172311.17
MEX	95.34	31.33	315.5	231.4	97	3.03	168.8	158,557.00	15507.2	170,910.80
USA	612.66	358.58	2115.9	827.8	212	8	21,676.40	2,119,839.00	106515.8	3,552,118.60
AM	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566
MA	0	0	0	0	0	0	0	0	0	0
AU	0	0	0	0	0	0	0	0	0.003566	0
UA	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0	0.003566
MU	0	0	0	0	0	0	0	0	0	0
UM	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566

RIE Index Distance to Leader Results - 1996

	TphnMain +	PCs +	Radios +	Tvsets +	Newspap +	ICT_Exp +	AirTptFt +	Air_Pass +	ContPtTf +	RaRdGood +
AUS	81.74	80.72	64.53	84.44	80.22	78.00	8.46	77.48	100.00	33.00
MEX	15.56	8.74	14.91	27.95	45.75	37.88	0.78	7.48	7.08	4.81
USA	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	48.60	100.00
Weight	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566

RIE Index Condorcet Results - 1996

	RailPass +	RdVhcl +	SulphOx -	NitOx -	CarbMon -	CbDioxEm -	CbDxTtEm -	EcoFPt -	FnConExp +	DefExp -
Weight	0.003566	0.003566	0.020266	0.020266	0.020266	0.0304	0.0304	0.020266	0.020266	0.020266
AUS	1066.28	110.32	101	81	285	16.22	1.32	6.91	79.44	154.52
MEX	1,799.31	43.26	11.67	12	76	3.49	1.46	2.51	76.96	58.31
USA	40,185.46	26.03	62	82	385	20.32	24.34	9.6	83.73	2752.04
AM	0	0.003566	0	0	0	0	0.0304	0	0.020266	0
MA	0.003566	0	0.020266	0.020266	0.020266	0.0304	0	0.020266	0	0.020266
AU	0	0.003566	0	0.020266	0.020266	0.0304	0.0304	0.020266	0	0.020266
UA	0.003566	0	0.020266	0	0	0	0	0	0.020266	0
MU	0	0.003566	0.020266	0.020266	0.020266	0.0304	0.0304	0.020266	0	0.020266
UM	0.003566	0	0	0	0	0	0	0	0.020266	0

RIE Index Distance to Leader Results - 1996

	RailPass +	RdVhcl +	SulphOx -	NitOx -	CarbMon -	CbDioxEm -	CbDxTtEm -	EcoFPt -	FnConExp +	DefExp -
AUS	2.65	100.00	11.55	14.81	26.67	21.52	100.00	36.32	94.88	37.74
MEX	4.48	39.21	100.00	100.00	100.00	100.00	90.41	100.00	91.91	100.00
USA	100.00	23.59	18.82	14.63	19.74	17.18	5.42	26.15	100.00	2.12
Weight	0.003566	0.003566	0.020266	0.020266	0.020266	0.0304	0.0304	0.020266	0.020266	0.020266

RIE Index Condorcet Results - 1996

	RoadPvd +	GFCF +	AvNoOcc -	HseStck +	PopAcDg +	PopAcWtr +	PopAcSan +	GpMemb +	LifeSat +	HholdWk +
Weight	0.002	0.002	0.002	0.002	0.019633	0.019633	0.019633	0.004088	0.004088	0.004088
AUS	38.7	14.7	2.82	0.39	97.5	100	100	2.85	7.4	27.65
MEX	31.8	9	4.52	0.22	87	88.43	67	0.75	7.43	64.42
USA	59.14	11	2.66	0.43	97.5	100	100	2.43	7.41	25.24
AM	0.002	0.002	0.002	0.002	0.019633	0.019633	0.019633	0.004088	0	0
MA	0	0	0	0	0	0	0	0	0.004088	0.004088
AU	0	0.002	0	0	0.0098165	0.0098165	0.0098165	0.004088	0	0.004088
UA	0.002	0	0.002	0.002	0.0098165	0.0098165	0.0098165	0	0.004088	0
MU	0	0	0	0	0	0	0	0	0.004088	0.004088
UM	0.002	0.002	0.002	0.002	0.019633	0.019633	0.019633	0.004088	0	0

RIE Index Distance to Leader Results - 1996

	RoadPvd +	GFCF +	AvNoOcc -	HseStck +	PopAcDg +	PopAcWtr +	PopAcSan +	GpMemb +	LifeSat +	HholdWk +
AUS	65.44	100.00	94.33	90.70	100.00	100.00	100.00	100.00	99.60	42.92
MEX	53.77	61.22	58.85	51.16	89.23	88.43	67.00	26.32	100.00	100.00
USA	100.00	74.83	100.00	100.00	100.00	100.00	100.00	85.26	99.73	39.18
Weight	0.002	0.002	0.002	0.002	0.019633	0.019633	0.019633	0.004088	0.004088	0.004088

RIE Index Condorcet Results - 1996

	GNI_PPP +	GINI -	YthUnpt -	DivceRt -	P'sners -	ScideRte -	CptnInd +	LawIndex +	GovEfInd +	PolStInd +	V&Aind +
Weight	0.004088	0.004088	0.004088	0.004088	0.004088	0.004088	0.00122	0.00122	0.00122	0.00122	0.00122
AUS	20,819	0.303	14.8	49.5	86.8	13.2	2.01	1.9	1.9	1.22	1.73
MEX	7,058	0.485	7.7	6.75	64.1	3.3	-0.31	-0.44	0.04	-0.17	-0.23
USA	28,771	0.36	12	48.95	440.1	11.4	1.81	1.79	1.82	1.06	1.53
AM	0.004088	0.004088	0	0	0	0	0.00122	0.00122	0.00122	0.00122	0.00122
MA	0	0	0.004088	0.004088	0.004088	0.004088	0	0	0	0	0
AU	0	0.004088	0	0	0.004088	0	0.00122	0.00122	0.00122	0.00122	0.00122
UA	0.004088	0	0.004088	0.004088	0	0.004088	0	0	0	0	0
MU	0	0	0.004088	0.004088	0.004088	0.004088	0	0	0	0	0
UM	0.004088	0.004088	0	0	0	0	0.00122	0.00122	0.00122	0.00122	0.00122

RIE Index Distance to Leader Results - 1996

	GNI_PPP +	GINI -	YthUnpt -	DivceRt -	P'sners -	ScideRte -	CptnInd +	LawIndex +	GovEfInd +	PolStInd +	V&Aind +
AUS	72.36	100.00	52.03	13.64	73.86	25.00	100.00	100.00	100.00	100.00	100.00
MEX	24.53	62.47	100.00	100.00	100.00	100.00	-15.42	-23.16	2.11	-13.93	-13.29
USA	100.00	84.17	64.17	13.79	14.57	28.95	90.05	94.21	95.79	86.89	88.44
Weight	0.004088	0.004088	0.004088	0.004088	0.004088	0.004088	0.00122	0.00122	0.00122	0.00122	0.00122

RIE Index Condorcet Results - 1996

	EmpRate +	AdUnptRt -	LTUnpt -	O_WkHrs -	JoblessH -	RelPovRt -	RlPovEld -	
Weight	0.006214	0.006214	0.006214	0.006214	0.006214	0.006214	0.006214	
AUS	68.4	6.7	28.4	11	13.59	10.25	19.88	
MEX	61.6	3.3	1.3	26	3.46	20.99	30.56	
USA	71.8	4.3	9.5	9	5.94	16.91	22.61	
AM	0.006214	0	0	0.006214	0	0.006214	0.006214	**0.5296**
MA	0	0.006214	0.006214	0	0.006214	0	0	**0.4701**
AU	0	0	0	0	0	0.006214	0.006214	**0.6629**
UA	0.006214	0.006214	0.006214	0.006214	0.006214	0	0	**0.3368**
MU	0	0.006214	0.006214	0	0.006214	0	0	**0.5102**
UM	0.006214	0	0	0.006214	0	0.006214	0.006214	**0.4895**

RIE Index Distance to Leader Results - 1996

	EmpRate +	AdUnptRt -	LTUnpt -	O_WkHrs -	JoblessH -	RelPovRt -	RlPovEld -
AUS	95.26	49.25	4.65	81.82	25.46	100.00	100.00
MEX	85.79	100.00	100.00	34.62	100.00	48.83	65.05
USA	100.00	76.74	13.97	100.00	58.25	60.62	87.93
Weight	0.006214	0.006214	0.006214	0.006214	0.006214	0.006214	0.006214

RIE Index Condorcet Results - 1997

	Lexp +	InfMort -	HALE +	Phys +	PopnGwth +	FertRate +	Calories -	FatCons -	SugCons -	SchLexp +
Weight	0.014725	0.014725	0.014725	0.014725	0.0107	0.0107	0.019633	0.019633	0.019633	0.009483
AUS	78.5	5.3	71.2	2.4	1.12	1.77	3119	128	49.1	20.35
MEX	73.2	26	64.17	1.5	1.45	2.64	3103	87.6	47	11.23
USA	76.5	7.2	68.67	2.3	1.20	1.97	3652	140.3	71	15.73
AM	0.014725	0.014725	0.014725	0.014725	0	0	0	0	0	0.009483
MA	0	0	0	0	0.0107	0.0107	0.019633	0.019633	0.019633	0
AU	0.014725	0.014725	0.014725	0.014725	0	0	0.019633	0.019633	0.019633	0.009483
UA	0	0	0	0	0.0107	0.0107	0	0	0	0
MU	0	0	0	0	0.0107	0.0107	0.019633	0.019633	0.019633	0
UM	0.014725	0.014725	0.014725	0.014725	0	0	0	0	0	0.009483

E =

	AUS	MEX	USA
AUS	0	0.4943	0.6436
MEX	0.5054	0	0.5164
USA	0.3561	0.4833	0

AMU =	0.4943	0.6436	0.5164	1.6543
MUA =	0.5164	0.5054	0.3561	1.3779
UAM =	0.3561	0.4833	0.4943	1.3336
AUM =	0.6436	0.4943	0.4833	1.6212
MAU =	0.5054	0.5164	0.6436	**1.6654**
UMA =	0.4833	0.3561	0.5054	1.3447

The final Condorcet ranking for RIE index for 1997 is MAU.

RIE Index Distance to Leader Results - 1997

	Lexp +	InfMort -	HALE +	Phys +	PopnGwth +	FertRate +	Calories -	FatCons -	SugCons -	SchLexp +
AUS	100.00	100.00	100.00	100.00	77.24	67.05	99.49	68.44	95.72	100.00
MEX	93.25	20.38	90.08	62.50	100.00	100.00	100.00	100.00	100.00	55.18
USA	97.45	73.61	96.39	95.83	82.76	74.62	84.97	62.44	66.20	77.30
Weight	0.014725	0.014725	0.014725	0.014725	0.0107	0.0107	0.019633	0.019633	0.019633	0.009483

RIE_AUS	72.91
RIE_MEX	71.79
RIE_USA	61.36

The final DTL ranking for RIE index for 1997 is AMU.

RIE Index Condorcet Results - 1997

	NetEnrlt +	PbExpEdn +	TSSM&E +	PupilTch -	PISAsci +	R&Dexp +	R&Drsrch +	HiTechXt +	Patents +	Sci&Tert +	NFBtert +
Weight	0.009483	0.009483	0.009483	0.009483	0.009483	0.00428	0.00428	0.00428	0.00428	0.00428	0.018966
AUS	86.7	4.85	20.78	17.9	526.5	1.57	7.14	15.03	43.42	753.59	14.41
MEX	50.9	5.1	25.01	27.55	413.5	0.34	0.6	17.46	1.19	24.18	-6.12
USA	87.78	5.6	17.48	15.06	495	2.58	8.8	33.46	226.32	724.47	3.55
AM	0.009483	0	0	0.009483	0.009483	0.00428	0.00428	0	0.00428	0.00428	0.018966
MA	0	0.009483	0.009483	0	0	0	0	0.00428	0	0	0
AU	0	0	0.009483	0	0.009483	0	0	0	0	0.00428	0.018966
UA	0.009483	0.009483	0	0.009483	0	0.00428	0.00428	0.00428	0.00428	0	0
MU	0	0	0.009483	0	0	0	0	0	0	0	0
UM	0.009483	0.009483	0	0.009483	0.009483	0.00428	0.00428	0.00428	0.00428	0.00428	0.018966

RIE Index Distance to Leader Results - 1997

	NetEnrlt +	PbExpEdn +	TSSM&E +	PupilTch -	PISAsci +	R&Dexp +	R&Drsrch +	HiTechXt +	Patents +	Sci&Tert +	NFBtert +
AUS	98.77	86.61	83.09	84.13	100.00	60.85	81.14	44.92	19.19	100.00	100.00
MEX	57.99	91.07	100.00	54.66	78.54	13.18	6.82	52.18	0.53	3.21	-42.47
USA	100.00	100.00	69.89	100.00	94.02	100.00	100.00	100.00	100.00	96.14	24.64
Weight	0.009483	0.009483	0.009483	0.009483	0.009483	0.00428	0.00428	0.00428	0.00428	0.00428	0.018966

RIE Index Condorcet Results - 1997

	HSkImm +	NtTyGn +	FstArea +	AgLand +	ArblLand +	IrrigLnd +	FertCons -	TractUse -	AgPdnInd +	FdPdnInd +	GDPEgUse -
Weight	0.018966	0.018966	0.0076	0.0076	0.0076	0.0076	0.0076	0.0076	0.0076	0.0076	0.020266
AUS	28.87	10.98	21.65	60.16	6.5	4.74	437.08	159.4	92.2	91	4.29
MEX	1.33	-1.4	35.25	56.16	13.05	22.92	660.28	84.1	97.7	96.6	5.43
USA	13.86	4.86	32.81	45.3	19.44	12.65	1,132.61	39.6	100.7	100	4.01
AM	0.018966	0.018966	0	0.0076	0	0	0.0076	0	0	0	0.020266
MA	0	0	0.0076	0	0.0076	0.0076	0	0.0076	0.0076	0.0076	0
AU	0.018966	0.018966	0	0.0076	0	0	0.0076	0	0	0	0
UA	0	0	0.0076	0	0.0076	0.0076	0	0.0076	0.0076	0.0076	0.020266
MU	0	0	0.0076	0.0076	0	0.0076	0.0076	0	0	0	0
UM	0.018966	0.018966	0	0	0.0076	0	0	0.0076	0.0076	0.0076	0.020266

RIE Index Distance to Leader Results - 1997

	HSkImm +	NtTyGn +	FstArea +	AgLand +	ArblLand +	IrrigLnd +	FertCons -	TractUse -	AgPdnInd +	FdPdnInd +	GDPEgUse -
AUS	100.00	100.00	61.42	100.00	33.44	20.68	100.00	24.84	91.56	91.00	93.47
MEX	4.61	-12.75	100.00	93.35	67.13	100.00	66.20	47.09	97.02	96.60	73.85
USA	48.01	44.26	93.08	75.30	100.00	55.19	38.59	100.00	100.00	100.00	100.00
Weight	0.018966	0.018966	0.0076	0.0076	0.0076	0.0076	0.0076	0.0076	0.0076	0.0076	0.020266

RIE Index Condorcet Results - 1997

	RbleEgSp +	ElecCons -	FWaterAv +	InGdWtAv +	WtrWdls -	OrgWtrPt -	FishCapt -	FishCons -	NBI +	ThtMamm -	ThtBird -
Weight	0.020266	0.020266	0.0152	0.0152	0.0152	0.0152	0.0304	0.0304	0.020266	0.020266	0.020266
AUS	6.5	9,262.39	22.68	3.78	4.9	4.94	0.18	20.22	0.85	22.33	4.81
MEX	10.6	1,613.15	3.39	1.48	19.1	3.02	1.24	10.27	0.93	13.31	4.81
USA	5.2	12,876.93	6.42	4.77	17.1	9.69	4.41	21.6	0.68	8.26	7.85
AM	0	0	0.0152	0.0152	0.0152	0	0.0304	0	0	0	0.010133
MA	0.020266	0.020266	0	0	0	0.0152	0	0.0304	0.020266	0.020266	0.010133
AU	0.020266	0.020266	0.0152	0	0.0152	0.0152	0.0304	0.0304	0.020266	0	0.020266
UA	0	0	0	0.0152	0	0	0	0	0	0.020266	0
MU	0.020266	0.020266	0	0	0	0.0152	0.0304	0.0304	0.020266	0	0.020266
UM	0	0	0.0152	0.0152	0.0152	0	0	0	0	0.020266	0

RIE Index Distance to Leader Results - 1997

	RbleEgSp +	ElecCons -	FWaterAv +	InGdWtAv +	WtrWdls -	OrgWtrPt -	FishCapt -	FishCons -	NBI +	ThtMamm -	ThtBird -
AUS	61.32	17.42	100.00	79.25	100.00	61.13	100.00	50.79	91.40	36.99	100.00
MEX	100.00	100.00	14.95	31.03	25.65	100.00	14.52	100.00	100.00	62.06	100.00
USA	49.06	12.53	28.31	100.00	28.65	31.17	4.08	47.55	73.12	100.00	61.27
Weight	0.020266	0.020266	0.0152	0.0152	0.0152	0.0152	0.0304	0.0304	0.020266	0.020266	0.020266

RIE Index Condorcet Results - 1997

	NtDmCdt +	DmCdtBnk +	FDINInf +	NetLnd +	MktCpt -	StksTd -	Real_IR -	RealXRte +	M&Teqp +	GFCF_Mch +
Weight	0.002675	0.002675	0.002675	0.002675	0.002675	0.002675	0.002675	0.002675	0.0107	0.0107
AUS	25,058	82.99	1.84	-897.36	71.28	41.34	7.41	114.19	22.64	8.4
MEX	14,412	49.39	3.2	-148.44	39	13.05	3.78	83.40	25.81	10
USA	23,310	159.36	1.28	-667.14	137.06	123.82	6.66	91.02	31.69	7.2
AM	0.002675	0.002675	0	0	0	0	0	0.002675	0	0
MA	0	0	0.002675	0.002675	0.002675	0.002675	0.002675	0	0.0107	0.0107
AU	0.002675	0	0.002675	0	0.002675	0.002675	0	0.002675	0	0.0107
UA	0	0.002675	0	0.002675	0	0	0.002675	0	0.0107	0
MU	0	0	0.002675	0.002675	0.002675	0.002675	0.002675	0	0	0.0107
UM	0.002675	0.002675	0	0	0	0	0	0.002675	0.0107	0

RIE Index Distance to Leader Results - 1997

	NtDmCdt +	DmCdtBnk +	FDINInf +	NetLnd +	MktCpt -	StksTd -	Real_IR -	RealXRte +	M&Teqp +	GFCF_Mch +
AUS	100.00	52.08	57.50	16.54	54.71	31.57	51.01	100.00	71.44	84.00
MEX	57.51	30.99	100.00	100.00	100.00	100.00	100.00	73.04	81.45	100.00
USA	93.02	100.00	40.00	22.25	28.45	10.54	56.76	79.71	100.00	72.00
Weight	0.002675	0.002675	0.002675	0.002675	0.002675	0.002675	0.002675	0.002675	0.0107	0.0107

RIE Index Condorcet Results - 1997

	TphnMain +	PCs +	Radios +	Tvsets +	Newspap +	ICT_Exp +	AirTptFt +	Air_Pass +	ContPtTf +	RaRdGood +
Weight	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566
AUS	512.88	329.41	1506.3	699.4	167.74	6.24	1,953.80	1,671,536.00	219,182.80	1,177,234.00
MEX	98.52	34.07	324.8	253.5	96.46	3.03	227.2	183,830.00	15507.2	177,499.24
USA	632.49	399.77	2109	839.9	205.59	8.12	25,478.80	2,165,987.00	106515.8	3,505,558.25
AM	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566
MA	0	0	0	0	0	0	0	0	0	0
AU	0	0	0	0	0	0	0	0	0.003566	0
UA	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0	0.003566
MU	0	0	0	0	0	0	0	0	0	0
UM	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566

RIE Index Distance to Leader Results - 1997

	TphnMain +	PCs +	Radios +	Tvsets +	Newspap +	ICT_Exp +	AirTptFt +	Air_Pass +	ContPtTf +	RaRdGood +
AUS	81.09	82.40	71.42	83.27	81.59	76.85	7.67	77.17	100.00	33.58
MEX	15.58	8.52	15.40	30.18	46.92	37.32	0.89	8.49	7.08	5.06
USA	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	48.60	100.00
Weight	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566

RIE Index Condorcet Results - 1997

	RailPass +	RdVhcl +	SulphOx -	NitOx -	CarbMon -	CbDioxEm -	CbDxTtEm -	EcoFPt -	FnConExp +	DefExp -
Weight	0.003566	0.003566	0.020266	0.020266	0.020266	0.0304	0.0304	0.020266	0.020266	0.020266
AUS	1,093.00	104.06	99	85	285	17.61	1.43	6.91	79.46	160.37
MEX	1795.21	44.62	11.67	12	70.21	3.61	1.51	2.51	75.61	68.12
USA	40,671.39	25.98	63	82	370	20.33	24.22	9.6	82.57	2947.57
AM	0	0.003566	0	0	0	0	0.0304	0	0.020266	0
MA	0.003566	0	0.020266	0.020266	0.020266	0.0304	0	0.020266	0	0.020266
AU	0	0.003566	0	0	0.020266	0.0304	0.0304	0.020266	0	0.020266
UA	0.003566	0	0.020266	0.020266	0	0	0	0	0.020266	0
MU	0	0.003566	0.020266	0.020266	0.020266	0.0304	0.0304	0.020266	0	0.020266
UM	0.003566	0	0	0	0	0	0	0	0.020266	0

RIE Index Distance to Leader Results - 1997

	RailPass +	RdVhcl +	SulphOx -	NitOx -	CarbMon -	CbDioxEm -	CbDxTtEm -	EcoFPt -	FnConExp +	DefExp -
AUS	2.69	100.00	11.79	14.12	24.64	20.50	100.00	36.32	96.23	42.48
MEX	4.41	42.88	100.00	100.00	100.00	100.00	94.70	100.00	91.57	100.00
USA	100.00	24.97	18.52	14.63	18.98	17.76	5.90	26.15	100.00	2.31
Weight	0.003566	0.003566	0.020266	0.020266	0.020266	0.0304	0.0304	0.020266	0.020266	0.020266

RIE Index Condorcet Results - 1997

	RoadPvd +	GFCF +	AvNoOcc -	HseStck +	PopAcDg +	PopAcWtr +	PopAcSan +	GpMemb +	LifeSat +	HholdWk +
Weight	0.002	0.002	0.002	0.002	0.019633	0.019633	0.019633	0.004088	0.004088	0.004088
AUS	38.7	14.7	2.8	0.39	97.5	100	100	2.85	7.49	27.65
MEX	29.7	9.5	4.49	0.22	87	89.5	68.5	0.75	7.62	64.42
USA	59.14	11.4	2.65	0.43	97.5	100	100	2.43	7.41	25.24
AM	0.002	0.002	0.002	0.002	0.019633	0.019633	0.019633	0.004088	0	0
MA	0	0	0	0	0	0	0	0	0.004088	0.004088
AU	0	0.002	0	0	0.0098165	0.0098165	0.0098165	0.004088	0.004088	0.004088
UA	0.002	0	0.002	0.002	0.0098165	0.0098165	0.0098165	0	0	0
MU	0	0	0	0	0	0	0	0	0.004088	0.004088
UM	0.002	0.002	0.002	0.002	0.019633	0.019633	0.019633	0.004088	0	0

RIE Index Distance to Leader Results - 1997

	RoadPvd +	GFCF +	AvNoOcc -	HseStck +	PopAcDg +	PopAcWtr +	PopAcSan +	GpMemb +	LifeSat +	HholdWk +
AUS	65.44	100.00	94.64	90.70	100.00	100.00	100.00	100.00	98.29	42.92
MEX	50.22	64.63	59.02	51.16	89.23	89.50	68.50	26.32	100.00	100.00
USA	100.00	77.55	100.00	100.00	100.00	100.00	100.00	85.26	97.24	39.18
Weight	0.002	0.002	0.002	0.002	0.019633	0.019633	0.019633	0.004088	0.004088	0.004088

RIE Index Condorcet Results - 1997

	GNI_PPP +	GINI -	YthUnpt -	DivceRt -	P'sners -	ScideRte -	CptnInd +	LawIndex +	GovEfInd +	PolStInd +	V&Aind +
Weight	0.004088	0.004088	0.004088	0.004088	0.004088	0.004088	0.00122	0.00122	0.00122	0.00122	0.00122
AUS	21,863	0.303	15.9	48.1	89.3	14.3	2.01	1.9	1.9	1.24	1.7
MEX	7,552	0.485	6.4	6.68	71.1	3.6	-0.31	-0.42	0.04	-0.17	-0.18
USA	30,216	0.372	11.3	48.95	447.9	11.3	1.81	1.78	1.82	1.13	1.48
AM	0.004088	0.004088	0	0	0	0	0.00122	0.00122	0.00122	0.00122	0.00122
MA	0	0	0.004088	0.004088	0.004088	0.004088	0	0	0	0	0
AU	0	0.004088	0	0.004088	0.004088	0	0.00122	0.00122	0.00122	0.00122	0.00122
UA	0.004088	0	0.004088	0	0	0.004088	0	0	0	0	0
MU	0	0	0.004088	0.004088	0.004088	0.004088	0	0	0	0	0
UM	0.004088	0.004088	0	0	0	0	0.00122	0.00122	0.00122	0.00122	0.00122

RIE Index Distance to Leader Results - 1997

	GNI_PPP +	GINI -	YthUnpt -	DivceRt -	P'sners -	ScideRte -	CptnInd +	LawIndex +	GovEfInd +	PolStInd +	V&Aind +
AUS	72.36	100.00	40.25	13.89	79.66	25.17	100.00	100.00	100.00	100.00	100.00
MEX	24.99	62.47	100.00	100.00	100.00	100.00	-15.42	-22.11	2.11	-13.71	-10.59
USA	100.00	81.45	56.64	13.65	15.88	31.86	90.05	93.68	95.79	91.13	87.06
Weight	0.004088	0.004088	0.004088	0.004088	0.004088	0.004088	0.00122	0.00122	0.00122	0.00122	0.00122

RIE Index Condorcet Results - 1997

	EmpRate +	AdUnptRt -	LTUnpt -	O_WkHrs -	JoblessH -	RelPovRt -	RlPovEld -	
Weight	0.006214	0.006214	0.006214	0.006214	0.006214	0.006214	0.006214	
AUS	68.3	6.6	30.7	10	13.54	10.25	19.88	
MEX	63.7	2.5	1.4	6.93	3.49	20.99	30.56	
USA	72.3	3.9	8.7	20	5.68	16.91	22.61	
AM	0.006214	0	0	0	0	0.006214	0.006214	**0.4943**
MA	0	0.006214	0.006214	0.006214	0.006214	0	0	**0.5054**
AU	0	0	0	0.006214	0	0.006214	0.006214	**0.6436**
UA	0.006214	0.006214	0.006214	0	0.006214	0	0	**0.3561**
MU	0	0.006214	0.006214	0.006214	0.006214	0	0	**0.5164**
UM	0.006214	0	0	0	0	0.006214	0.006214	**0.4833**

RIE Index Distance to Leader Results - 1997

	EmpRate +	AdUnptRt -	LTUnpt -	O_WkHrs -	JoblessH -	RelPovRt -	RlPovEld -
AUS	94.47	37.88	4.69	69.30	25.74	100.00	100.00
MEX	88.11	100.00	100.00	100.00	100.00	48.83	65.05
USA	100.00	64.10	16.46	34.65	61.40	60.62	87.93
Weight	0.006214	0.006214	0.006214	0.006214	0.006214	0.006214	0.006214

RIE Index Condorcet Results - 1998

	Lexp +	InfMort -	HALE +	Phys +	PopnGwth +	FertRate +	Calories -	FatCons -	SugCons -	SchLexp +
Weight	0.014725	0.014725	0.014725	0.014725	0.0107	0.0107	0.019633	0.019633	0.019633	0.009483
AUS	78.7	5.0	71.4	2.4	1.03	1.76	3048	127.8	48.2	20.35
MEX	73.3	25.3	64.26	1.5	1.40	2.57	3121	87.3	49.1	11.43
USA	76.7	7.2	68.85	2.3	1.17	2.00	3664	143.6	71.5	15.73
AM	0.014725	0.014725	0.014725	0.014725	0	0	0.019633	0	0.019633	0.009483
MA	0	0	0	0	0.0107	0.0107	0	0.019633	0	0
AU	0.014725	0.014725	0.014725	0.014725	0	0	0.019633	0.019633	0.019633	0.009483
UA	0	0	0	0	0.0107	0.0107	0	0	0	0
MU	0	0	0	0	0.0107	0.0107	0.019633	0.019633	0.019633	0
UM	0.014725	0.014725	0.014725	0.014725	0	0	0	0	0	0.009483

E =

	AUS	**MEX**	**USA**
AUS	0	0.5368	0.6409
MEX	0.4629	0	0.5137
USA	0.3587	0.4859	0

AMU =	0.5368	0.6409	0.5137	**1.6915**
MUA =	0.5137	0.4629	0.3587	1.3353
UAM =	0.3587	0.4859	0.5368	1.3815
AUM =	0.6409	0.5368	0.4859	1.6637
MAU =	0.4629	0.5137	0.6409	1.6175
UMA =	0.4859	0.3587	0.4629	1.3076

The final Condorcet ranking for RIE index for 1998 is AMU.

RIE Index Distance to Leader Results - 1998

	Lexp +	InfMort -	HALE +	Phys +	PopnGwth +	FertRate +	Calories -	FatCons -	SugCons -	SchLexp +
AUS	100.00	100.00	100.00	100.00	73.57	68.48	100.00	68.31	100.00	100.00
MEX	93.14	19.76	89.97	62.50	100.00	100.00	97.66	100.00	98.17	56.17
USA	97.46	69.44	96.40	95.83	83.57	77.82	83.19	60.79	67.41	77.30
Weight	0.014725	0.014725	0.014725	0.014725	0.0107	0.0107	0.019633	0.019633	0.019633	0.009483

RIE_AUS	73.07
RIE_MEX	71.87
RIE_USA	61.39

The final DTL ranking for RIE index for 1998 is AMU.

RIE Index Condorcet Results - 1998

	NetEnrlt +	PbExpEdn +	TSSM&E +	PupilTch -	PISAsci +	R&Dexp +	R&Drsrch +	HiTechXt +	Patents +	Sci&Tert +	NFBtert +
Weight	0.009483	0.009483	0.009483	0.009483	0.009483	0.00428	0.00428	0.00428	0.00428	0.00428	0.018966
AUS	86.7	4.85	20.78	17.9	526.5	1.51	7.3	14.92	62.53	786.17	14.41
MEX	52.76	5.1	25.01	27.41	413.5	0.38	0.5	19.18	1.48	27.45	-6.12
USA	87.78	5.6	17.48	15.06	495	2.62	8.98	34.37	291.07	717.37	3.55
AM	0.009483	0	0	0.009483	0.009483	0.00428	0.00428	0	0.00428	0.00428	0.018966
MA	0	0.009483	0.009483	0	0	0	0	0.00428	0	0	0
AU	0	0	0.009483	0	0.009483	0	0	0	0	0.00428	0.018966
UA	0.009483	0.009483	0	0.009483	0	0.00428	0.00428	0.00428	0.00428	0	0
MU	0	0	0.009483	0	0	0	0	0	0	0	0
UM	0.009483	0.009483	0	0.009483	0.009483	0.00428	0.00428	0.00428	0.00428	0.00428	0.018966

RIE Index Distance to Leader Results - 1998

	NetEnrlt +	PbExpEdn +	TSSM&E +	PupilTch -	PISAsci +	R&Dexp +	R&Drsrch +	HiTechXt +	Patents +	Sci&Tert +	NFBtert +
AUS	98.77	86.61	83.09	84.13	100.00	57.63	81.29	43.41	21.48	100.00	100.00
MEX	60.10	91.07	100.00	54.94	78.54	14.50	5.57	55.80	0.51	3.49	-42.47
USA	100.00	100.00	69.89	100.00	94.02	100.00	100.00	100.00	100.00	91.25	24.64
Weight	0.009483	0.009483	0.009483	0.009483	0.009483	0.00428	0.00428	0.00428	0.00428	0.00428	0.018966

RIE Index Condorcet Results - 1998

	HSkImm +	NtTyGn +	FstArea +	AgLand +	ArblLand +	IrrigLnd +	FertCons -	TractUse -	AgPdnInd +	FdPdnInd +	GDPEgUse -
Weight	0.018966	0.018966	0.0076	0.0076	0.0076	0.0076	0.0076	0.0076	0.0076	0.0076	0.020266
AUS	28.87	11.12	21.65	60.37	6.97	4.4	420.23	170.7	96.6	96	4.44
MEX	1.33	-1.5	35.25	56.16	13.05	22.93	724.62	84.1	96.9	95.8	5.45
USA	13.86	5.04	32.81	45.18	19.35	12.66	1,115.71	39.1	99.6	100.2	4.11
AM	0.018966	0.018966	0	0.0076	0	0	0.0076	0	0	0.0076	0.020266
MA	0	0	0.0076	0	0.0076	0.0076	0	0.0076	0.0076	0	0
AU	0.018966	0.018966	0	0.0076	0	0	0.0076	0	0	0	0
UA	0	0	0.0076	0	0.0076	0.0076	0	0.0076	0.0076	0.0076	0.020266
MU	0	0	0.0076	0.0076	0	0.0076	0.0076	0	0	0	0
UM	0.018966	0.018966	0	0	0.0076	0	0	0.0076	0.0076	0.0076	0.020266

RIE Index Distance to Leader Results - 1998

	HSkImm +	NtTyGn +	FstArea +	AgLand +	ArblLand +	IrrigLnd +	FertCons -	TractUse -	AgPdnInd +	FdPdnInd +	GDPEgUse -
AUS	100.00	100.00	61.42	100.00	36.02	19.19	100.00	22.91	96.99	95.81	92.57
MEX	4.61	-13.49	100.00	93.03	67.44	100.00	57.99	46.49	97.29	95.61	75.41
USA	48.01	45.32	93.08	74.84	100.00	55.21	37.66	100.00	100.00	100.00	100.00
Weight	0.018966	0.018966	0.0076	0.0076	0.0076	0.0076	0.0076	0.0076	0.0076	0.0076	0.020266

RIE Index Condorcet Results - 1998

	RbleEgSp +	ElecCons -	FWaterAv +	InGdWtAv +	WtrWdls -	OrgWtrPt -	FishCapt -	FishCons -	NBI +	ThtMamm -	ThtBird -
Weight	0.020266	0.020266	0.0152	0.0152	0.0152	0.0152	0.0304	0.0304	0.020266	0.020266	0.020266
AUS	6.2	9,760.35	22.45	3.85	4.9	4.96	0.2	20.43	0.85	22.6	4.96
MEX	10.3	1,636.43	3.34	1.46	19.1	3.05	1.03	9.91	0.93	13.58	4.92
USA	5.1	13,168.18	6.35	4.71	17.1	9.64	4.36	21.6	0.68	8.38	7.97
AM	0	0	0.0152	0.0152	0.0152	0	0.0304	0	0	0	0
MA	0.020266	0.020266	0	0	0	0.0152	0	0.0304	0.020266	0.020266	0.020266
AU	0.020266	0.020266	0.0152	0	0.0152	0.0152	0.0304	0.0304	0.020266	0	0.020266
UA	0	0	0	0.0152	0	0	0	0	0	0.020266	0
MU	0.020266	0.020266	0	0	0	0.0152	0.0304	0.0304	0.020266	0	0.020266
UM	0	0	0.0152	0.0152	0.0152	0	0	0	0	0.020266	0

RIE Index Distance to Leader Results - 1998

	RbleEgSp +	ElecCons -	FWaterAv +	InGdWtAv +	WtrWdls -	OrgWtrPt -	FishCapt -	FishCons -	NBI +	ThtMamm -	ThtBird -
AUS	60.19	16.77	100.00	81.74	100.00	61.49	100.00	48.51	91.40	37.08	99.19
MEX	100.00	100.00	14.88	31.00	25.65	100.00	19.42	100.00	100.00	61.71	100.00
USA	49.51	12.43	28.29	100.00	28.65	31.64	4.59	45.88	73.12	100.00	61.73
Weight	0.020266	0.020266	0.0152	0.0152	0.0152	0.0152	0.0304	0.0304	0.020266	0.020266	0.020266

RIE Index Condorcet Results - 1998

	NtDmCdt +	DmCdtBnk +	FDINInf +	NetLnd +	MktCpt -	StksTd -	Real_IR -	RealXRte +	M&Teqp +	GFCF_Mch +
Weight	0.002675	0.002675	0.002675	0.002675	0.002675	0.002675	0.002675	0.002675	0.0107	0.0107
AUS	27,667	87.8	1.61	-1,332.12	88.81	43.49	8.01	104.33	23.08	8.1
MEX	15,591	45.99	2.95	-312.90	21.78	8.11	9.51	84.21	26.54	11.1
USA	25,280	173.79	2.06	-628.96	154.71	151.23	7.16	98.24	31.34	7.3
AM	0.002675	0.002675	0	0	0	0	0.002675	0.002675	0	0
MA	0	0	0.002675	0.002675	0.002675	0.002675	0	0	0.0107	0.0107
AU	0.002675	0	0	0	0.002675	0.002675	0	0.002675	0	0.0107
UA	0	0.002675	0.002675	0.002675	0	0	0.002675	0	0.0107	0
MU	0	0	0.002675	0.002675	0.002675	0.002675	0	0	0	0.0107
UM	0.002675	0.002675	0	0	0	0	0.002675	0.002675	0.0107	0

RIE Index Distance to Leader Results - 1998

	NtDmCdt +	DmCdtBnk +	FDINInf +	NetLnd +	MktCpt -	StksTd -	Real_IR -	RealXRte +	M&Teqp +	GFCF_Mch +
AUS	100.00	50.52	54.58	23.49	24.52	18.65	89.39	100.00	73.64	72.97
MEX	56.35	26.46	100.00	100.00	100.00	100.00	75.29	80.72	84.68	100.00
USA	91.37	100.00	69.83	49.75	14.08	5.36	100.00	94.16	100.00	65.77
Weight	0.002675	0.002675	0.002675	0.002675	0.002675	0.002675	0.002675	0.002675	0.0107	0.0107

RIE Index Condorcet Results - 1998

	TphnMain +	PCs +	Radios +	Tvsets +	Newspap +	ICT_Exp +	AirTptFt +	Air_Pass +	ContPtTf +	RaRdGood +
Weight	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566
AUS	509.86	368.77	1603.3	705.5	165.61	6.24	1,904.40	1,613,260.00	219,182.80	1177303.79
MEX	104.22	36.74	313.02	260.9	95.7	3.03	284.8	186,007.00	15507.2	179,158.30
USA	651.87	449.51	2096.24	837.4	201.41	8.24	25,757.90	2,132,182.00	106515.8	3,688,816.20
AM	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566
MA	0	0	0	0	0	0	0	0	0	0
AU	0	0	0	0	0	0	0	0	0.003566	0
UA	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0	0.003566
MU	0	0	0	0	0	0	0	0	0	0
UM	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566

RIE Index Distance to Leader Results - 1998

	TphnMain +	PCs +	Radios +	Tvsets +	Newspap +	ICT_Exp +	AirTptFt +	Air_Pass +	ContPtTf +	RaRdGood +
AUS	78.21	82.04	76.48	84.25	82.23	75.73	7.39	75.66	100.00	31.92
MEX	15.99	8.17	14.93	31.16	47.52	36.77	1.11	8.72	7.08	4.86
USA	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	48.60	100.00
Weight	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566

RIE Index Condorcet Results - 1998

	RailPass +	RdVhcl +	SulphOx -	NitOx -	CarbMon -	CbDioxEm -	CbDxTtEm -	EcoFPt -	FnConExp +	DefExp -
Weight	0.003566	0.003566	0.020266	0.020266	0.020266	0.0304	0.0304	0.020266	0.020266	0.020266
AUS	1141.79	108.12	98	87	283	17.76	1.46	6.91	80.17	165.96
MEX	1767.32	46.24	11.67	12	62	3.79	1.61	2.51	79.17	73.41
USA	40,510.13	26.38	62	80	358	20.23	24.44	9.6	82	3138.76
AM	0	0.003566	0	0	0	0	0.0304	0	0.020266	0
MA	0.003566	0	0.020266	0.020266	0.020266	0.0304	0	0.020266	0	0.020266
AU	0	0.003566	0	0	0.020266	0.0304	0.0304	0.020266	0	0.020266
UA	0.003566	0	0.020266	0.020266	0	0	0	0	0.020266	0
MU	0	0.003566	0.020266	0.020266	0.020266	0.0304	0.0304	0.020266	0	0.020266
UM	0.003566	0	0	0	0	0	0	0	0.020266	0

RIE Index Distance to Leader Results - 1998

	RailPass +	RdVhcl +	SulphOx -	NitOx -	CarbMon -	CbDioxEm -	CbDxTtEm -	EcoFPt -	FnConExp +	DefExp -
AUS	2.82	100.00	11.91	13.79	21.91	21.34	100.00	36.32	97.77	44.23
MEX	4.36	42.77	100.00	100.00	100.00	100.00	90.68	100.00	96.55	100.00
USA	100.00	24.40	18.82	15.00	17.32	18.73	5.97	26.15	100.00	2.34
Weight	0.003566	0.003566	0.020266	0.020266	0.020266	0.0304	0.0304	0.020266	0.020266	0.020266

RIE Index Condorcet Results - 1998

	RoadPvd +	GFCF +	AvNoOcc -	HseStck +	PopAcDg +	PopAcWtr +	PopAcSan +	GpMemb +	LifeSat +	HholdWk +
Weight	0.002	0.002	0.002	0.002	0.019633	0.019633	0.019633	0.004088	0.004088	0.004088
AUS	38.7	14.7	2.78	0.39	97.5	100	100	2.85	7.59	27.65
MEX	34.3	9.8	4.46	0.23	87	90.57	70	0.75	7.7	64.42
USA	59.14	11.8	2.64	0.43	97.5	100	100	2.43	7.4	25.24
AM	0.002	0.002	0.002	0.002	0.019633	0.019633	0.019633	0.004088	0	0
MA	0	0	0	0	0	0	0	0	0.004088	0.004088
AU	0	0.002	0	0	0.0098165	0.0098165	0.0098165	0.004088	0.004088	0.004088
UA	0.002	0	0.002	0.002	0.0098165	0.0098165	0.0098165	0	0	0
MU	0	0	0	0	0	0	0	0	0.004088	0.004088
UM	0.002	0.002	0.002	0.002	0.019633	0.019633	0.019633	0.004088	0	0

RIE Index Distance to Leader Results - 1998

	RoadPvd +	GFCF +	AvNoOcc -	HseStck +	PopAcDg +	PopAcWtr +	PopAcSan +	GpMemb +	LifeSat +	HholdWk +
AUS	65.44	100.00	94.96	90.70	100.00	100.00	100.00	100.00	98.57	42.92
MEX	58.00	66.67	59.19	53.49	89.23	90.57	70.00	26.32	100.00	100.00
USA	100.00	80.27	100.00	100.00	100.00	100.00	100.00	85.26	96.10	39.18
Weight	0.002	0.002	0.002	0.002	0.019633	0.019633	0.019633	0.004088	0.004088	0.004088

RIE Index Condorcet Results - 1998

	GNI_PPP +	GINI -	YthUnpt -	DivceRt -	P'sners -	ScideRte -	CptnInd +	LawIndex +	GovEfInd +	PolStInd +	V&Aind +
Weight	0.004088	0.004088	0.004088	0.004088	0.004088	0.004088	0.00122	0.00122	0.00122	0.00122	0.00122
AUS	23,040	0.303	14.1	46.5	91.1	14.1	2.01	1.9	1.9	1.26	1.66
MEX	7,899	0.485	5.4	6.6	78.3	3.5	-0.31	-0.38	0.04	-0.17	-0.17
USA	31,472	0.371	10.4	48.95	452.9	10.7	1.81	1.77	1.82	1.18	1.41
AM	0.004088	0.004088	0	0	0	0	0.00122	0.00122	0.00122	0.00122	0.00122
MA	0	0	0.004088	0.004088	0.004088	0.004088	0	0	0	0	0
AU	0	0.004088	0	0.004088	0.004088	0	0.00122	0.00122	0.00122	0.00122	0.00122
UA	0.004088	0	0.004088	0	0	0.004088	0	0	0	0	0
MU	0	0	0.004088	0.004088	0.004088	0.004088	0	0	0	0	0
UM	0.004088	0.004088	0	0	0	0	0.00122	0.00122	0.00122	0.00122	0.00122

RIE Index Distance to Leader Results - 1998

	GNI_PPP +	GINI -	YthUnpt -	DivceRt -	P'sners -	ScideRte -	CptnInd +	LawIndex +	GovEfInd +	PolStInd +	V&Aind +
AUS	73.21	100.00	38.30	14.19	85.95	24.82	100.00	100.00	100.00	100.00	100.00
MEX	25.10	62.47	100.00	100.00	100.00	100.00	-15.42	-20.00	2.11	-13.49	-10.24
USA	100.00	81.67	51.92	13.48	17.28	32.71	90.05	93.16	95.79	93.65	84.94
Weight	0.004088	0.004088	0.004088	0.004088	0.004088	0.004088	0.00122	0.00122	0.00122	0.00122	0.00122

RIE Index Condorcet Results - 1998

	EmpRate +	AdUnptRt -	LTUnpt -	O_WkHrs -	JoblessH -	RelPovRt -	RlPovEld -	
Weight	0.006214	0.006214	0.006214	0.006214	0.006214	0.006214	0.006214	
AUS	69.0	6.1	34.5	5	13.49	10.25	19.88	
MEX	64.2	2.2	0.8	5	3.51	20.99	30.56	
USA	72.3	3.5	8.0	19	5.42	16.91	22.61	
AM	0.006214	0	0	0.003107	0	0.006214	0.006214	**0.5368**
MA	0	0.006214	0.006214	0.003107	0.006214	0	0	**0.4629**
AU	0	0	0	0.006214	0	0.006214	0.006214	**0.6409**
UA	0.006214	0.006214	0.006214	0	0.006214	0	0	**0.3587**
MU	0	0.006214	0.006214	0.006214	0.006214	0	0	**0.5137**
UM	0.006214	0	0	0	0	0.006214	0.006214	**0.4859**

RIE Index Distance to Leader Results - 1998

	EmpRate +	AdUnptRt -	LTUnpt -	O_WkHrs -	JoblessH -	RelPovRt -	RlPovEld -
AUS	95.44	36.07	2.41	100.00	26.02	100.00	100.00
MEX	88.80	100.00	100.00	100.00	100.00	48.83	65.05
USA	100.00	62.86	10.44	26.32	64.85	60.62	87.93
Weight	0.006214	0.006214	0.006214	0.006214	0.006214	0.006214	0.006214

RIE Index Condorcet Results - 1999

	Lexp +	InfMort -	HALE +	Phys +	PopnGwth +	FertRate +	Calories -	FatCons -	SugCons -	SchLexp +
Weight	0.014725	0.014725	0.014725	0.014725	0.0107	0.0107	0.019633	0.019633	0.019633	0.009483
AUS	79	5.7	71.7	2.4	1.14	1.75	3058	131.7	44	20.35
MEX	73.7	24.4	64.61	1.5	1.39	2.50	3113	85.4	48.4	11.63
USA	76.7	7.1	68.85	2.2	1.15	2.01	3705	147.5	69.6	15.73
AM	0.014725	0.014725	0.014725	0.014725	0	0	0.019633	0	0.019633	0.009483
MA	0	0	0	0	0.0107	0.0107	0	0.019633	0	0
AU	0.014725	0.014725	0.014725	0.014725	0	0	0.019633	0.019633	0.019633	0.009483
UA	0	0	0	0	0.0107	0.0107	0	0	0	0
MU	0	0	0	0	0.0107	0.0107	0.019633	0.019633	0.019633	0
UM	0.014725	0.014725	0.014725	0.014725	0	0	0	0	0	0.009483

E =

	AUS	**MEX**	**USA**
AUS	0	0.5615	0.6588
MEX	0.4381	0	0.5111
USA	0.3409	0.4886	0

AMU =	0.5615	0.6588	0.5111	**1.7314**
MUA =	0.5111	0.4381	0.3409	1.2900
UAM =	0.3409	0.4886	0.5615	1.3910
AUM =	0.6588	0.5615	0.4886	1.7090
MAU =	0.4381	0.5111	0.6588	1.6080
UMA =	0.4886	0.3409	0.4381	1.2676

The final Condorcet ranking for RIE index for 1999 is AMU.

RIE Index Distance to Leader Results - 1999

	Lexp +	InfMort -	HALE +	Phys +	PopnGwth +	FertRate +	Calories -	FatCons -	SugCons -	SchLexp +
AUS	100.00	100.00	100.00	100.00	82.01	70.00	100.00	64.84	100.00	100.00
MEX	93.29	23.36	90.12	62.50	100.00	100.00	98.23	100.00	90.91	57.15
USA	97.09	80.28	96.04	91.67	82.73	80.40	82.54	57.90	63.22	77.30
Weight	0.014725	0.014725	0.014725	0.014725	0.0107	0.0107	0.019633	0.019633	0.019633	0.009483

RIE_AUS	72.64
RIE_MEX	72.22
RIE_USA	61.31

The final DTL ranking for RIE index for 1999 is AMU.

RIE Index Condorcet Results - 1999

	NetEnrlt +	PbExpEdn +	TSSM&E +	PupilTch -	PISAsci +	R&Dexp +	R&Drsrch +	HiTechXt +	Patents +	Sci&Tert +	NFBtert +
Weight	0.009483	0.009483	0.009483	0.009483	0.009483	0.00428	0.00428	0.00428	0.00428	0.00428	0.018966
AUS	86.7	4.85	20.78	17.3	526.5	1.61	7.44	15.09	53.00	802.39	14.41
MEX	54.89	5.1	25.01	27.23	413.5	0.43	0.6	20.68	1.24	30.28	-6.12
USA	87.78	5.6	17.48	15.06	495	2.66	9.3	35.53	300.7	711.45	3.55
AM	0.009483	0	0	0.009483	0.009483	0.00428	0.00428	0	0.00428	0.00428	0.018966
MA	0	0.009483	0.009483	0	0	0	0	0.00428	0	0	0
AU	0	0	0.009483	0	0.009483	0	0	0	0	0.00428	0.018966
UA	0.009483	0.009483	0	0.009483	0	0.00428	0.00428	0.00428	0.00428	0	0
MU	0	0	0.009483	0	0	0	0	0	0	0	0
UM	0.009483	0.009483	0	0.009483	0.009483	0.00428	0.00428	0.00428	0.00428	0.00428	0.018966

RIE Index Distance to Leader Results - 1999

	NetEnrlt +	PbExpEdn +	TSSM&E +	PupilTch -	PISAsci +	R&Dexp +	R&Drsrch +	HiTechXt +	Patents +	Sci&Tert +	NFBtert +
AUS	98.77	86.61	83.09	87.05	100.00	60.53	80.00	42.47	17.63	100.00	100.00
MEX	62.53	91.07	100.00	55.31	78.54	16.17	6.45	58.20	0.41	3.77	-42.47
USA	100.00	100.00	69.89	100.00	94.02	100.00	100.00	100.00	100.00	88.67	24.64
Weight	0.009483	0.009483	0.009483	0.009483	0.009483	0.00428	0.00428	0.00428	0.00428	0.00428	0.018966

RIE Index Condorcet Results - 1999

	HSkImm +	NtTyGn +	FstArea +	AgLand +	ArblLand +	IrrigLnd +	FertCons -	TractUse -	AgPdnInd +	FdPdnInd +	GDPEgUse -
Weight	0.018966	0.018966	0.0076	0.0076	0.0076	0.0076	0.0076	0.0076	0.0076	0.0076	0.020266
AUS	28.87	11.26	21.65	59.06	6.24	4.67	490.63	153.1	101.1	101.1	4.44
MEX	1.33	-1.6	35.25	56.16	12.99	23	716.13	84.1	99.5	99.2	5.56
USA	13.86	5.22	32.81	44.99	19.22	12.7	1,111.45	38.5	100.2	100.3	4.16
AM	0.018966	0.018966	0	0.0076	0	0	0.0076	0	0.0076	0.0076	0.020266
MA	0	0	0.0076	0	0.0076	0.0076	0	0.0076	0	0	0
AU	0.018966	0.018966	0	0.0076	0	0	0.0076	0	0.0076	0.0076	0
UA	0	0	0.0076	0	0.0076	0.0076	0	0.0076	0	0	0.020266
MU	0	0	0.0076	0.0076	0	0.0076	0.0076	0	0	0	0
UM	0.018966	0.018966	0	0	0.0076	0	0	0.0076	0.0076	0.0076	0.020266

RIE Index Distance to Leader Results - 1999

	HSkImm +	NtTyGn +	FstArea +	AgLand +	ArblLand +	IrrigLnd +	FertCons -	TractUse -	AgPdnInd +	FdPdnInd +	GDPEgUse -
AUS	100.00	100.00	61.42	100.00	32.47	20.30	100.00	25.15	100.00	100.00	93.69
MEX	4.61	-14.21	100.00	95.09	67.59	100.00	68.51	45.78	98.42	98.12	74.82
USA	48.01	46.36	93.08	76.18	100.00	55.22	44.14	100.00	99.11	99.21	100.00
Weight	0.018966	0.018966	0.0076	0.0076	0.0076	0.0076	0.0076	0.0076	0.0076	0.0076	0.020266

RIE Index Condorcet Results - 1999

	RbleEgSp +	ElecCons -	FWaterAv +	InGdWtAv +	WtrWdls -	OrgWtrPt -	FishCapt -	FishCons -	NBI +	ThtMamm -	ThtBird -
Weight	0.020266	0.020266	0.0152	0.0152	0.0152	0.0152	0.0304	0.0304	0.020266	0.020266	0.020266
AUS	6.0	9,929.15	22.19	3.8	4.9	4.98	0.2	20.64	0.85	22.89	5.1
MEX	10.5	1,710.15	3.29	1.44	19.1	3.05	0.99	9.56	0.93	13.86	5.13
USA	4.9	13,281.30	6.28	4.66	17.1	9.4	4.11	21.6	0.68	8.5	8.1
AM	0	0	0.0152	0.0152	0.0152	0	0.0304	0	0	0	0.020266
MA	0.020266	0.020266	0	0	0	0.0152	0	0.0304	0.020266	0.020266	0
AU	0.020266	0.020266	0.0152	0	0.0152	0.0152	0.0304	0.0304	0.020266	0	0.020266
UA	0	0	0	0.0152	0	0	0	0	0	0.020266	0
MU	0.020266	0.020266	0	0	0	0.0152	0.0304	0.0304	0.020266	0	0.020266
UM	0	0	0.0152	0.0152	0.0152	0	0	0	0	0.020266	0

RIE Index Distance to Leader Results - 1999

	RbleEgSp +	ElecCons -	FWaterAv +	InGdWtAv +	WtrWdls -	OrgWtrPt -	FishCapt -	FishCons -	NBI +	ThtMamm -	ThtBird -
AUS	57.14	17.22	100.00	81.55	100.00	61.24	100.00	46.32	91.40	37.13	100.00
MEX	100.00	100.00	14.83	30.90	25.65	100.00	20.20	100.00	100.00	61.33	99.42
USA	46.67	12.88	28.30	100.00	28.65	32.45	4.87	44.26	73.12	100.00	62.96
Weight	0.020266	0.020266	0.0152	0.0152	0.0152	0.0152	0.0304	0.0304	0.020266	0.020266	0.020266

RIE Index Condorcet Results - 1999

	NtDmCdt +	DmCdtBnk +	FDINInf +	NetLnd +	MktCpt -	StksTd -	Real_IR -	RealXRte +	M&Teqp +	GFCF_Mch +
Weight	0.002675	0.002675	0.002675	0.002675	0.002675	0.002675	0.002675	0.002675	0.0107	0.0107
AUS	29,927	90.85	0.82	-1,264.03	106.33	48.31	5.96	104.89	23.52	8.2
MEX	16,526	43.07	2.79	-244.18	32.01	7.49	7.52	92.13	26.27	11
USA	26,735	186.15	3.14	-870.84	180.5	201.54	6.46	96.96	30.99	7.4
AM	0.002675	0.002675	0	0	0	0	0.002675	0.002675	0	0
MA	0	0	0.002675	0.002675	0.002675	0.002675	0	0	0.0107	0.0107
AU	0.002675	0	0	0	0.002675	0.002675	0.002675	0.002675	0	0.0107
UA	0	0.002675	0.002675	0.002675	0	0	0	0	0.0107	0
MU	0	0	0	0.002675	0.002675	0.002675	0	0	0	0.0107
UM	0.002675	0.002675	0.002675	0	0	0	0.002675	0.002675	0.0107	0

RIE Index Distance to Leader Results - 1999

	NtDmCdt +	DmCdtBnk +	FDINInf +	NetLnd +	MktCpt -	StksTd -	Real_IR -	RealXRte +	M&Teqp +	GFCF_Mch +
AUS	100.00	48.80	26.11	19.32	30.10	15.50	100.00	100.00	75.90	74.55
MEX	55.22	23.14	88.85	100.00	100.00	100.00	79.26	87.83	84.77	100.00
USA	89.33	100.00	100.00	28.04	17.73	3.72	92.26	92.44	100.00	67.27
Weight	0.002675	0.002675	0.002675	0.002675	0.002675	0.002675	0.002675	0.002675	0.0107	0.0107

RIE Index Condorcet Results - 1999

	TphnMain +	PCs +	Radios +	Tvsets +	Newspap +	ICT_Exp +	AirTptFt +	Air_Pass +	ContPtTf +	RaRdGood +
Weight	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566
AUS	515.69	422.7	1743.6	708	162.71	6.24	1,693.00	1,668,588.00	219,182.80	1,180,085.00
MEX	113.14	44.52	322.45	272.2	95.82	3.03	317	212,882.00	15507.2	195,321.80
USA	657.69	505.3	2091.9	835	198.52	8.35	27,292.20	2,273,382.00	106515.8	3,757,165.00
AM	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566
MA	0	0	0	0	0	0	0	0	0	0
AU	0	0	0	0	0	0	0	0	0.003566	0
UA	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0	0.003566
MU	0	0	0	0	0	0	0	0	0	0
UM	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566

RIE Index Distance to Leader Results - 1999

	TphnMain +	PCs +	Radios +	Tvsets +	Newspap +	ICT_Exp +	AirTptFt +	Air_Pass +	ContPtTf +	RaRdGood +
AUS	78.41	83.65	83.35	84.79	81.96	74.73	6.20	73.40	100.00	31.41
MEX	17.20	8.81	15.41	32.60	48.27	36.29	1.16	9.36	7.08	5.20
USA	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	48.60	100.00
Weight	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566

RIE Index Condorcet Results - 1999

	RailPass +	RdVhcl +	SulphOx -	NitOx -	CarbMon -	CbDioxEm -	CbDxTtEm -	EcoFPt -	FnConExp +	DefExp -
Weight	0.003566	0.003566	0.020266	0.020266	0.020266	0.0304	0.0304	0.020266	0.020266	0.020266
AUS	1,155.00	105.46	102	86	275	18.49	1.51	6.91	79.35	158.79
MEX	1739.42	48.04	11.67	12	58.19	3.66	1.55	2.51	79.15	85.19
USA	40682.82	26.28	57	74	338	20.25	24.39	9.6	82.29	3305.72
AM	0	0.003566	0	0	0	0	0.0304	0	0.020266	0
MA	0.003566	0	0.020266	0.020266	0.020266	0.0304	0	0.020266	0	0.020266
AU	0	0.003566	0	0	0.020266	0.0304	0.0304	0.020266	0	0.020266
UA	0.003566	0	0.020266	0.020266	0	0	0	0	0.020266	0
MU	0	0.003566	0.020266	0.020266	0.020266	0.0304	0.0304	0.020266	0	0.020266
UM	0.003566	0	0	0	0	0	0	0	0.020266	0

RIE Index Distance to Leader Results - 1999

	RailPass +	RdVhcl +	SulphOx -	NitOx -	CarbMon -	CbDioxEm -	CbDxTtEm -	EcoFPt -	FnConExp +	DefExp -
AUS	2.84	100.00	11.44	13.95	21.16	19.79	100.00	36.32	96.43	53.65
MEX	4.28	45.55	100.00	100.00	100.00	100.00	97.42	100.00	96.18	100.00
USA	100.00	24.92	20.47	16.22	17.22	18.07	6.19	26.15	100.00	2.58
Weight	0.003566	0.003566	0.020266	0.020266	0.020266	0.0304	0.0304	0.020266	0.020266	0.020266

RIE Index Condorcet Results - 1999

	RoadPvd +	GFCF +	AvNoOcc -	HseStck +	PopAcDg +	PopAcWtr +	PopAcSan +	GpMemb +	LifeSat +	HholdWk +
Weight	0.002	0.002	0.002	0.002	0.019633	0.019633	0.019633	0.004088	0.004088	0.004088
AUS	38.7	14.7	2.77	0.4	97.5	100	100	2.85	7.68	27.65
MEX	32.8	10.1	4.44	0.23	87	91.64	71.5	0.75	7.78	64.42
USA	59.14	12.2	2.63	0.44	97.5	100	100	2.43	7.4	25.24
AM	0.002	0.002	0.002	0.002	0.019633	0.019633	0.019633	0.004088	0	0
MA	0	0	0	0	0	0	0	0	0.004088	0.004088
AU	0	0.002	0	0	0.0098165	0.0098165	0.0098165	0.004088	0.004088	0.004088
UA	0.002	0	0.002	0.002	0.0098165	0.0098165	0.0098165	0	0	0
MU	0	0	0	0	0	0	0	0	0.004088	0.004088
UM	0.002	0.002	0.002	0.002	0.019633	0.019633	0.019633	0.004088	0	0

RIE Index Distance to Leader Results - 1999

	RoadPvd +	GFCF +	AvNoOcc -	HseStck +	PopAcDg +	PopAcWtr +	PopAcSan +	GpMemb +	LifeSat +	HholdWk +
AUS	65.44	100.00	94.95	90.91	100.00	100.00	100.00	100.00	98.71	42.92
MEX	55.46	68.71	59.23	52.27	89.23	91.64	71.50	26.32	100.00	100.00
USA	100.00	82.99	100.00	100.00	100.00	100.00	100.00	85.26	95.12	39.18
Weight	0.002	0.002	0.002	0.002	0.019633	0.019633	0.019633	0.004088	0.004088	0.004088

RIE Index Condorcet Results - 1999

	GNI_PPP +	GINI -	YthUnpt -	DivceRt -	P'sners -	ScideRte -	CptnInd +	LawIndex +	GovEfInd +	PolStInd +	V&Aind +
Weight	0.004088	0.004088	0.004088	0.004088	0.004088	0.004088	0.00122	0.00122	0.00122	0.00122	0.00122
AUS	23,976	0.303	13	46	96.5	13.1	2.01	1.9	1.9	1.3	1.62
MEX	8,208	0.485	3.4	6.6	84.2	3.4	-0.31	-0.38	0.04	-0.17	0
USA	32,979	0.37	9.9	48.95	469.1	10.4	1.81	1.72	1.82	1.21	1.4
AM	0.004088	0.004088	0	0	0	0	0.00122	0.00122	0.00122	0.00122	0.00122
MA	0	0	0.004088	0.004088	0.004088	0.004088	0	0	0	0	0
AU	0	0.004088	0	0.004088	0.004088	0	0.00122	0.00122	0.00122	0.00122	0.00122
UA	0.004088	0	0.004088	0	0	0.004088	0	0	0	0	0
MU	0	0	0.004088	0.004088	0.004088	0.004088	0	0	0	0	0
UM	0.004088	0.004088	0	0	0	0	0.00122	0.00122	0.00122	0.00122	0.00122

RIE Index Distance to Leader Results - 1999

	GNI_PPP +	GINI -	YthUnpt -	DivceRt -	P'sners -	ScideRte -	CptnInd +	LawIndex +	GovEfInd +	PolStInd +	V&Aind +
AUS	72.70	100.00	26.15	14.35	87.29	25.95	100.00	100.00	100.00	100.00	100.00
MEX	24.89	62.47	100.00	100.00	100.00	100.00	-15.42	-20.00	2.11	-13.08	0.00
USA	100.00	81.89	34.34	13.48	17.95	32.69	90.05	90.53	95.79	93.08	86.42
Weight	0.004088	0.004088	0.004088	0.004088	0.004088	0.004088	0.00122	0.00122	0.00122	0.00122	0.00122

RIE Index Condorcet Results - 1999

	EmpRate +	AdUnptRt -	LTUnpt -	O_WkHrs -	JoblessH -	RelPovRt -	RlPovEld -	
Weight	0.006214	0.006214	0.006214	0.006214	0.006214	0.006214	0.006214	
AUS	69.3	5.5	30.2	9	13.45	10.25	19.88	
MEX	63.9	1.8	1.7	1.67	3.54	20.99	30.56	
USA	72.4	3.2	6.8	18	5.15	16.91	22.61	
AM	0.006214	0	0	0	0	0.006214	0.006214	**0.5615**
MA	0	0.006214	0.006214	0.006214	0.006214	0	0	**0.4381**
AU	0	0	0	0.006214	0	0.006214	0.006214	**0.6588**
UA	0.006214	0.006214	0.006214	0	0.006214	0	0	**0.3409**
MU	0	0.006214	0.006214	0.006214	0.006214	0	0	**0.5111**
UM	0.006214	0	0	0	0	0.006214	0.006214	**0.4886**

RIE Index Distance to Leader Results - 1999

	EmpRate +	AdUnptRt -	LTUnpt -	O_WkHrs -	JoblessH -	RelPovRt -	RlPovEld -
AUS	95.72	32.73	5.67	18.56	26.31	100.00	100.00
MEX	88.26	100.00	100.00	100.00	100.00	48.83	65.05
USA	100.00	56.25	25.21	9.28	68.65	60.62	87.93
Weight	0.006214	0.006214	0.006214	0.006214	0.006214	0.006214	0.006214

RIE Index Condorcet Results - 2000

	Lexp +	InfMort -	HALE +	Phys +	PopnGwth +	FertRate +	Calories -	FatCons -	SugCons -	SchLexp +
Weight	0.014725	0.014725	0.014725	0.014725	0.0107	0.0107	0.019633	0.019633	0.019633	0.009483
AUS	79.3	5.2	72.0	2.5	1.19	1.75	3069	135.9	45.2	20.35
MEX	74	23.3	64.88	1.5	1.42	2.41	3158	86.4	49	11.85
USA	76.8	6.9	68.94	2.3	1.13	2.06	3817	156	71.8	15.73
AM	0.014725	0.014725	0.014725	0.014725	0	0	0.019633	0	0.019633	0.009483
MA	0	0	0	0	0.0107	0.0107	0	0.019633	0	0
AU	0.014725	0.014725	0.014725	0.014725	0.0107	0	0.019633	0.019633	0.019633	0.009483
UA	0	0	0	0	0	0.0107	0	0	0	0
MU	0	0	0	0	0.0107	0.0107	0.019633	0.019633	0.019633	0
UM	0.014725	0.014725	0.014725	0.014725	0	0	0	0	0	0.009483

E =

	AUS	**MEX**	**USA**
AUS	0	0.5438	0.6521
MEX	0.4559	0	0.5088
USA	0.3476	0.4908	0

AMU =	0.5438	0.6521	0.5088	**1.7047**
MUA =	0.5088	0.4559	0.3476	1.3123
UAM =	0.3476	0.4908	0.5438	1.3821
AUM =	0.6521	0.5438	0.4908	1.6867
MAU =	0.4559	0.5088	0.6521	1.6169
UMA =	0.4908	0.3476	0.4559	1.2943

The final Condorcet ranking for RIE index for 2000 is AMU.

RIE Index Distance to Leader Results - 2000

	Lexp +	InfMort -	HALE +	Phys +	PopnGwth +	FertRate +	Calories -	FatCons -	SugCons -	SchLexp +
AUS	100.00	100.00	100.00	100.00	83.80	72.61	100.00	63.58	100.00	100.00
MEX	93.32	22.32	90.16	60.00	100.00	100.00	97.18	100.00	92.24	58.23
USA	96.85	75.36	95.80	92.00	79.58	85.48	80.40	55.38	62.95	77.30
Weight	0.014725	0.014725	0.014725	0.014725	0.0107	0.0107	0.019633	0.019633	0.019633	0.009483

RIE_AUS	73.48
RIE_MEX	71.48
RIE_USA	61.79

The final DTL ranking for RIE index for 2000 is AMU.

RIE Index Condorcet Results - 2000

	NetEnrlt +	PbExpEdn +	TSSM&E +	PupilTch -	PISAsci +	R&Dexp +	R&Drsrch +	HiTechXt +	Patents +	Sci&Tert +	NFBtert +
Weight	0.009483	0.009483	0.009483	0.009483	0.009483	0.00428	0.00428	0.00428	0.00428	0.00428	0.018966
AUS	86.7	4.85	20.78	17.3	526.5	1.56	7.3	15.22	53.99	767.50	14.41
MEX	56.15	5.1	25.01	27.16	413.5	0.37	0.63	22.4	1.15	30.11	-6.12
USA	87.78	5.6	17.48	15.06	495	2.74	9.3	35.29	301.43	711.30	3.55
AM	0.009483	0	0	0.009483	0.009483	0.00428	0.00428	0	0.00428	0.00428	0.018966
MA	0	0.009483	0.009483	0	0	0	0	0.00428	0	0	0
AU	0	0	0.009483	0	0.009483	0	0	0	0	0.00428	0.018966
UA	0.009483	0.009483	0	0.009483	0	0.00428	0.00428	0.00428	0.00428	0	0
MU	0	0	0.009483	0	0	0	0	0	0	0	0
UM	0.009483	0.009483	0	0.009483	0.009483	0.00428	0.00428	0.00428	0.00428	0.00428	0.018966

RIE Index Distance to Leader Results - 2000

	NetEnrlt +	PbExpEdn +	TSSM&E +	PupilTch -	PISAsci +	R&Dexp +	R&Drsrch +	HiTechXt +	Patents +	Sci&Tert +	NFBtert +
AUS	98.77	86.61	83.09	87.05	100.00	56.93	78.49	43.13	17.91	100.00	100.00
MEX	63.97	91.07	100.00	55.45	78.54	13.50	6.77	63.47	0.38	3.92	-42.47
USA	100.00	100.00	69.89	100.00	94.02	100.00	100.00	100.00	100.00	92.68	24.64
Weight	0.009483	0.009483	0.009483	0.009483	0.009483	0.00428	0.00428	0.00428	0.00428	0.00428	0.018966

RIE Index Condorcet Results - 2000

	HSkImm +	NtTyGn +	FstArea +	AgLand +	ArblLand +	IrrigLnd +	FertCons -	TractUse -	AgPdnInd +	FdPdnInd +	GDPEgUse -
Weight	0.018966	0.018966	0.0076	0.0076	0.0076	0.0076	0.0076	0.0076	0.0076	0.0076	0.020266
AUS	28.87	11.4	21.65	59.29	6.55	4.71	452.25	160.6	98.2	97.6	4.43
MEX	1.33	-1.7	35.25	56.22	12.99	23.08	738.71	84	98.7	98.8	5.89
USA	13.86	5.4	32.81	44.99	19.22	12.66	1,115.78	38.1	101.2	101.6	4.16
AM	0.018966	0.018966	0	0.0076	0	0	0.0076	0	0	0	0.020266
MA	0	0	0.0076	0	0.0076	0.0076	0	0.0076	0.0076	0.0076	0
AU	0.018966	0.018966	0	0.0076	0	0	0.0076	0	0	0	0
UA	0	0	0.0076	0	0.0076	0.0076	0	0.0076	0.0076	0.0076	0.020266
MU	0	0	0.0076	0.0076	0	0.0076	0.0076	0	0	0	0
UM	0.018966	0.018966	0	0	0.0076	0	0	0.0076	0.0076	0.0076	0.020266

RIE Index Distance to Leader Results - 2000

	HSkImm +	NtTyGn +	FstArea +	AgLand +	ArblLand +	IrrigLnd +	FertCons -	TractUse -	AgPdnInd +	FdPdnInd +	GDPEgUse -
AUS	100.00	100.00	61.42	100.00	34.08	20.41	100.00	23.72	97.04	96.06	93.91
MEX	4.61	-14.91	100.00	94.82	67.59	100.00	61.22	45.36	97.53	97.24	70.63
USA	48.01	47.37	93.08	75.88	100.00	54.85	40.53	100.00	100.00	100.00	100.00
Weight	0.018966	0.018966	0.0076	0.0076	0.0076	0.0076	0.0076	0.0076	0.0076	0.0076	0.020266

RIE Index Condorcet Results - 2000

	RbleEgSp +	ElecCons -	FWaterAv +	InGdWtAv +	WtrWdls -	OrgWtrPt -	FishCapt -	FishCons -	NBI +	ThtMamm -	ThtBird -
Weight	0.020266	0.020266	0.0152	0.0152	0.0152	0.0152	0.0304	0.0304	0.020266	0.020266	0.020266
AUS	6.0	10,054.61	21.93	3.76	4.9	4.98	0.18	20.85	0.85	22.4	5.31
MEX	10.6	1,802.04	3.25	1.42	19.1	3.02	1.05	9.21	0.93	14.15	5.31
USA	4.8	13,667.43	6.2	4.61	17.1	7.15	3.96	21.6	0.68	8.62	8.22
AM	0	0	0.0152	0.0152	0.0152	0	0.0304	0	0	0	0.010133
MA	0.020266	0.020266	0	0	0	0.0152	0	0.0304	0.020266	0.020266	0.010133
AU	0.020266	0.020266	0.0152	0	0.0152	0.0152	0.0304	0.0304	0.020266	0	0.020266
UA	0	0	0	0.0152	0	0	0	0	0	0.020266	0
MU	0.020266	0.020266	0	0	0	0.0152	0.0304	0.0304	0.020266	0	0.020266
UM	0	0	0.0152	0.0152	0.0152	0	0	0	0	0.020266	0

RIE Index Distance to Leader Results - 2000

	RbleEgSp +	ElecCons -	FWaterAv +	InGdWtAv +	WtrWdls -	OrgWtrPt -	FishCapt -	FishCons -	NBI +	ThtMamm -	ThtBird -
AUS	56.60	17.92	100.00	81.56	100.00	60.64	100.00	44.17	91.40	38.48	100.00
MEX	100.00	100.00	14.82	30.80	25.65	100.00	17.14	100.00	100.00	60.92	100.00
USA	45.28	13.18	28.27	100.00	28.65	42.24	4.55	42.64	73.12	100.00	64.60
Weight	0.020266	0.020266	0.0152	0.0152	0.0152	0.0152	0.0304	0.0304	0.020266	0.020266	0.020266

RIE Index Condorcet Results - 2000

	NtDmCdt +	DmCdtBnk +	FDINInf +	NetLnd +	MktCpt -	StksTd -	Real_IR -	RealXRte +	M&Teqp +	GFCF_Mch +
Weight	0.002675	0.002675	0.002675	0.002675	0.002675	0.002675	0.002675	0.002675	0.0107	0.0107
AUS	32,228	92.35	3.51	-669.30	96.2	58.4	4.01	100.00	23.95	7.9
MEX	17,164	38.3	2.94	-293.36	21.53	7.8	4.30	100.00	27.07	10.8
USA	29,012	188.75	3.29	-957.75	154.68	326.3	6.9	100.00	30.64	7.4
AM	0.002675	0.002675	0.002675	0	0	0	0.002675	0.0013375	0	0
MA	0	0	0	0.002675	0.002675	0.002675	0	0.0013375	0.0107	0.0107
AU	0.002675	0	0.002675	0.002675	0.002675	0.002675	0.002675	0.0013375	0	0.0107
UA	0	0.002675	0	0	0	0	0	0.0013375	0.0107	0
MU	0	0	0	0.002675	0.002675	0.002675	0.002675	0.0013375	0	0.0107
UM	0.002675	0.002675	0.002675	0	0	0	0	0.0013375	0.0107	0

RIE Index Distance to Leader Results - 2000

	NtDmCdt +	DmCdtBnk +	FDINInf +	NetLnd +	MktCpt -	StksTd -	Real_IR -	RealXRte +	M&Teqp +	GFCF_Mch +
AUS	100.00	48.93	100.00	43.83	22.38	13.36	100.00	100.00	78.17	73.15
MEX	53.26	20.29	83.76	100.00	100.00	100.00	93.26	100.00	88.35	100.00
USA	90.02	100.00	93.73	30.63	13.92	2.39	58.12	100.00	100.00	68.52
Weight	0.002675	0.002675	0.002675	0.002675	0.002675	0.002675	0.002675	0.002675	0.0107	0.0107

RIE Index Condorcet Results - 2000

	TphnMain +	PCs +	Radios +	Tvsets +	Newspap +	ICT_Exp +	AirTptFt +	Air_Pass +	ContPtTf +	RaRdGood +
Weight	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566
AUS	540.39	469.9	1879.6	736.2	160.96	6.24	1,730.70	1,700,914.00	219,182.80	1,182,530.00
MEX	125.88	58.18	331.88	283.2	93.51	3.03	309.9	213,280.00	15507.2	204233.08
USA	682.13	570.47	2078.7	835	196.3	8.47	30,166.00	2,350,395.00	106515.8	3,741,899.25
AM	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566
MA	0	0	0	0	0	0	0	0	0	0
AU	0	0	0	0	0	0	0	0	0.003566	0
UA	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0	0.003566
MU	0	0	0	0	0	0	0	0	0	0
UM	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566

RIE Index Distance to Leader Results - 2000

	TphnMain +	PCs +	Radios +	Tvsets +	Newspap +	ICT_Exp +	AirTptFt +	Air_Pass +	ContPtTf +	RaRdGood +
AUS	79.22	82.37	90.42	88.17	82.00	73.67	5.74	72.37	100.00	31.60
MEX	18.45	10.20	15.97	33.92	47.64	35.77	1.03	9.07	7.08	5.46
USA	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	48.60	100.00
Weight	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566

RIE Index Condorcet Results - 2000

	RailPass +	RdVhcl +	SulphOx -	NitOx -	CarbMon -	CbDioxEm -	CbDxTtEm -	EcoFPt -	FnConExp +	DefExp -
Weight	0.003566	0.003566	0.020266	0.020266	0.020266	0.0304	0.0304	0.020266	0.020266	0.020266
AUS	1,265.00	108.44	127	86	265	18.43	1.48	6.91	79.97	151.06
MEX	1711.53	50.34	11.67	12	52.17	3.80	1.59	2.51	79.17	99.95
USA	40855.52	26.76	52	72	329	20.60	24.38	9.6	82.47	3574.09
AM	0	0.003566	0	0	0	0	0.0304	0	0.020266	0
MA	0.003566	0	0.020266	0.020266	0.020266	0.0304	0	0.020266	0	0.020266
AU	0	0.003566	0	0	0.020266	0.0304	0.0304	0.020266	0	0.020266
UA	0.003566	0	0.020266	0.020266	0	0	0	0	0.020266	0
MU	0	0.003566	0.020266	0.020266	0.020266	0.0304	0.0304	0.020266	0	0.020266
UM	0.003566	0	0	0	0	0	0	0	0.020266	0

RIE Index Distance to Leader Results - 2000

	RailPass +	RdVhcl +	SulphOx -	NitOx -	CarbMon -	CbDioxEm -	CbDxTtEm -	EcoFPt -	FnConExp +	DefExp -
AUS	3.10	100.00	9.19	13.95	19.69	20.62	100.00	36.32	96.97	66.17
MEX	4.19	46.42	100.00	100.00	100.00	100.00	93.08	100.00	96.00	100.00
USA	100.00	24.68	22.44	16.67	15.86	18.45	6.07	26.15	100.00	2.80
Weight	0.003566	0.003566	0.020266	0.020266	0.020266	0.0304	0.0304	0.020266	0.020266	0.020266

RIE Index Condorcet Results - 2000

	RoadPvd +	GFCF +	AvNoOcc -	HseStck +	PopAcDg +	PopAcWtr +	PopAcSan +	GpMemb +	LifeSat +	HholdWk +
Weight	0.002	0.002	0.002	0.002	0.019633	0.019633	0.019633	0.004088	0.004088	0.004088
AUS	38.8	14.7	2.75	0.4	97.5	100	100	2.85	7.77	27.65
MEX	33	10.5	4.41	0.23	87	92.71	73	0.75	7.92	64.42
USA	59.14	12.5	2.63	0.43	97.5	100	100	2.43	7.39	25.24
AM	0.002	0.002	0.002	0.002	0.019633	0.019633	0.019633	0.004088	0	0
MA	0	0	0	0	0	0	0	0	0.004088	0.004088
AU	0	0.002	0	0	0.0098165	0.0098165	0.0098165	0.004088	0.004088	0.004088
UA	0.002	0	0.002	0.002	0.0098165	0.0098165	0.0098165	0	0	0
MU	0	0	0	0	0	0	0	0	0.004088	0.004088
UM	0.002	0.002	0.002	0.002	0.019633	0.019633	0.019633	0.004088	0	0

RIE Index Distance to Leader Results - 2000

	RoadPvd +	GFCF +	AvNoOcc -	HseStck +	PopAcDg +	PopAcWtr +	PopAcSan +	GpMemb +	LifeSat +	HholdWk +
AUS	65.61	100.00	95.64	93.02	100.00	100.00	100.00	100.00	98.11	42.92
MEX	55.80	71.43	59.64	53.49	89.23	92.71	73.00	26.32	100.00	100.00
USA	100.00	85.03	100.00	100.00	100.00	100.00	100.00	85.26	93.31	39.18
Weight	0.002	0.002	0.002	0.002	0.019633	0.019633	0.019633	0.004088	0.004088	0.004088

RIE Index Condorcet Results - 2000

	GNI_PPP +	GINI -	YthUnpt -	DivceRt -	P'sners -	ScideRte -	CptnInd +	LawIndex +	GovEfInd +	PolStInd +	V&Aind +
Weight	0.004088	0.004088	0.004088	0.004088	0.004088	0.004088	0.00122	0.00122	0.00122	0.00122	0.00122
AUS	24,706	0.303	11.8	44	93.4	12.5	2.01	1.9	1.9	1.34	1.61
MEX	8,815	0.485	4.4	7.4	92.9	3.5	-0.31	-0.38	0.04	-0.17	0.09
USA	34,548	0.368	9.3	48.95	468.5	10.8	1.81	1.69	1.82	1.3	1.37
AM	0.004088	0.004088	0	0	0	0	0.00122	0.00122	0.00122	0.00122	0.00122
MA	0	0	0.004088	0.004088	0.004088	0.004088	0	0	0	0	0
AU	0	0.004088	0	0.004088	0.004088	0	0.00122	0.00122	0.00122	0.00122	0.00122
UA	0.004088	0	0.004088	0	0	0.004088	0	0	0	0	0
MU	0	0	0.004088	0.004088	0.004088	0.004088	0	0	0	0	0
UM	0.004088	0.004088	0	0	0	0	0.00122	0.00122	0.00122	0.00122	0.00122

RIE Index Distance to Leader Results - 2000

	GNI_PPP +	GINI -	YthUnpt -	DivceRt -	P'sners -	ScideRte -	CptnInd +	LawIndex +	GovEfInd +	PolStInd +	V&Aind +
AUS	71.51	100.00	37.29	16.82	99.49	28.00	100.00	100.00	100.00	100.00	100.00
MEX	25.52	62.47	100.00	100.00	100.00	100.00	-15.42	-20.00	2.11	-12.69	5.59
USA	100.00	82.34	47.31	15.12	19.83	32.41	90.05	88.95	95.79	97.01	85.09
Weight	0.004088	0.004088	0.004088	0.004088	0.004088	0.004088	0.00122	0.00122	0.00122	0.00122	0.00122

RIE Index Condorcet Results - 2000

	EmpRate +	AdUnptRt -	LTUnpt -	O_WkHrs -	JoblessH -	RelPovRt -	RlPovEld -	
Weight	0.006214	0.006214	0.006214	0.006214	0.006214	0.006214	0.006214	
AUS	70.2	5.1	29.1	4	13.4	10.25	19.88	
MEX	63.6	1.5	1.1	14	3.56	20.99	30.56	
USA	73.3	3.1	6.0	3	4.89	16.91	22.61	
AM	0.006214	0	0	0.006214	0	0.006214	0.006214	**0.5438**
MA	0	0.006214	0.006214	0	0.006214	0	0	**0.4559**
AU	0	0	0	0	0	0.006214	0.006214	**0.6521**
UA	0.006214	0.006214	0.006214	0.006214	0.006214	0	0	**0.3476**
MU	0	0.006214	0.006214	0	0.006214	0	0	**0.5088**
UM	0.006214	0	0	0.006214	0	0.006214	0.006214	**0.4908**

RIE Index Distance to Leader Results - 2000

	EmpRate +	AdUnptRt -	LTUnpt -	O_WkHrs -	JoblessH -	RelPovRt -	RlPovEld -
AUS	95.77	29.41	3.75	75.00	26.59	100.00	100.00
MEX	86.77	100.00	100.00	21.43	100.00	48.83	65.05
USA	100.00	48.39	18.10	100.00	72.85	60.62	87.93
Weight	0.006214	0.006214	0.006214	0.006214	0.006214	0.006214	0.006214

RIE Index Condorcet Results - 2001

	Lexp +	InfMort -	HALE +	Phys +	PopnGwth +	FertRate +	Calories -	FatCons -	SugCons -	SchLexp +
Weight	0.014725	0.014725	0.014725	0.014725	0.0107	0.0107	0.019633	0.019633	0.019633	0.009483
AUS	79.7	5.3	72.3	2.5	1.35	1.73	3130	137.9	45.8	20.35
MEX	74.3	22.4	65.14	1.5	1.04	2.34	3179	87.9	48.5	11.98
USA	77.1	6.8	69.21	2.4	1.09	2.03	3785	157.6	71.1	15.73
AM	0.014725	0.014725	0.014725	0.014725	0.0107	0	0.019633	0	0.019633	0.009483
MA	0	0	0	0	0	0.0107	0	0.019633	0	0
AU	0.014725	0.014725	0.014725	0.014725	0.0107	0	0.019633	0.019633	0.019633	0.009483
UA	0	0	0	0	0	0.0107	0	0	0	0
MU	0	0	0	0	0	0.0107	0.019633	0.019633	0.019633	0
UM	0.014725	0.014725	0.014725	0.014725	0.0107	0	0	0	0	0.009483

E =

	AUS	MEX	USA
AUS	0	0.5282	0.6580
MEX	0.4714	0	0.5147
USA	0.3417	0.4850	0

AMU =	0.5282	0.6580	0.5147	**1.7009**
MUA =	0.5147	0.4714	0.3417	1.3278
UAM =	0.3417	0.4850	0.5282	1.3549
AUM =	0.6580	0.5282	0.4850	1.6712
MAU =	0.4714	0.5147	0.6580	1.6441
UMA =	0.4850	0.3417	0.4714	1.2981

The final Condorcet ranking for RIE index for 2001 is AMU.

RIE Index Distance to Leader Results - 2001

	Lexp +	InfMort -	HALE +	Phys +	PopnGwth +	FertRate +	Calories -	FatCons -	SugCons -	SchLexp +
AUS	100.00	100.00	100.00	100.00	100.00	73.93	100.00	63.74	100.00	100.00
MEX	93.22	23.66	90.06	60.00	77.04	100.00	98.46	100.00	94.43	58.87
USA	96.74	77.94	95.69	96.00	80.74	86.75	82.69	55.77	64.42	77.30
Weight	0.014725	0.014725	0.014725	0.014725	0.0107	0.0107	0.019633	0.019633	0.019633	0.009483

RIE_AUS	73.98
RIE_MEX	72.65
RIE_USA	61.81

The final DTL ranking for RIE index for 2001 is AMU.

RIE Index Condorcet Results - 2001

	NetEnrlt +	PbExpEdn +	TSSM&E +	PupilTch -	PISAsci +	R&Dexp +	R&Drsrch +	HiTechXt +	Patents +	Sci&Tert +	NFBtert +
Weight	0.009483	0.009483	0.009483	0.009483	0.009483	0.00428	0.00428	0.00428	0.00428	0.00428	0.018966
AUS	86.7	4.85	20.78	17.0	526.5	1.65	7.74	15.45	55.12	761.76	14.41
MEX	58.28	5.1	25.01	26.98	413.5	0.39	0.65	22	1.19	32.29	-6.12
USA	87.78	5.6	17.48	15.06	495	2.76	9.5	34.26	307.05	704.02	3.55
AM	0.009483	0	0	0.009483	0.009483	0.00428	0.00428	0	0.00428	0.00428	0.018966
MA	0	0.009483	0.009483	0	0	0	0	0.00428	0	0	0
AU	0	0	0.009483	0	0.009483	0	0	0	0	0.00428	0.018966
UA	0.009483	0.009483	0	0.009483	0	0.00428	0.00428	0.00428	0.00428	0	0
MU	0	0	0.009483	0	0	0	0	0	0	0	0
UM	0.009483	0.009483	0	0.009483	0.009483	0.00428	0.00428	0.00428	0.00428	0.00428	0.018966

RIE Index Distance to Leader Results - 2001

	NetEnrlt +	PbExpEdn +	TSSM&E +	PupilTch -	PISAsci +	R&Dexp +	R&Drsrch +	HiTechXt +	Patents +	Sci&Tert +	NFBtert +
AUS	98.77	86.61	83.09	88.59	100.00	59.78	81.47	45.10	17.95	100.00	100.00
MEX	66.39	91.07	100.00	55.82	78.54	14.13	6.84	64.21	0.39	4.24	-42.47
USA	100.00	100.00	69.89	100.00	94.02	100.00	100.00	100.00	100.00	92.42	24.64
Weight	0.009483	0.009483	0.009483	0.009483	0.009483	0.00428	0.00428	0.00428	0.00428	0.00428	0.018966

RIE Index Condorcet Results - 2001

	HSkImm +	NtTyGn +	FstArea +	AgLand +	ArblLand +	IrrigLnd +	FertCons -	TractUse -	AgPdnInd +	FdPdnInd +	GDPEgUse -
Weight	0.018966	0.018966	0.0076	0.0076	0.0076	0.0076	0.0076	0.0076	0.0076	0.0076	0.020266
AUS	28.87	11.54	21.65	59.32	6.61	4.82	469.34	162.2	100.6	101.4	4.67
MEX	1.33	-1.8	35.25	56.22	12.99	23.15	752.17	84	101.8	102	5.81
USA	13.86	5.58	32.81	44.81	19.04	12.73	1,124.68	37.4	98.6	98.1	4.29
AM	0.018966	0.018966	0	0.0076	0	0	0.0076	0	0	0	0.020266
MA	0	0	0.0076	0	0.0076	0.0076	0	0.0076	0.0076	0.0076	0
AU	0.018966	0.018966	0	0.0076	0	0	0.0076	0	0.0076	0.0076	0
UA	0	0	0.0076	0	0.0076	0.0076	0	0.0076	0	0	0.020266
MU	0	0	0.0076	0.0076	0	0.0076	0.0076	0	0.0076	0.0076	0
UM	0.018966	0.018966	0	0	0.0076	0	0	0.0076	0	0	0.020266

RIE Index Distance to Leader Results - 2001

	HSkImm +	NtTyGn +	FstArea +	AgLand +	ArblLand +	IrrigLnd +	FertCons -	TractUse -	AgPdnInd +	FdPdnInd +	GDPEgUse -
AUS	100.00	100.00	61.42	100.00	34.72	20.82	100.00	23.06	98.82	99.41	91.86
MEX	4.61	-15.60	100.00	94.77	68.22	100.00	62.40	44.52	100.00	100.00	73.84
USA	48.01	48.35	93.08	75.54	100.00	54.99	41.73	100.00	96.86	96.18	100.00
Weight	0.018966	0.018966	0.0076	0.0076	0.0076	0.0076	0.0076	0.0076	0.0076	0.0076	0.020266

RIE Index Condorcet Results - 2001

	RbleEgSp +	ElecCons -	FWaterAv +	InGdWtAv +	WtrWdls -	OrgWtrPt -	FishCapt -	FishCons -	NBI +	ThtMamm -
Weight	0.020266	0.020266	0.0152	0.0152	0.0152	0.0152	0.0304	0.0304	0.020266	0.020266
AUS	6.1	10,365.58	21.63	3.71	4.9	4.97	0.18	21.2	0.85	23.44
MEX	10.2	1,804.40	3.2	1.4	19.1	3.03	1.13	8.7	0.93	14.4
USA	4.3	13,029.89	6.14	4.56	17.1	6.26	4.16	21.6	0.68	8.74
AM	0	0	0.0152	0.0152	0.0152	0	0.0304	0	0	0
MA	0.020266	0.020266	0	0	0	0.0152	0	0.0304	0.020266	0.020266
AU	0.020266	0.020266	0.0152	0	0.0152	0.0152	0.0304	0.0304	0.020266	0
UA	0	0	0	0.0152	0	0	0	0	0	0.020266
MU	0.020266	0.020266	0	0	0	0.0152	0.0304	0.0304	0.020266	0
UM	0	0	0.0152	0.0152	0.0152	0	0	0	0	0.020266

RIE Index Distance to Leader Results - 2001

	RbleEgSp +	ElecCons -	FWaterAv +	InGdWtAv +	WtrWdls -	OrgWtrPt -	FishCapt -	FishCons -	NBI +	ThtMamm -
AUS	59.80	17.41	100.00	81.36	100.00	60.97	100.00	41.04	91.40	37.29
MEX	100.00	100.00	14.79	30.70	25.65	100.00	15.93	100.00	100.00	60.69
USA	42.16	13.85	28.39	100.00	28.65	48.40	4.33	40.28	73.12	100.00
Weight	0.020266	0.020266	0.0152	0.0152	0.0152	0.0152	0.0304	0.0304	0.020266	0.020266

RIE Index Condorcet Results - 2001

	ThtBird -	NtDmCdt +	DmCdtBnk +	FDINInf +	NetLnd +	MktCpt -	StksTd -	Real_IR -	RealXRte +	M&Teqp +
Weight	0.020266	0.002675	0.002675	0.002675	0.002675	0.002675	0.002675	0.002675	0.002675	0.0107
AUS	5.38	34,507	93.92	2.24	-715.22	101.69	65.24	5.79	96.13	24.39
MEX	5.26	16,710	37.81	4.45	-263.68	20.3	6.44	6.53	106.52	27.65
USA	8.34	30,709	193.42	1.66	-987.67	137.5	288.22	4.41	105.69	30.29
AM	0	0.002675	0.002675	0	0	0	0	0.002675	0	0
MA	0.020266	0	0	0.002675	0.002675	0.002675	0.002675	0	0.002675	0.0107
AU	0.020266	0.002675	0	0.002675	0.002675	0.002675	0.002675	0	0	0
UA	0	0	0.002675	0	0	0	0	0.002675	0.002675	0.0107
MU	0.020266	0	0	0.002675	0.002675	0.002675	0.002675	0	0.002675	0
UM	0	0.002675	0.002675	0	0	0	0	0.002675	0	0.0107

RIE Index Distance to Leader Results - 2001

	ThtBird -	NtDmCdt +	DmCdtBnk +	FDINInf +	NetLnd +	MktCpt -	StksTd -	Real_IR -	RealXRte +	M&Teqp +
AUS	97.77	100.00	48.56	50.34	36.87	19.96	9.87	76.17	90.25	80.52
MEX	100.00	48.42	19.55	100.00	100.00	100.00	100.00	67.53	100.00	91.28
USA	63.07	88.99	100.00	37.30	26.70	14.76	2.23	100.00	99.22	100.00
Weight	0.020266	0.002675	0.002675	0.002675	0.002675	0.002675	0.002675	0.002675	0.002675	0.0107

RIE Index Condorcet Results - 2001

	GFCF_Mch +	TphnMain +	PCs +	Radios +	Tvsets +	Newspap +	ICT_Exp +	AirTptFt +	Air_Pass +	ContPtTf +
Weight	0.0107	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566
AUS	7.8	540.1	515.12	1905.9	731.5	158.44	6.24	1,678.10	1,724,484.00	219,182.80
MEX	9.7	138.6	69.43	341.31	285.3	93.41	3.03	295.9	202,992.00	15507.2
USA	6.6	671.87	623.87	2083.22	869.9	194.86	8.7	27,920.00	2,172,446.00	106515.8
AM	0	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566
MA	0.0107	0	0	0	0	0	0	0	0	0
AU	0.0107	0	0	0	0	0	0	0	0	0.003566
UA	0	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0
MU	0.0107	0	0	0	0	0	0	0	0	0
UM	0	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566

RIE Index Distance to Leader Results - 2001

	GFCF_Mch +	TphnMain +	PCs +	Radios +	Tvsets +	Newspap +	ICT_Exp +	AirTptFt +	Air_Pass +	ContPtTf +
AUS	80.41	80.39	82.57	91.49	84.09	81.31	71.72	6.01	79.38	100.00
MEX	100.00	20.63	11.13	16.38	32.80	47.94	34.83	1.06	9.34	7.08
USA	68.04	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	48.60
Weight	0.0107	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566

RIE Index Condorcet Results - 2001

	RaRdGood +	RailPass +	RdVhcl +	SulphOx -	NitOx -	CarbMon -	CbDioxEm -	CbDxTtEm -	EcoFPt -	FnConExp +
Weight	0.003566	0.003566	0.003566	0.020266	0.020266	0.020266	0.0304	0.0304	0.020266	0.020266
AUS	1184792.72	1255.11	111.83	130	85	247	18.93	1.52	6.91	79.16
MEX	213144.36	1683.63	55.31	11.67	12	46.16	3.73	1.57	2.51	81.91
USA	3893862.6	41028.21	27.54	51	68	313	20.14	23.8	9.6	84.08
AM	0.003566	0	0.003566	0	0	0	0	0.0304	0	0
MA	0	0.003566	0	0.020266	0.020266	0.020266	0.0304	0	0.020266	0.020266
AU	0	0	0.003566	0	0	0.020266	0.0304	0.0304	0.020266	0
UA	0.003566	0.003566	0	0.020266	0.020266	0	0	0	0	0.020266
MU	0	0	0.003566	0.020266	0.020266	0.020266	0.0304	0.0304	0.020266	0
UM	0.003566	0.003566	0	0	0	0	0	0	0	0.020266

RIE Index Distance to Leader Results - 2001

	RaRdGood +	RailPass +	RdVhcl +	SulphOx -	NitOx -	CarbMon -	CbDioxEm -	CbDxTtEm -	EcoFPt -	FnConExp +
AUS	30.43	3.06	100.00	8.98	14.12	18.69	19.70	100.00	36.32	94.15
MEX	5.47	4.10	49.46	100.00	100.00	100.00	100.00	96.82	100.00	97.42
USA	100.00	100.00	24.63	22.88	17.65	14.75	18.52	6.39	26.15	100.00
Weight	0.003566	0.003566	0.003566	0.020266	0.020266	0.020266	0.0304	0.0304	0.020266	0.020266

RIE Index Condorcet Results - 2001

	DefExp -	RoadPvd +	GFCF +	AvNoOcc -	HseStck +	PopAcDg +	PopAcWtr +	PopAcSan +	GpMemb +	LifeSat +
Weight	0.020266	0.002	0.002	0.002	0.002	0.019633	0.019633	0.019633	0.004088	0.004088
AUS	144.17	38.8	14.7	2.75	0.4	97.5	100	100	2.85	8.0
MEX	112.94	33.2	10.3	4.38	0.23	87	93.79	74.5	0.75	7.93
USA	3760.26	59.14	12.6	2.56	0.44	97.5	100	100	2.43	7.38
AM	0	0.002	0.002	0.002	0.002	0.019633	0.019633	0.019633	0.004088	0.004088
MA	0.020266	0	0	0	0	0	0	0	0	0
AU	0.020266	0	0.002	0	0	0.0098165	0.0098165	0.0098165	0.004088	0.004088
UA	0	0.002	0	0.002	0.002	0.0098165	0.0098165	0.0098165	0	0
MU	0.020266	0	0	0	0	0	0	0	0	0.004088
UM	0	0.002	0.002	0.002	0.002	0.019633	0.019633	0.019633	0.004088	0

RIE Index Distance to Leader Results - 2001

	DefExp -	RoadPvd +	GFCF +	AvNoOcc -	HseStck +	PopAcDg +	PopAcWtr +	PopAcSan +	GpMemb +	LifeSat +
AUS	78.34	65.61	100.00	93.09	90.91	100.00	100.00	100.00	100.00	100.00
MEX	100.00	56.14	70.07	58.45	52.27	89.23	93.79	74.50	26.32	99.13
USA	3.00	100.00	85.71	100.00	100.00	100.00	100.00	100.00	85.26	92.25
Weight	0.020266	0.002	0.002	0.002	0.002	0.019633	0.019633	0.019633	0.004088	0.004088

RIE Index Condorcet Results - 2001

	HholdWk +	GNI_PPP +	GINI -	YthUnpt -	DivceRt -	P'sners -	ScideRte -	CptnInd +	LawIndex +	GovEfInd +	PolStInd +
Weight	0.004088	0.004088	0.004088	0.004088	0.004088	0.004088	0.004088	0.00122	0.00122	0.00122	0.00122
AUS	27.65	25,931	0.303	12.9	53.6	97.46	12.7	2.01	1.9	1.9	1.25
MEX	64.42	8,885	0.485	4.1	8.6	99.21	3.8	-0.31	-0.33	0.04	-0.17
USA	25.24	35,262	0.367	10.6	48.95	479.1	11	1.81	1.66	1.82	1.29
AM	0	0.004088	0.004088	0	0	0.004088	0	0.00122	0.00122	0.00122	0.00122
MA	0.004088	0	0	0.004088	0.004088	0	0.004088	0	0	0	0
AU	0.004088	0	0.004088	0	0	0.004088	0	0.00122	0.00122	0.00122	0
UA	0	0.004088	0	0.004088	0.004088	0	0.004088	0	0	0	0.00122
MU	0.004088	0	0	0.004088	0.004088	0.004088	0.004088	0	0	0	0
UM	0	0.004088	0.004088	0	0	0	0	0.00122	0.00122	0.00122	0.00122

RIE Index Distance to Leader Results - 2001

	HholdWk +	GNI_PPP +	GINI -	YthUnpt -	DivceRt -	P'sners -	ScideRte -	CptnInd +	LawIndex +	GovEfInd +	PolStInd +
AUS	42.92	73.54	100.00	31.78	16.04	100.00	29.92	100.00	100.00	100.00	96.90
MEX	100.00	25.20	62.47	100.00	100.00	98.24	100.00	-15.42	-17.37	2.11	-13.18
USA	39.18	100.00	82.56	38.68	17.57	20.34	34.55	90.05	87.37	95.79	100.00
Weight	0.004088	0.004088	0.004088	0.004088	0.004088	0.004088	0.004088	0.00122	0.00122	0.00122	0.00122

RIE Index Condorcet Results - 2001

	V&Aind +	EmpRate +	AdUnptRt -	LTUnpt -	O_WkHrs -	JoblessH -	RelPovRt -	RlPovEld -	
Weight	0.00122	0.006214	0.006214	0.006214	0.006214	0.006214	0.006214	0.006214	
AUS	1.54	70.0	5.3	21.2	-14	13.35	10.25	19.88	
MEX	0.17	62.9	1.6	1.1	-10	3.59	20.99	30.56	
USA	1.33	72.3	3.8	6.1	-19	4.88	16.91	22.61	
AM	0.00122	0.006214	0	0	0.006214	0	0.006214	0.006214	**0.5282**
MA	0	0	0.006214	0.006214	0	0.006214	0	0	**0.4714**
AU	0.00122	0	0	0	0	0	0.006214	0.006214	**0.6580**
UA	0	0.006214	0.006214	0.006214	0.006214	0.006214	0	0	**0.3417**
MU	0	0	0.006214	0.006214	0	0.006214	0	0	**0.5147**
UM	0.00122	0.006214	0	0	0.006214	0	0.006214	0.006214	**0.4850**

RIE Index Distance to Leader Results - 2001

	V&Aind +	EmpRate +	AdUnptRt -	LTUnpt -	O_WkHrs -	JoblessH -	RelPovRt -	RlPovEld -
AUS	100.00	96.82	30.19	5.03	135.71	26.89	100.00	100.00
MEX	11.04	87.00	100.00	100.00	190.00	100.00	48.83	65.05
USA	86.36	100.00	42.11	17.50	100.00	73.55	60.62	87.93
Weight	0.00122	0.006214	0.006214	0.006214	0.006214	0.006214	0.006214	0.006214

RIE Index Condorcet Results - 2002

	Lexp +	InfMort -	HALE +	Phys +	PopnGwth +	FertRate +	Calories -	FatCons -	SugCons -	SchLexp +
Weight	0.014725	0.014725	0.014725	0.014725	0.0107	0.0107	0.019633	0.019633	0.019633	0.009483
AUS	80	5.0	72.6	2.5	1.17	1.75	3090	131.3	46.1	20.35
MEX	74.6	21.4	65.4	1.5	1.01	2.27	3192	90.2	49.6	12.22
USA	77.2	7	69.3	2.3	1.06	2.01	3766	156.4	71.9	15.73
AM	0.014725	0.014725	0.014725	0.014725	0.0107	0	0.019633	0	0.019633	0.009483
MA	0	0	0	0	0	0.0107	0	0.019633	0	0
AU	0.014725	0.014725	0.014725	0.014725	0.0107	0	0.019633	0.019633	0.019633	0.009483
UA	0	0	0	0	0	0.0107	0	0	0	0
MU	0	0	0	0	0	0.0107	0.019633	0.019633	0.019633	0
UM	0.014725	0.014725	0.014725	0.014725	0.0107	0	0	0	0	0.009483

E =

	AUS	MEX	USA
AUS	0	0.5241	0.6502
MEX	0.4755	0	0.5174
USA	0.3494	0.4823	0

AMU =	0.5241	0.6502	0.5174	**1.6917**
MUA =	0.5174	0.4755	0.3494	1.3423
UAM =	0.3494	0.4823	0.5241	1.3559
AUM =	0.6502	0.5241	0.4823	1.6567
MAU =	0.4755	0.5174	0.6502	1.6431
UMA =	0.4823	0.3494	0.4755	1.3073

The final Condorcet ranking for RIE index for 2002 is AMU.

RIE Index Distance to Leader Results - 2002

	Lexp +	InfMort -	HALE +	Phys +	PopnGwth +	FertRate +	Calories -	FatCons -	SugCons -	SchLexp +
AUS	100.00	100.00	100.00	100.00	100.00	77.09	100.00	68.70	100.00	100.00
MEX	93.25	23.36	90.08	60.00	86.32	100.00	96.80	100.00	92.94	60.05
USA	96.50	71.43	95.45	92.00	90.60	88.55	82.05	57.67	64.12	77.30
Weight	0.014725	0.014725	0.014725	0.014725	0.0107	0.0107	0.019633	0.019633	0.019633	0.009483

RIE_AUS	74.04
RIE_MEX	70.45
RIE_USA	61.58

The final DTL ranking for RIE index for 2002 is AMU.

RIE Index Condorcet Results - 2002

	NetEnrlt +	PbExpEdn +	TSSM&E +	PupilTch -	PISAsci +	R&Dexp +	R&Drsrch +	HiTechXt +	Patents +	Sci&Tert +	NFBtert +
Weight	0.009483	0.009483	0.009483	0.009483	0.009483	0.00428	0.00428	0.00428	0.00428	0.00428	0.018966
AUS	86.7	4.85	20.78	16.9	526.5	1.69	7.8	16.45	49.9	756.02	14.41
MEX	60.16	5.1	25.01	26.87	413.5	0.41	0.67	21.38	1.37	34.51	-6.12
USA	87.78	5.6	17.48	15.06	495	2.65	9.6	33.46	301.61	697.5	3.55
AM	0.009483	0	0	0.009483	0.009483	0.00428	0.00428	0	0.00428	0.00428	0.018966
MA	0	0.009483	0.009483	0	0	0	0	0.00428	0	0	0
AU	0	0	0.009483	0	0.009483	0	0	0	0	0.00428	0.018966
UA	0.009483	0.009483	0	0.009483	0	0.00428	0.00428	0.00428	0.00428	0	0
MU	0	0	0.009483	0	0	0	0	0	0	0	0
UM	0.009483	0.009483	0	0.009483	0.009483	0.00428	0.00428	0.00428	0.00428	0.00428	0.018966

RIE Index Distance to Leader Results - 2002

	NetEnrlt +	PbExpEdn +	TSSM&E +	PupilTch -	PISAsci +	R&Dexp +	R&Drsrch +	HiTechXt +	Patents +	Sci&Tert +	NFBtert +
AUS	98.77	86.61	83.09	89.11	100.00	63.77	81.25	49.16	16.54	100.00	100.00
MEX	68.53	91.07	100.00	56.05	78.54	15.47	6.98	63.90	0.45	4.56	-42.47
USA	100.00	100.00	69.89	100.00	94.02	100.00	100.00	100.00	100.00	92.26	24.64
Weight	0.009483	0.009483	0.009483	0.009483	0.009483	0.00428	0.00428	0.00428	0.00428	0.00428	0.018966

RIE Index Condorcet Results - 2002

	HSkImm +	NtTyGn +	FstArea +	AgLand +	ArblLand +	IrrigLnd +	FertCons -	TractUse -	AgPdnInd +	FdPdnInd +	GDPEgUse -
Weight	0.018966	0.018966	0.0076	0.0076	0.0076	0.0076	0.0076	0.0076	0.0076	0.0076	0.020266
AUS	28.87	11.68	21.65	58.19	6.28	5.24	472.21	154.3	83.3	85.1	4.67
MEX	1.33	-1.9	35.25	56.22	12.99	23.15	690.28	84	98.9	99.6	5.69
USA	13.86	5.76	32.81	44.71	18.96	12.74	1,111.30	36.9	96.7	97	4.35
AM	0.018966	0.018966	0	0.0076	0	0	0.0076	0	0	0	0.020266
MA	0	0	0.0076	0	0.0076	0.0076	0	0.0076	0.0076	0.0076	0
AU	0.018966	0.018966	0	0.0076	0	0	0.0076	0	0	0	0
UA	0	0	0.0076	0	0.0076	0.0076	0	0.0076	0.0076	0.0076	0.020266
MU	0	0	0.0076	0.0076	0	0.0076	0.0076	0	0.0076	0.0076	0
UM	0.018966	0.018966	0	0	0.0076	0	0	0.0076	0	0	0.020266

RIE Index Distance to Leader Results - 2002

	HSkImm +	NtTyGn +	FstArea +	AgLand +	ArblLand +	IrrigLnd +	FertCons -	TractUse -	AgPdnInd +	FdPdnInd +	GDPEgUse -
AUS	100.00	100.00	61.42	100.00	33.12	22.63	100.00	23.91	84.23	85.44	93.15
MEX	4.61	-16.27	100.00	96.61	68.51	100.00	68.41	43.93	100.00	100.00	76.45
USA	48.01	49.32	93.08	76.83	100.00	55.03	42.49	100.00	97.78	97.39	100.00
Weight	0.018966	0.018966	0.0076	0.0076	0.0076	0.0076	0.0076	0.0076	0.0076	0.0076	0.020266

RIE Index Condorcet Results - 2002

	RbleEgSp +	ElecCons -	FWaterAv +	InGdWtAv +	WtrWdls -	OrgWtrPt -	FishCapt -	FishCons -	NBI +	ThtMamm -	ThtBird -
Weight	0.020266	0.020266	0.0152	0.0152	0.0152	0.0152	0.0304	0.0304	0.020266	0.020266	0.020266
AUS	6.1	10,772.97	21.38	3.67	4.9	4.99	0.17	21.28	0.85	24.23	5.39
MEX	9.6	1,825.34	3.16	1.38	19.1	3.04	1.2	8.16	0.93	14.66	5.18
USA	4.3	13,125.88	6.07	4.51	17.1	5.1	3.64	21.6	0.68	9.03	8.62
AM	0	0	0.0152	0.0152	0.0152	0	0.0304	0	0	0	0
MA	0.020266	0.020266	0	0	0	0.0152	0	0.0304	0.020266	0.020266	0.020266
AU	0.020266	0.020266	0.0152	0	0.0152	0.0152	0.0304	0.0304	0.020266	0	0.020266
UA	0	0	0	0.0152	0	0	0	0	0	0.020266	0
MU	0.020266	0.020266	0	0	0	0.0152	0.0304	0.0304	0.020266	0	0.020266
UM	0	0	0.0152	0.0152	0.0152	0	0	0	0	0.020266	0

RIE Index Distance to Leader Results - 2002

	RbleEgSp +	ElecCons -	FWaterAv +	InGdWtAv +	WtrWdls -	OrgWtrPt -	FishCapt -	FishCons -	NBI +	ThtMamm -	ThtBird -
AUS	63.54	16.94	100.00	81.37	100.00	60.92	100.00	38.35	91.40	37.27	96.10
MEX	100.00	100.00	14.78	30.60	25.65	100.00	14.17	100.00	100.00	61.60	100.00
USA	44.79	13.91	28.39	100.00	28.65	59.61	4.67	37.78	73.12	100.00	60.09
Weight	0.020266	0.020266	0.0152	0.0152	0.0152	0.0152	0.0304	0.0304	0.020266	0.020266	0.020266

RIE Index Condorcet Results - 2002

	NtDmCdt +	DmCdtBnk +	FDINInf +	NetLnd +	MktCpt -	StksTd -	Real_IR -	RealXRte +	M&Teqp +	GFCF_Mch +
Weight	0.002675	0.002675	0.002675	0.002675	0.002675	0.002675	0.002675	0.002675	0.0107	0.0107
AUS	38,970	100.96	4.29	-1,492.97	91.97	71.54	5.02	101.47	24.86	8.3
MEX	18,759	40.48	2.38	-193.84	15.89	4.27	1.16	106.74	28.17	8.9
USA	32,381	192.1	0.77	-1,521.31	106.36	243.14	2.97	105.80	29.76	5.8
AM	0.002675	0.002675	0.002675	0	0	0	0	0	0	0
MA	0	0	0	0.002675	0.002675	0.002675	0.002675	0.002675	0.0107	0.0107
AU	0.002675	0	0.002675	0.002675	0.002675	0.002675	0	0	0	0.0107
UA	0	0.002675	0	0	0	0	0.002675	0.002675	0.0107	0
MU	0	0	0.002675	0.002675	0.002675	0.002675	0.002675	0.002675	0	0.0107
UM	0.002675	0.002675	0	0	0	0	0	0	0.0107	0

RIE Index Distance to Leader Results - 2002

	NtDmCdt +	DmCdtBnk +	FDINInf +	NetLnd +	MktCpt -	StksTd -	Real_IR -	RealXRte +	M&Teqp +	GFCF_Mch +
AUS	100.00	52.56	100.00	12.98	17.28	5.97	23.11	95.06	83.53	93.26
MEX	48.14	21.07	55.48	100.00	100.00	100.00	100.00	100.00	94.66	100.00
USA	83.09	100.00	17.95	12.74	14.94	1.76	39.06	99.12	100.00	65.17
Weight	0.002675	0.002675	0.002675	0.002675	0.002675	0.002675	0.002675	0.002675	0.0107	0.0107

RIE Index Condorcet Results - 2002

	TphnMain +	PCs +	Radios +	Tvsets +	Newspap +	ICT_Exp +	AirTptFt +	Air_Pass +	ContPtTf +	RaRdGood +
Weight	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566
AUS	555.22	565.14	1960.2	728.1	156.12	6.24	1,544.70	1,986,742.00	219,182.80	1187289.03
MEX	148.54	82.85	350.74	284.1	92.65	3.03	341.6	194,594.00	15507.2	222055.64
USA	656.76	658.88	2078.88	882	192.36	8.55	31,761.90	2,075,155.00	106515.8	3962211.4
AM	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566
MA	0	0	0	0	0	0	0	0	0	0
AU	0	0	0	0	0	0	0	0	0.003566	0
UA	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0	0.003566
MU	0	0	0	0	0	0	0	0	0	0
UM	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566

RIE Index Distance to Leader Results - 2002

	TphnMain +	PCs +	Radios +	Tvsets +	Newspap +	ICT_Exp +	AirTptFt +	Air_Pass +	ContPtTf +	RaRdGood +
AUS	84.54	85.77	94.29	82.55	81.16	72.98	4.86	95.74	100.00	29.97
MEX	22.62	12.57	16.87	32.21	48.16	35.44	1.08	9.38	7.08	5.60
USA	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	48.60	100.00
Weight	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566

RIE Index Condorcet Results - 2002

	RailPass +	RdVhcl +	SulphOx -	NitOx -	CarbMon -	CbDioxEm -	CbDxTtEm -	EcoFPt -	FnConExp +	DefExp -
Weight	0.003566	0.003566	0.020266	0.020266	0.020266	0.0304	0.0304	0.020266	0.020266	0.020266
AUS	1292.88	114.95	143	86	249	19.15	1.53	6.91	79.42	136.72
MEX	1655.74	59.43	11.67	12	40.14	3.76	1.58	2.51	81.4	118.52
USA	41200.9	27.88	48	65	304	20.01	23.55	9.6	86.11	3963.5
AM	0	0.003566	0	0	0	0	0.0304	0	0	0
MA	0.003566	0	0.020266	0.020266	0.020266	0.0304	0	0.020266	0.020266	0.020266
AU	0	0.003566	0	0	0.020266	0.0304	0.0304	0.020266	0	0.020266
UA	0.003566	0	0.020266	0.020266	0	0	0	0	0.020266	0
MU	0	0.003566	0.020266	0.020266	0.020266	0.0304	0.0304	0.020266	0	0.020266
UM	0.003566	0	0	0	0	0	0	0	0.020266	0

RIE Index Distance to Leader Results - 2002

	RailPass +	RdVhcl +	SulphOx -	NitOx -	CarbMon -	CbDioxEm -	CbDxTtEm -	EcoFPt -	FnConExp +	DefExp -
AUS	3.14	100.00	8.16	13.95	16.12	19.63	100.00	36.32	92.23	86.69
MEX	4.02	51.70	100.00	100.00	100.00	100.00	96.84	100.00	94.53	100.00
USA	100.00	24.25	24.31	18.46	13.20	18.79	6.50	26.15	100.00	2.99
Weight	0.003566	0.003566	0.020266	0.020266	0.020266	0.0304	0.0304	0.020266	0.020266	0.020266

RIE Index Condorcet Results - 2002

	RoadPvd +	GFCF +	AvNoOcc -	HseStck +	PopAcDg +	PopAcWtr +	PopAcSan +	GpMemb +	LifeSat +	HholdWk +
Weight	0.002	0.002	0.002	0.002	0.019633	0.019633	0.019633	0.004088	0.004088	0.004088
AUS	38.8	14.7	2.74	0.4	97.5	100	100	2.85	7.9	27.65
MEX	33.5	10.3	4.36	0.24	87	94.86	76	0.75	8.01	64.42
USA	59.14	12.1	2.56	0.44	97.5	100	100	2.43	7.38	25.24
AM	0.002	0.002	0.002	0.002	0.019633	0.019633	0.019633	0.004088	0	0
MA	0	0	0	0	0	0	0	0	0.004088	0.004088
AU	0	0.002	0	0	0.0098165	0.0098165	0.0098165	0.004088	0.004088	0.004088
UA	0.002	0	0.002	0.002	0.0098165	0.0098165	0.0098165	0	0	0
MU	0	0	0	0	0	0	0	0	0.004088	0.004088
UM	0.002	0.002	0.002	0.002	0.019633	0.019633	0.019633	0.004088	0	0

RIE Index Distance to Leader Results - 2002

	RoadPvd +	GFCF +	AvNoOcc -	HseStck +	PopAcDg +	PopAcWtr +	PopAcSan +	GpMemb +	LifeSat +	HholdWk +
AUS	65.61	100.00	93.43	90.91	100.00	100.00	100.00	100.00	98.63	42.92
MEX	56.65	70.07	58.72	54.55	89.23	94.86	76.00	26.32	100.00	100.00
USA	100.00	82.31	100.00	100.00	100.00	100.00	100.00	85.26	92.13	39.18
Weight	0.002	0.002	0.002	0.002	0.019633	0.019633	0.019633	0.004088	0.004088	0.004088

RIE Index Condorcet Results - 2002

	GNI_PPP +	GINI -	YthUnpt -	DivceRt -	P'sners -	ScideRte -	CptnInd +	LawIndex +	GovEfInd +	PolStInd +	V&Aind +
Weight	0.004088	0.004088	0.004088	0.004088	0.004088	0.004088	0.00122	0.00122	0.00122	0.00122	0.00122
AUS	26,890	0.303	12.7	51.2	99.48	11.8	2.01	1.9	1.9	1.16	1.5
MEX	8,977	0.485	4.9	9.8	106.22	3.97	-0.31	-0.31	0.04	-0.17	0.36
USA	36,132	0.366	12	48.95	486.91	11.3	1.81	1.62	1.82	0.21	1.32
AM	0.004088	0.004088	0	0	0.004088	0	0.00122	0.00122	0.00122	0.00122	0.00122
MA	0	0	0.004088	0.004088	0	0.004088	0	0	0	0	0
AU	0	0.004088	0	0	0.004088	0	0.00122	0.00122	0.00122	0.00122	0.00122
UA	0.004088	0	0.004088	0.004088	0	0.004088	0	0	0	0	0
MU	0	0	0.004088	0.004088	0.004088	0.004088	0	0	0	0	0
UM	0.004088	0.004088	0	0	0	0	0.00122	0.00122	0.00122	0.00122	0.00122

RIE Index Distance to Leader Results - 2002

	GNI_PPP +	GINI -	YthUnpt -	DivceRt -	P'sners -	ScideRte -	CptnInd +	LawIndex +	GovEfInd +	PolStInd +	V&Aind +
AUS	74.42	100.00	38.58	19.14	100.00	33.64	100.00	100.00	100.00	100.00	100.00
MEX	24.85	62.47	100.00	100.00	93.65	100.00	-15.42	-16.32	2.11	-14.66	24.00
USA	100.00	82.79	40.83	20.02	20.43	35.13	90.05	85.26	95.79	18.10	88.00
Weight	0.004088	0.004088	0.004088	0.004088	0.004088	0.004088	0.00122	0.00122	0.00122	0.00122	0.00122

RIE Index Condorcet Results - 2002

	EmpRate +	AdUnptRt -	LTUnpt -	O_WkHrs -	JoblessH -	RelPovRt -	RlPovEld -	
Weight	0.006214	0.006214	0.006214	0.006214	0.006214	0.006214	0.006214	
AUS	70.4	5.1	22.1	-27	13.31	10.25	19.88	
MEX	63.0	1.8	0.9	14	3.62	20.99	30.56	
USA	71.2	4.8	8.5	-25	4.7	16.91	22.61	
AM	0.006214	0	0	0.006214	0	0.006214	0.006214	**0.5241**
MA	0	0.006214	0.006214	0	0.006214	0	0	**0.4755**
AU	0	0	0	0.006214	0	0.006214	0.006214	**0.6502**
UA	0.006214	0.006214	0.006214	0	0.006214	0	0	**0.3494**
MU	0	0.006214	0.006214	0	0.006214	0	0	**0.5174**
UM	0.006214	0	0	0.006214	0	0.006214	0.006214	**0.4823**

RIE Index Distance to Leader Results - 2002

	EmpRate +	AdUnptRt -	LTUnpt -	O_WkHrs -	JoblessH -	RelPovRt -	RlPovEld -
AUS	98.88	35.29	4.12	100.00	27.16	100.00	100.00
MEX	88.48	100.00	100.00	-192.86	100.00	48.83	65.05
USA	100.00	37.50	10.69	108.00	76.92	60.62	87.93
Weight	0.006214	0.006214	0.006214	0.006214	0.006214	0.006214	0.006214

RIE Index Condorcet Results - 2003

	Lexp +	InfMort -	HALE +	Phys +	PopnGwth +	FertRate +	Calories -	FatCons -	SugCons -	SchLexp +
Weight	0.014725	0.014725	0.014725	0.014725	0.0107	0.0107	0.019633	0.019633	0.019633	0.009483
AUS	80.3	4.8	72.9	2.6	1.17	1.77	3135	132.3	47.4	20.35
MEX	74.9	20.5	65.66	1.5	1.01	2.21	3171	89.1	48.5	12.49
USA	77.5	6.9	69.57	2.4	0.84	2.04	3754	155.3	70.7	15.73
AM	0.014725	0.014725	0.014725	0.014725	0.0107	0	0.019633	0	0.019633	0.009483
MA	0	0	0	0	0	0.0107	0	0.019633	0	0
AU	0.014725	0.014725	0.014725	0.014725	0.0107	0	0.019633	0.019633	0.019633	0.009483
UA	0	0	0	0	0	0.0107	0	0	0	0
MU	0	0	0	0	0.0107	0.0107	0.019633	0.019633	0.019633	0
UM	0.014725	0.014725	0.014725	0.014725	0	0	0	0	0	0.009483

E =

	AUS	MEX	USA
AUS	0	0.5241	0.6571
MEX	0.4755	0	0.5254
USA	0.3426	0.4743	0

AMU =	0.5241	0.6571	0.5254	**1.7066**
MUA =	0.5254	0.4755	0.3426	1.3435
UAM =	0.3426	0.4743	0.5241	1.3410
AUM =	0.6571	0.5241	0.4743	1.6555
MAU =	0.4755	0.5254	0.6571	1.6580
UMA =	0.4743	0.3426	0.4755	1.2924

The final Condorcet ranking for RIE index for 2003 is AMU.

RIE Index Distance to Leader Results - 2003

	Lexp +	InfMort -	HALE +	Phys +	PopnGwth +	FertRate +	Calories -	FatCons -	SugCons -	SchLexp +
AUS	100.00	100.00	100.00	100.00	100.00	80.09	100.00	67.35	100.00	100.00
MEX	93.28	23.41	90.11	57.69	86.32	100.00	98.86	100.00	97.73	61.38
USA	96.51	69.57	95.47	92.31	71.79	92.31	83.51	57.37	67.04	77.30
Weight	0.014725	0.014725	0.014725	0.014725	0.0107	0.0107	0.019633	0.019633	0.019633	0.009483

RIE_AUS	74.19
RIE_MEX	73.19
RIE_USA	61.73

The final DTL ranking for RIE index for 2003 is AMU.

RIE Index Condorcet Results - 2003

	NetEnrlt +	PbExpEdn +	TSSM&E +	PupilTch -	PISAsci +	R&Dexp +	R&Drsrch +	HiTechXt +	Patents +	Sci&Tert +	NFBtert +
Weight	0.009483	0.009483	0.009483	0.009483	0.009483	0.00428	0.00428	0.00428	0.00428	0.00428	0.018966
AUS	86.7	4.85	20.78	16.6	526.5	1.69	8.04	13.77	51.38	750.28	14.41
MEX	62.44	5.1	25.01	26.66	413.5	0.43	0.69	21.34	1.19	36.43	-6.12
USA	87.78	5.6	17.48	15.06	495	2.68	9.76	32.62	302.26	690.61	3.55
AM	0.009483	0	0	0.009483	0.009483	0.00428	0.00428	0	0.00428	0.00428	0.018966
MA	0	0.009483	0.009483	0	0	0	0	0.00428	0	0	0
AU	0	0	0.009483	0	0.009483	0	0	0	0	0.00428	0.018966
UA	0.009483	0.009483	0	0.009483	0	0.00428	0.00428	0.00428	0.00428	0	0
MU	0	0	0.009483	0	0	0	0	0	0	0	0
UM	0.009483	0.009483	0	0.009483	0.009483	0.00428	0.00428	0.00428	0.00428	0.00428	0.018966

RIE Index Distance to Leader Results - 2003

	NetEnrlt +	PbExpEdn +	TSSM&E +	PupilTch -	PISAsci +	R&Dexp +	R&Drsrch +	HiTechXt +	Patents +	Sci&Tert +	NFBtert +
AUS	98.77	86.61	83.09	90.72	100.00	63.06	82.38	42.21	17.00	100.00	100.00
MEX	71.13	91.07	100.00	56.49	78.54	16.04	7.07	65.42	0.39	4.86	-42.47
USA	100.00	100.00	69.89	100.00	94.02	100.00	100.00	100.00	100.00	92.05	24.64
Weight	0.009483	0.009483	0.009483	0.009483	0.009483	0.00428	0.00428	0.00428	0.00428	0.00428	0.018966

RIE Index Condorcet Results - 2003

	HSkImm +	NtTyGn +	FstArea +	AgLand +	ArblLand +	IrrigLnd +	FertCons -	TractUse -	AgPdnInd +	FdPdnInd +	GDPEgUse -
Weight	0.018966	0.018966	0.0076	0.0076	0.0076	0.0076	0.0076	0.0076	0.0076	0.0076	0.020266
AUS	28.87	11.82	21.65	57.21	6.2	5.31	475.08	152.2	92.8	96.5	4.81
MEX	1.33	-2	35.25	56.22	12.99	23.15	734.51	84	100.8	101.4	5.62
USA	13.86	5.94	32.81	44.69	18.94	12.75	1117.11	36.9	98.2	98.4	4.51
AM	0.018966	0.018966	0	0.0076	0	0	0.0076	0	0	0	0.020266
MA	0	0	0.0076	0	0.0076	0.0076	0	0.0076	0.0076	0.0076	0
AU	0.018966	0.018966	0	0.0076	0	0	0.0076	0	0	0	0
UA	0	0	0.0076	0	0.0076	0.0076	0	0.0076	0.0076	0.0076	0.020266
MU	0	0	0.0076	0.0076	0	0.0076	0.0076	0	0.0076	0.0076	0
UM	0.018966	0.018966	0	0	0.0076	0	0	0.0076	0	0	0.020266

RIE Index Distance to Leader Results - 2003

	HSkImm +	NtTyGn +	FstArea +	AgLand +	ArblLand +	IrrigLnd +	FertCons -	TractUse -	AgPdnInd +	FdPdnInd +	GDPEgUse -
AUS	100.00	100.00	61.42	100.00	32.73	22.94	100.00	24.24	92.06	95.17	93.76
MEX	4.61	-16.92	100.00	98.27	68.59	100.00	64.68	43.93	100.00	100.00	80.25
USA	48.01	50.25	93.08	78.12	100.00	55.08	42.53	100.00	97.42	97.04	100.00
Weight	0.018966	0.018966	0.0076	0.0076	0.0076	0.0076	0.0076	0.0076	0.0076	0.0076	0.020266

RIE Index Condorcet Results - 2003

	RbleEgSp +	ElecCons -	FWaterAv +	InGdWtAv +	WtrWdls -	OrgWtrPt -	FishCapt -	FishCons -	NBI +	ThtMamm -	ThtBird -
Weight	0.020266	0.020266	0.0152	0.0152	0.0152	0.0152	0.0304	0.0304	0.020266	0.020266	0.020266
AUS	5.8	10,713.38	21.13	3.62	4.9	5.03	0.17	21.49	0.85	24	5.67
MEX	9.6	1,801.47	3.11	1.36	19.1	3.03	1.27	7.81	0.93	14.95	5.48
USA	4.5	13,078.35	6.02	4.47	17.1	3.92	3.45	21.6	0.68	8.98	8.58
AM	0	0	0.0152	0.0152	0.0152	0	0.0304	0	0	0	0
MA	0.020266	0.020266	0	0	0	0.0152	0	0.0304	0.020266	0.020266	0.020266
AU	0.020266	0.020266	0.0152	0	0.0152	0	0.0304	0.0304	0.020266	0	0.020266
UA	0	0	0	0.0152	0	0.0152	0	0	0	0.020266	0
MU	0.020266	0.020266	0	0	0	0.0152	0.0304	0.0304	0.020266	0	0.020266
UM	0	0	0.0152	0.0152	0.0152	0	0	0	0	0.020266	0

RIE Index Distance to Leader Results - 2003

	RbleEgSp +	ElecCons -	FWaterAv +	InGdWtAv +	WtrWdls -	OrgWtrPt -	FishCapt -	FishCons -	NBI +	ThtMamm -	ThtBird -
AUS	60.42	16.82	100.00	80.98	100.00	60.24	100.00	36.34	91.40	37.42	96.65
MEX	100.00	100.00	14.72	30.43	25.65	100.00	13.39	100.00	100.00	60.07	100.00
USA	46.88	13.77	28.49	100.00	28.65	77.30	4.93	36.16	73.12	100.00	63.87
Weight	0.020266	0.020266	0.0152	0.0152	0.0152	0.0152	0.0304	0.0304	0.020266	0.020266	0.020266

RIE Index Condorcet Results - 2003

	NtDmCdt +	DmCdtBnk +	FDINInf +	NetLnd +	MktCpt -	StksTd -	Real_IR -	RealXRte +	M&Teqp +	GFCF_Mch +
Weight	0.002675	0.002675	0.002675	0.002675	0.002675	0.002675	0.002675	0.002675	0.0107	0.0107
AUS	42,373	103.55	1.87	-1,713.84	111.01	70.12	4.88	114.67	25.29	8.41
MEX	19,185	39.45	1.92	-125.55	19.17	3.68	-1.46	95.28	28.69	8.5
USA	33,800	207.29	0.61	-1,940.79	130.27	141.97	2.25	99.59	29.75	5.6
AM	0.002675	0.002675	0	0	0	0	0	0.002675	0	0
MA	0	0	0.002675	0.002675	0.002675	0.002675	0.002675	0	0.0107	0.0107
AU	0.002675	0	0.002675	0.002675	0.002675	0.002675	0	0.002675	0	0.0107
UA	0	0.002675	0	0	0	0	0.002675	0	0.0107	0
MU	0	0	0.002675	0.002675	0.002675	0.002675	0.002675	0	0	0.0107
UM	0.002675	0.002675	0	0	0	0	0	0.002675	0.0107	0

RIE Index Distance to Leader Results - 2003

	NtDmCdt +	DmCdtBnk +	FDINInf +	NetLnd +	MktCpt -	StksTd -	Real_IR -	RealXRte +	M&Teqp +	GFCF_Mch +
AUS	100.00	49.95	97.40	7.33	17.27	5.25	-29.92	100.00	85.01	98.94
MEX	45.28	19.03	100.00	100.00	100.00	100.00	100.00	83.09	96.44	100.00
USA	79.77	100.00	31.77	6.47	14.72	2.59	-64.89	86.85	100.00	65.88
Weight	0.002675	0.002675	0.002675	0.002675	0.002675	0.002675	0.002675	0.002675	0.0107	0.0107

RIE Index Condorcet Results - 2003

	TphnMain +	PCs +	Radios +	Tvsets +	Newspap +	ICT_Exp +	AirTptFt +	Air_Pass +	ContPtTf +	RaRdGood +
Weight	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566
AUS	551.75	603.83	1961.7	724.3	153.79	6.24	1,358.98	1,831,639.00	219,182.80	1,190,780.00
MEX	159.64	97.76	360.05	283	91.89	3.03	349.56	192,024.00	15507.2	230966.92
USA	629.42	687.73	2074.54	899.45	189.85	8.79	35,124.76	2,122,697.00	106515.8	4,030,560.20
AM	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566
MA	0	0	0	0	0	0	0	0	0	0
AU	0	0	0	0	0	0	0	0	0.003566	0
UA	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0	0.003566
MU	0	0	0	0	0	0	0	0	0	0
UM	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566

RIE Index Distance to Leader Results - 2003

	TphnMain +	PCs +	Radios +	Tvsets +	Newspap +	ICT_Exp +	AirTptFt +	Air_Pass +	ContPtTf +	RaRdGood +
AUS	87.66	87.80	94.56	80.53	81.01	70.99	3.87	86.29	100.00	29.54
MEX	25.36	14.21	17.36	31.46	48.40	34.47	1.00	9.05	7.08	5.73
USA	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	48.60	100.00
Weight	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566

RIE Index Condorcet Results - 2003

	RailPass +	RdVhcl +	SulphOx -	NitOx -	CarbMon -	CbDioxEm -	CbDxTtEm -	EcoFPt -	FnConExp +	DefExp -
Weight	0.003566	0.003566	0.020266	0.020266	0.020266	0.0304	0.0304	0.020266	0.020266	0.020266
AUS	1,340.00	118.13	149	87	243	18.84	1.45	6.91	79.04	129.41
MEX	1627.84	61.02	11.67	12	34.13	3.77	1.52	2.51	80.87	128.45
USA	41373.59	28.02	44.38	65.96	270.07	20.00	22.63	9.6	86.98	4169.57
AM	0	0.003566	0	0	0	0	0.0304	0	0	0
MA	0.003566	0	0.020266	0.020266	0.020266	0.0304	0	0.020266	0.020266	0.020266
AU	0	0.003566	0	0	0.020266	0.0304	0.0304	0.020266	0	0.020266
UA	0.003566	0	0.020266	0.020266	0	0	0	0	0.020266	0
MU	0	0.003566	0.020266	0.020266	0.020266	0.0304	0.0304	0.020266	0	0.020266
UM	0.003566	0	0	0	0	0	0	0	0.020266	0

RIE Index Distance to Leader Results - 2003

	RailPass +	RdVhcl +	SulphOx -	NitOx -	CarbMon -	CbDioxEm -	CbDxTtEm -	EcoFPt -	FnConExp +	DefExp -
AUS	3.24	100.00	7.83	13.79	14.05	20.01	100.00	36.32	90.87	99.26
MEX	3.93	51.65	100.00	100.00	100.00	100.00	95.39	100.00	92.98	100.00
USA	100.00	23.72	26.30	18.19	12.64	18.85	6.41	26.15	100.00	3.08
Weight	0.003566	0.003566	0.020266	0.020266	0.020266	0.0304	0.0304	0.020266	0.020266	0.020266

RIE Index Condorcet Results - 2003

	RoadPvd +	GFCF +	AvNoOcc -	HseStck +	PopAcDg +	PopAcWtr +	PopAcSan +	GpMemb +	LifeSat +	HholdWk +
Weight	0.002	0.002	0.002	0.002	0.019633	0.019633	0.019633	0.004088	0.004088	0.004088
AUS	38.8	14.7	2.71	0.41	97.5	100	100	2.85	8.0	27.65
MEX	33.5	10.4	4.34	0.24	87	95.93	77.5	0.75	8.09	64.42
USA	59.14	12.4	2.53	0.44	97.5	100	100	2.43	7.37	25.24
AM	0.002	0.002	0.002	0.002	0.019633	0.019633	0.019633	0.004088	0	0
MA	0	0	0	0	0	0	0	0	0.004088	0.004088
AU	0	0.002	0	0	0.0098165	0.0098165	0.0098165	0.004088	0.004088	0.004088
UA	0.002	0	0.002	0.002	0.0098165	0.0098165	0.0098165	0	0	0
MU	0	0	0	0	0	0	0	0	0.004088	0.004088
UM	0.002	0.002	0.002	0.002	0.019633	0.019633	0.019633	0.004088	0	0

RIE Index Distance to Leader Results - 2003

	RoadPvd +	GFCF +	AvNoOcc -	HseStck +	PopAcDg +	PopAcWtr +	PopAcSan +	GpMemb +	LifeSat +	HholdWk +
AUS	65.61	100.00	93.36	93.18	100.00	100.00	100.00	100.00	98.89	42.92
MEX	56.65	70.75	58.29	54.55	89.23	95.93	77.50	26.32	100.00	100.00
USA	100.00	84.35	100.00	100.00	100.00	100.00	100.00	85.26	91.10	39.18
Weight	0.002	0.002	0.002	0.002	0.019633	0.019633	0.019633	0.004088	0.004088	0.004088

RIE Index Condorcet Results - 2003

	GNI_PPP +	GINI -	YthUnpt -	DivceRt -	P'sners -	ScideRte -	CptnInd +	LawIndex +	GovEfInd +	PolStInd +	V&Aind +
Weight	0.004088	0.004088	0.004088	0.004088	0.004088	0.004088	0.00122	0.00122	0.00122	0.00122	0.00122
AUS	28,085	0.303	11.6	49.9	101.49	11.1	2.01	1.9	1.9	1.1	1.46
MEX	9,137	0.485	5.3	10.8	113.24	4.1	-0.31	-0.29	0.04	-0.17	0.34
USA	37,602	0.364	12.4	48.95	494.72	11.6	1.81	1.6	1.82	1.38	1.26
AM	0.004088	0.004088	0	0	0.004088	0	0.00122	0.00122	0.00122	0.00122	0.00122
MA	0	0	0.004088	0.004088	0	0.004088	0	0	0	0	0
AU	0	0.004088	0.004088	0	0.004088	0.004088	0.00122	0.00122	0.00122	0	0.00122
UA	0.004088	0	0	0.004088	0	0	0	0	0	0.00122	0
MU	0	0	0.004088	0.004088	0.004088	0.004088	0	0	0	0	0
UM	0.004088	0.004088	0	0	0	0	0.00122	0.00122	0.00122	0.00122	0.00122

RIE Index Distance to Leader Results - 2003

	GNI_PPP +	GINI -	YthUnpt -	DivceRt -	P'sners -	ScideRte -	CptnInd +	LawIndex +	GovEfInd +	PolStInd +	V&Aind +
AUS	74.69	100.00	45.69	21.64	100.00	36.94	100.00	100.00	100.00	79.71	100.00
MEX	24.30	62.47	100.00	100.00	89.62	100.00	-15.42	-15.26	2.11	-12.32	23.29
USA	100.00	83.24	42.74	22.06	20.51	35.34	90.05	84.21	95.79	100.00	86.30
Weight	0.004088	0.004088	0.004088	0.004088	0.004088	0.004088	0.00122	0.00122	0.00122	0.00122	0.00122

RIE Index Condorcet Results - 2003

	EmpRate +	AdUnptRt -	LTUnpt -	O_WkHrs -	JoblessH -	RelPovRt -	RlPovEld -	
Weight	0.006214	0.006214	0.006214	0.006214	0.006214	0.006214	0.006214	
AUS	71.0	4.8	22.5	-37	13.26	10.25	19.88	
MEX	62.5	1.9	1.0	-17	3.64	20.99	30.56	
USA	70.9	5	11.8	-33	4.51	16.91	22.61	
AM	0.006214	0	0	0.006214	0	0.006214	0.006214	**0.5241**
MA	0	0.006214	0.006214	0	0.006214	0	0	**0.4755**
AU	0.006214	0.006214	0	0.006214	0	0.006214	0.006214	**0.6571**
UA	0	0	0.006214	0	0.006214	0	0	**0.3426**
MU	0	0.006214	0.006214	0	0.006214	0	0	**0.5254**
UM	0.006214	0	0	0.006214	0	0.006214	0.006214	**0.4743**

RIE Index Distance to Leader Results - 2003

	EmpRate +	AdUnptRt -	LTUnpt -	O_WkHrs -	JoblessH -	RelPovRt -	RlPovEld -
AUS	100.00	39.58	4.56	100.00	27.45	100.00	100.00
MEX	88.03	100.00	100.00	217.65	100.00	48.83	65.05
USA	99.86	38.00	8.70	112.12	80.71	60.62	87.93
Weight	0.006214	0.006214	0.006214	0.006214	0.006214	0.006214	0.006214

RIE Index Condorcet Results - 2004

	Lexp +	InfMort -	HALE +	Phys +	PopnGwth +	FertRate +	Calories -	FatCons -	SugCons -	SchLexp +
Weight	0.014725	0.014725	0.014725	0.014725	0.0107	0.0107	0.019633	0.019633	0.019633	0.009483
AUS	80.5	4.7	73.1	2.7	1.19	1.75	3181	133.3	48.7	20.35
MEX	75.2	19.7	65.93	1.6	1.01	2.2	3150	88	47.4	12.59
USA	77.6	6.7	69.66	2.4	0.97	2.04	3742	154.2	69.5	15.73
AM	0.014725	0.014725	0.014725	0.014725	0.0107	0	0	0	0	0.009483
MA	0	0	0	0	0	0.0107	0.019633	0.019633	0.019633	0
AU	0.014725	0.014725	0.014725	0.014725	0.0107	0	0.019633	0.019633	0.019633	0.009483
UA	0	0	0	0	0	0.0107	0	0	0	0
MU	0	0	0	0	0.0107	0.0107	0.019633	0.019633	0.019633	0
UM	0.014725	0.014725	0.014725	0.014725	0	0	0	0	0	0.009483

E =

	AUS	MEX	USA
AUS	0	0.5236	0.6267
MEX	0.4761	0	0.5254
USA	0.3730	0.4743	0

AMU =	0.5236	0.6267	0.5254	**1.6757**
MUA =	0.5254	0.4761	0.3730	1.3745
UAM =	0.3730	0.4743	0.5236	1.3708
AUM =	0.6267	0.5236	0.4743	1.6245
MAU =	0.4761	0.5254	0.6267	1.6282
UMA =	0.4743	0.3730	0.4761	1.3234

The final Condorcet ranking for RIE index for 2004 is AMU.

RIE Index Distance to Leader Results - 2004

	Lexp +	InfMort -	HALE +	Phys +	PopnGwth +	FertRate +	Calories -	FatCons -	SugCons -	SchLexp +
AUS	100.00	100.00	100.00	100.00	100.00	79.55	99.03	66.02	97.33	100.00
MEX	93.42	23.86	90.25	59.26	84.87	100.00	100.00	100.00	100.00	61.87
USA	96.40	70.15	95.36	88.89	81.51	92.73	84.18	57.07	68.20	77.30
Weight	0.014725	0.014725	0.014725	0.014725	0.0107	0.0107	0.019633	0.019633	0.019633	0.009483

RIE_AUS	74.02
RIE_MEX	72.49
RIE_USA	62.17

The final DTL ranking for RIE index for 2004 is AMU.

RIE Index Condorcet Results - 2004

	NetEnrlt +	PbExpEdn +	TSSM&E +	PupilTch -	PISAsci +	R&Dexp +	R&Drsrch +	HiTechXt +	Patents +	Sci&Tert +	NFBtert +
Weight	0.009483	0.009483	0.009483	0.009483	0.009483	0.00428	0.00428	0.00428	0.00428	0.00428	0.018966
AUS	86.7	4.85	20.78	16.4	526.5	1.71	8.19	13.65	58.58	744.54	14.41
MEX	63.78	5.1	25.01	26.55	413.5	0.45	0.71	21.2	1.56	38.34	-6.12
USA	87.78	5.6	17.48	15.06	495	2.68	9.92	32.29	286.97	683.72	3.55
AM	0.009483	0	0	0.009483	0.009483	0.00428	0.00428	0	0.00428	0.00428	0.018966
MA	0	0.009483	0.009483	0	0	0	0	0.00428	0	0	0
AU	0	0	0.009483	0	0.009483	0	0	0	0	0.00428	0.018966
UA	0.009483	0.009483	0	0.009483	0	0.00428	0.00428	0.00428	0.00428	0	0
MU	0	0	0.009483	0	0	0	0	0	0	0	0
UM	0.009483	0.009483	0	0.009483	0.009483	0.00428	0.00428	0.00428	0.00428	0.00428	0.018966

RIE Index Distance to Leader Results - 2004

	NetEnrlt +	PbExpEdn +	TSSM&E +	PupilTch -	PISAsci +	R&Dexp +	R&Drsrch +	HiTechXt +	Patents +	Sci&Tert +	NFBtert +
AUS	98.77	86.61	83.09	91.83	100.00	63.81	82.56	42.27	20.41	100.00	100.00
MEX	72.66	91.07	100.00	56.72	78.54	16.79	7.16	65.66	0.54	5.15	-42.47
USA	100.00	100.00	69.89	100.00	94.02	100.00	100.00	100.00	100.00	91.83	24.64
Weight	0.009483	0.009483	0.009483	0.009483	0.009483	0.00428	0.00428	0.00428	0.00428	0.00428	0.018966

RIE Index Condorcet Results - 2004

	HSkImm +	NtTyGn +	FstArea +	AgLand +	ArblLand +	IrrigLnd +	FertCons -	TractUse -	AgPdnInd +	FdPdnInd +	GDPEgUse -
Weight	0.018966	0.018966	0.0076	0.0076	0.0076	0.0076	0.0076	0.0076	0.0076	0.0076	0.020266
AUS	28.87	11.96	21.65	56.25	6.12	5.38	477.95	150.1	87.9	89.2	4.95
MEX	1.33	-2.1	35.25	56.22	12.99	23.15	741.68	84	103.3	103.7	5.55
USA	13.86	6.12	32.81	44.67	18.92	12.76	1117.55	36.9	103.1	102.4	4.68
AM	0.018966	0.018966	0	0.0076	0	0	0.0076	0	0	0	0.020266
MA	0	0	0.0076	0	0.0076	0.0076	0	0.0076	0.0076	0.0076	0
AU	0.018966	0.018966	0	0.0076	0	0	0.0076	0	0	0	0
UA	0	0	0.0076	0	0.0076	0.0076	0	0.0076	0.0076	0.0076	0.020266
MU	0	0	0.0076	0.0076	0	0.0076	0.0076	0	0.0076	0.0076	0
UM	0.018966	0.018966	0	0	0.0076	0	0	0.0076	0	0	0.020266

RIE Index Distance to Leader Results - 2004

	HSkImm +	NtTyGn +	FstArea +	AgLand +	ArblLand +	IrrigLnd +	FertCons -	TractUse -	AgPdnInd +	FdPdnInd +	GDPEgUse -
AUS	100.00	100.00	61.42	100.00	32.35	23.24	100.00	24.58	85.09	86.02	94.55
MEX	4.61	-17.56	100.00	99.95	68.66	100.00	64.44	43.93	100.00	100.00	84.32
USA	48.01	51.17	93.08	79.41	100.00	55.12	42.77	100.00	99.81	98.75	100.00
Weight	0.018966	0.018966	0.0076	0.0076	0.0076	0.0076	0.0076	0.0076	0.0076	0.0076	0.020266

RIE Index Condorcet Results - 2004

	RbleEgSp +	ElecCons -	FWaterAv +	InGdWtAv +	WtrWdls -	OrgWtrPt -	FishCapt -	FishCons -	NBI +	ThtMamm -	ThtBird -
Weight	0.020266	0.020266	0.0152	0.0152	0.0152	0.0152	0.0304	0.0304	0.020266	0.020266	0.020266
AUS	5.4	10,654.12	20.88	3.58	4.9	5.05	0.16	21.7	0.85	24.27	5.88
MEX	9.9	1,777.91	3.07	1.34	19.1	3.03	1.34	7.46	0.93	15.22	5.65
USA	4.5	13,030.99	5.96	4.43	17.1	3.74	3.26	21.6	0.68	8.97	8.59
AM	0	0	0.0152	0.0152	0.0152	0	0.0304	0	0	0	0
MA	0.020266	0.020266	0	0	0	0.0152	0	0.0304	0.020266	0.020266	0.020266
AU	0.020266	0.020266	0.0152	0	0.0152	0	0.0304	0	0.020266	0	0.020266
UA	0	0	0	0.0152	0	0.0152	0	0.0304	0	0.020266	0
MU	0.020266	0.020266	0	0	0	0.0152	0.0304	0.0304	0.020266	0	0.020266
UM	0	0	0.0152	0.0152	0.0152	0	0	0	0	0.020266	0

RIE Index Distance to Leader Results - 2004

	RbleEgSp +	ElecCons -	FWaterAv +	InGdWtAv +	WtrWdls -	OrgWtrPt -	FishCapt -	FishCons -	NBI +	ThtMamm -	ThtBird -
AUS	54.55	16.69	100.00	80.81	100.00	60.00	100.00	34.38	91.40	36.96	96.09
MEX	100.00	100.00	14.70	30.25	25.65	100.00	11.94	100.00	100.00	58.94	100.00
USA	45.45	13.64	28.54	100.00	28.65	81.02	4.91	34.54	73.12	100.00	65.77
Weight	0.020266	0.020266	0.0152	0.0152	0.0152	0.0152	0.0304	0.0304	0.020266	0.020266	0.020266

RIE Index Condorcet Results - 2004

	NtDmCdt +	DmCdtBnk +	FDINInf +	NetLnd +	MktCpt -	StksTd -	Real_IR -	RealXRte +	M&Teqp +	GFCF_Mch +
Weight	0.002675	0.002675	0.002675	0.002675	0.002675	0.002675	0.002675	0.002675	0.0107	0.0107
AUS	47,004	108.97	6.66	-2,038.74	121.82	80.69	5.21	124.04	25.71	8.48
MEX	20,291	38.44	2.57	-110.59	25.42	6.33	-0.21	91.50	29.22	8.1
USA	35,769	215.48	0.91	-2,444.70	139.38	165.26	1.66	95.37	29.74	6
AM	0.002675	0.002675	0.002675	0	0	0	0	0.002675	0	0.0107
MA	0	0	0	0.002675	0.002675	0.002675	0.002675	0	0.0107	0
AU	0.002675	0	0.002675	0.002675	0.002675	0.002675	0	0.002675	0	0.0107
UA	0	0.002675	0	0	0	0	0.002675	0	0.0107	0
MU	0	0	0.002675	0.002675	0.002675	0.002675	0.002675	0	0	0.0107
UM	0.002675	0.002675	0	0	0	0	0	0.002675	0.0107	0

RIE Index Distance to Leader Results - 2004

	NtDmCdt +	DmCdtBnk +	FDINInf +	NetLnd +	MktCpt -	StksTd -	Real_IR -	RealXRte +	M&Teqp +	GFCF_Mch +
AUS	100.00	50.57	100.00	5.42	20.87	7.84	-4.03	100.00	86.45	100.00
MEX	43.17	17.84	38.59	100.00	100.00	100.00	100.00	73.77	98.25	95.52
USA	76.10	100.00	13.66	4.52	18.24	3.83	-12.65	76.89	100.00	70.75
Weight	0.002675	0.002675	0.002675	0.002675	0.002675	0.002675	0.002675	0.002675	0.0107	0.0107

RIE Index Condorcet Results - 2004

	TphnMain +	PCs +	Radios +	Tvsets +	Newspap +	ICT_Exp +	AirTptFt +	Air_Pass +	ContPtTf +	RaRdGood +
Weight	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566
AUS	540.6	682.21	1963.2	720.5	151.47	6.24	1,898.07	2,070,304.00	219,182.80	1,189,794.00
MEX	174.12	108	369.48	276.4	91.13	3.03	402.6	204,629.00	15507.2	239878.2
USA	605.97	749.18	2070.2	917.04	187.35	9.01	37,450.12	2,309,205.00	106515.8	4098909
AM	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566
MA	0	0	0	0	0	0	0	0	0	0
AU	0	0	0	0	0	0	0	0	0.003566	0
UA	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0	0.003566
MU	0	0	0	0	0	0	0	0	0	0
UM	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566

RIE Index Distance to Leader Results - 2004

	TphnMain +	PCs +	Radios +	Tvsets +	Newspap +	ICT_Exp +	AirTptFt +	Air_Pass +	ContPtTf +	RaRdGood +
AUS	89.21	91.06	94.83	78.57	80.85	69.26	5.07	89.65	100.00	29.03
MEX	28.73	14.42	17.85	30.14	48.64	33.63	1.08	8.86	7.08	5.85
USA	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	48.60	100.00
Weight	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566	0.003566

RIE Index Condorcet Results - 2004

	RailPass +	RdVhcl +	SulphOx -	NitOx -	CarbMon -	CbDioxEm -	CbDxTtEm -	EcoFPt -	FnConExp +	DefExp -
Weight	0.003566	0.003566	0.020266	0.020266	0.020266	0.0304	0.0304	0.020266	0.020266	0.020266
AUS	1,347.00	121.32	157	88	237	19.39	1.43	6.91	79.53	122.1
MEX	1599.95	63.98	11.67	12	28.11	3.67	1.43	2.51	79.23	138.37
USA	41546.29	28.35	41.38	63.85	251.7	20.18	21.86	9.6	87.2	4375.64
AM	0	0.003566	0	0	0	0	0.0152	0	0.020266	0.020266
MA	0.003566	0	0.020266	0.020266	0.020266	0.0304	0.0152	0.020266	0	0
AU	0	0.003566	0	0	0.020266	0.0304	0.0304	0.020266	0	0.020266
UA	0.003566	0	0.020266	0.020266	0	0	0	0	0.020266	0
MU	0	0.003566	0.020266	0.020266	0.020266	0.0304	0.0304	0.020266	0	0.020266
UM	0.003566	0	0	0	0	0	0	0	0.020266	0

RIE Index Distance to Leader Results - 2004

	RailPass +	RdVhcl +	SulphOx -	NitOx -	CarbMon -	CbDioxEm -	CbDxTtEm -	EcoFPt -	FnConExp +	DefExp -
AUS	3.24	100.00	7.43	13.64	11.86	18.93	100.00	36.32	91.20	100.00
MEX	3.85	52.74	100.00	100.00	100.00	100.00	100.00	100.00	90.86	88.24
USA	100.00	23.37	28.20	18.79	11.17	18.19	6.54	26.15	100.00	2.79
Weight	0.003566	0.003566	0.020266	0.020266	0.020266	0.0304	0.0304	0.020266	0.020266	0.020266

RIE Index Condorcet Results - 2004

	RoadPvd +	GFCF +	AvNoOcc -	HseStck +	PopAcDg +	PopAcWtr +	PopAcSan +	GpMemb +	LifeSat +	HholdWk +
Weight	0.002	0.002	0.002	0.002	0.019633	0.019633	0.019633	0.004088	0.004088	0.004088
AUS	38.9	14.7	2.7	0.41	97.5	100	100	2.85	8.14	27.65
MEX	33.5	10.5	4.31	0.24	87	97	79	0.75	8.16	64.42
USA	59.14	12.7	2.54	0.45	97.5	100	100	2.43	7.37	25.24
AM	0.002	0.002	0.002	0.002	0.019633	0.019633	0.019633	0.004088	0	0
MA	0	0	0	0	0	0	0	0	0.004088	0.004088
AU	0	0.002	0	0	0.0098165	0.0098165	0.0098165	0.004088	0.004088	0.004088
UA	0.002	0	0.002	0.002	0.0098165	0.0098165	0.0098165	0	0	0
MU	0	0	0	0	0	0	0	0	0.004088	0.004088
UM	0.002	0.002	0.002	0.002	0.019633	0.019633	0.019633	0.004088	0	0

RIE Index Distance to Leader Results - 2004

	RoadPvd +	GFCF +	AvNoOcc -	HseStck +	PopAcDg +	PopAcWtr +	PopAcSan +	GpMemb +	LifeSat +	HholdWk +
AUS	65.78	100.00	94.07	91.11	100.00	100.00	100.00	100.00	99.75	42.92
MEX	56.65	71.43	58.93	53.33	89.23	97.00	79.00	26.32	100.00	100.00
USA	100.00	86.39	100.00	100.00	100.00	100.00	100.00	85.26	90.32	39.18
Weight	0.002	0.002	0.002	0.002	0.019633	0.019633	0.019633	0.004088	0.004088	0.004088

RIE Index Condorcet Results - 2004

	GNI_PPP +	GINI -	YthUnpt -	DivceRt -	P'sners -	ScideRte -	CptnInd +	LawIndex +	GovEfInd +	PolStInd +	V&Aind +
Weight	0.004088	0.004088	0.004088	0.004088	0.004088	0.004088	0.00122	0.00122	0.00122	0.00122	0.00122
AUS	29,339	0.303	11.7	52.7	103.5	10.4	2.01	1.9	1.9	1.03	1.4
MEX	9,645	0.485	6.4	11.88	120.26	4.24	-0.31	-0.26	0.04	-0.17	0.36
USA	39,824	0.363	11.8	48.95	502.53	11.9	1.81	1.58	1.82	1.42	1.21
AM	0.004088	0.004088	0	0	0.004088	0	0.00122	0.00122	0.00122	0.00122	0.00122
MA	0	0	0.004088	0.004088	0	0.004088	0	0	0	0	0
AU	0	0.004088	0.004088	0	0.004088	0.004088	0.00122	0.00122	0.00122	0	0.00122
UA	0.004088	0	0	0.004088	0	0	0	0	0	0.00122	0
MU	0	0	0.004088	0.004088	0.004088	0.004088	0	0	0	0	0
UM	0.004088	0.004088	0	0	0	0	0.00122	0.00122	0.00122	0.00122	0.00122

RIE Index Distance to Leader Results - 2004

	GNI_PPP +	GINI -	YthUnpt -	DivceRt -	P'sners -	ScideRte -	CptnInd +	LawIndex +	GovEfInd +	PolStInd +	V&Aind +
AUS	73.67	100.00	54.70	22.54	100.00	40.77	100.00	100.00	100.00	72.54	100.00
MEX	24.22	62.47	100.00	100.00	86.06	100.00	-15.42	-13.68	2.11	-11.97	25.71
USA	100.00	83.47	54.24	24.27	20.60	35.63	90.05	83.16	95.79	100.00	86.43
Weight	0.004088	0.004088	0.004088	0.004088	0.004088	0.004088	0.00122	0.00122	0.00122	0.00122	0.00122

RIE Index Condorcet Results - 2004

	EmpRate +	AdUnptRt -	LTUnpt -	O_WkHrs -	JoblessH -	RelPovRt -	RlPovEld -	
Weight	0.006214	0.006214	0.006214	0.006214	0.006214	0.006214	0.006214	
AUS	71.6	4.2	20.7	-35	13.21	10.25	19.88	
MEX	63.6	2.3	1.1	-26	3.67	20.99	30.56	
USA	70.9	4.6	12.7	-31	4.33	16.91	22.61	
AM	0.006214	0	0	0.006214	0	0.006214	0.006214	**0.5236**
MA	0	0.006214	0.006214	0	0.006214	0	0	**0.4761**
AU	0.006214	0.006214	0	0.006214	0	0.006214	0.006214	**0.6267**
UA	0	0	0.006214	0	0.006214	0	0	**0.3730**
MU	0	0.006214	0.006214	0	0.006214	0	0	**0.5254**
UM	0.006214	0	0	0.006214	0	0.006214	0.006214	**0.4743**

RIE Index Distance to Leader Results - 2004

	EmpRate +	AdUnptRt -	LTUnpt -	O_WkHrs -	JoblessH -	RelPovRt -	RlPovEld -
AUS	100.00	54.76	5.31	100.00	27.78	100.00	100.00
MEX	88.83	100.00	100.00	134.62	100.00	48.83	65.05
USA	99.02	50.00	8.67	112.90	84.76	60.62	87.93
Weight	0.006214	0.006214	0.006214	0.006214	0.006214	0.006214	0.006214

VOLUME 2
Appendix E: RIE Index Weighted Results

RIE Index
Weighted Results
- Australia

Year	LexpA	InfMortA	HALEA	PhysA	Weighted Health Contribution	PopnGwtA	FertRatA	Weighted Population Contribution	CalorieA	FatConsA	SugConsA	Weighted Food Consumption Contribution
1990	0.838	0.609	0.849	0.726	**0.044**	-0.053	-0.685	**-0.008**	0.067	-0.533	0.785	**0.006**
1991	0.973	0.678	0.943	0.881	**0.051**	-0.605	-0.750	**-0.014**	0.463	-0.401	1.029	**0.021**
1992	1.006	0.684	0.967	1.037	**0.054**	-0.789	-0.698	**-0.016**	0.844	-0.248	0.678	**0.025**
1993	1.174	0.741	1.087	1.037	**0.059**	-1.393	-0.737	**-0.023**	0.970	-0.328	1.442	**0.041**
1994	1.174	0.753	1.087	1.037	**0.060**	0.394	-0.764	**-0.004**	0.940	-0.292	1.671	**0.046**
1995	1.140	0.766	1.061	1.192	**0.061**	-2.235	-0.803	**-0.033**	0.649	-0.325	1.121	**0.028**
1996	1.241	0.760	1.134	1.037	**0.061**	-0.499	-0.829	**-0.014**	0.714	-0.395	1.579	**0.037**
1997	1.342	0.791	1.205	1.037	**0.064**	-0.999	-0.868	**-0.020**	0.739	-0.322	0.999	**0.028**
1998	1.409	0.810	1.252	1.037	**0.066**	-1.236	-0.881	**-0.023**	1.095	-0.316	1.136	**0.038**
1999	1.509	0.766	1.323	1.037	**0.068**	-0.946	-0.894	**-0.020**	1.045	-0.430	1.778	**0.047**
2000	1.610	0.797	1.393	1.192	**0.074**	-0.815	-0.894	**-0.018**	0.990	-0.553	1.595	**0.040**
2001	1.744	0.791	1.490	1.192	**0.077**	-0.394	-0.921	**-0.014**	0.684	-0.612	1.503	**0.031**
2002	1.845	0.810	1.561	1.192	**0.080**	-0.868	-0.894	**-0.019**	0.885	-0.418	1.457	**0.038**
2003	1.945	0.823	1.631	1.348	**0.085**	-0.868	-0.868	**-0.019**	0.659	-0.448	1.258	**0.029**
2004	2.012	0.829	1.679	1.504	**0.089**	-0.815	-0.894	**-0.018**	0.428	-0.477	1.060	**0.020**

Note: The 'A' at the end of the variable code refers to Australia.

RIE Index
Weighted Results
- Australia

Year	SchLexpA	NetEnrlA	PbExpEdA	TSSM&EA	PupilTcA	PISAsciA	**Weighted Education & Training Contribution**	R&DexpA	R&DrsrcA	HiTechXA	PatentsA
1990	0.957	0.558	-0.873	-0.082	0.238	0.826	**0.015**	-0.048	0.254	-0.441	-0.233
1991	0.957	0.558	-0.873	-0.082	0.269	0.826	**0.016**	0.064	0.451	-0.373	-0.283
1992	0.957	0.558	-0.873	-0.082	0.299	0.826	**0.016**	0.120	0.574	-0.330	-0.330
1993	0.957	0.558	-0.873	-0.082	0.330	0.826	**0.016**	0.096	0.531	-0.255	-0.307
1994	0.957	0.558	-0.873	-0.082	0.360	0.826	**0.017**	0.176	0.654	-0.145	-0.267
1995	0.957	0.558	-0.873	-0.082	0.404	0.826	**0.017**	0.128	0.611	-0.166	-0.379
1996	0.957	0.558	-0.873	-0.082	0.418	0.826	**0.017**	0.240	0.734	-0.170	-0.410
1997	0.957	0.558	-0.873	-0.082	0.447	0.826	**0.017**	0.160	0.691	-0.213	-0.428
1998	0.957	0.558	-0.873	-0.082	0.447	0.826	**0.017**	0.112	0.734	-0.221	-0.229
1999	0.957	0.558	-0.873	-0.082	0.534	0.826	**0.018**	0.192	0.771	-0.209	-0.328
2000	0.957	0.558	-0.873	-0.082	0.534	0.826	**0.018**	0.152	0.734	-0.199	-0.318
2001	0.957	0.558	-0.873	-0.082	0.578	0.826	**0.019**	0.224	0.851	-0.182	-0.306
2002	0.957	0.558	-0.873	-0.082	0.592	0.826	**0.019**	0.256	0.867	-0.110	-0.360
2003	0.957	0.558	-0.873	-0.082	0.636	0.826	**0.019**	0.256	0.931	-0.305	-0.345
2004	0.957	0.558	-0.873	-0.082	0.665	0.826	**0.019**	0.272	0.971	-0.314	-0.270

RIE Index
Weighted Results
- Australia

Year	Sci&TArA	Weighted Knowledge Renewal Contribution	NFBtertA	HSkImmA	NtTyGnA	Weighted Net Brain Gain Contribution	Human Resource Theme Contribution	FstAreaA	AgLandA
1990	0.391	**0.000**	1.019	1.029	1.059	**0.059**	**0.117**	-1.138	0.968
1991	0.382	**0.001**	1.019	1.029	1.085	**0.059**	**0.134**	-1.138	0.941
1992	0.465	**0.002**	1.019	1.029	1.111	**0.060**	**0.142**	-1.138	1.000
1993	0.516	**0.002**	1.019	1.029	1.137	**0.060**	**0.157**	-1.138	0.890
1994	0.605	**0.004**	1.019	1.029	1.163	**0.061**	**0.183**	-1.138	1.055
1995	0.679	**0.004**	1.019	1.029	1.189	**0.061**	**0.139**	-1.138	0.947
1996	0.727	**0.005**	1.019	1.029	1.215	**0.062**	**0.168**	-1.138	0.983
1997	0.711	**0.004**	1.019	1.029	1.241	**0.062**	**0.156**	-1.138	0.925
1998	0.793	**0.005**	1.019	1.029	1.267	**0.063**	**0.167**	-1.138	0.955
1999	0.833	**0.005**	1.019	1.029	1.293	**0.063**	**0.183**	-1.138	0.766
2000	0.746	**0.005**	1.019	1.029	1.319	**0.064**	**0.182**	-1.138	0.799
2001	0.732	**0.006**	1.019	1.029	1.345	**0.064**	**0.182**	-1.138	0.804
2002	0.717	**0.006**	1.019	1.029	1.371	**0.065**	**0.188**	-1.138	0.641
2003	0.703	**0.005**	1.019	1.029	1.397	**0.065**	**0.185**	-1.138	0.499
2004	0.689	**0.006**	1.019	1.029	1.423	**0.066**	**0.181**	-1.138	0.361

RIE Index
Weighted Results
- Australia

Year	ArblLanA	IrrigLnA	FertConA	TractUsA	AgPdnInA	FdPdnInA	Weighted Land & Agricultural Use Contribution	GDPEgUsA	RbleEgSA	ElecConA	Weighted Energy Production Use Contribution
1990	-0.966	-0.936	1.017	-1.054	-1.142	-1.131	**-0.033**	0.351	-0.448	-0.245	**-0.007**
1991	-1.007	-0.871	0.916	-0.938	-1.736	-1.589	**-0.041**	0.311	-0.385	-0.248	**-0.007**
1992	-0.980	-0.873	0.865	-1.031	-1.300	-0.808	**-0.032**	0.244	-0.573	-0.257	**-0.012**
1993	-0.996	-0.855	0.796	-0.981	-0.805	-0.350	**-0.026**	0.324	-0.417	-0.284	**-0.008**
1994	-0.892	-0.845	0.780	-1.300	-2.488	-1.562	**-0.049**	0.071	-0.448	-0.295	**-0.014**
1995	-0.998	-0.783	0.590	-0.972	-1.003	-0.377	**-0.028**	-0.089	-0.417	-0.338	**-0.017**
1996	-0.890	-0.850	0.635	-1.307	0.937	0.956	**-0.005**	0.098	-0.354	-0.360	**-0.012**
1997	-0.929	-0.832	0.504	-1.192	0.561	0.579	**-0.012**	-0.049	-0.292	-0.396	**-0.015**
1998	-0.862	-0.870	0.549	-1.395	1.432	1.252	**-0.001**	-0.249	-0.385	-0.489	**-0.023**
1999	-0.966	-0.840	0.363	-1.079	2.323	1.939	**0.010**	-0.249	-0.448	-0.521	**-0.025**
2000	-0.922	-0.835	0.464	-1.214	1.749	1.467	**0.003**	-0.235	-0.448	-0.544	**-0.025**
2001	-0.913	-0.823	0.419	-1.243	2.224	1.979	**0.010**	-0.555	-0.417	-0.602	**-0.032**
2002	-0.960	-0.776	0.412	-1.101	-1.201	-0.215	**-0.033**	-0.555	-0.417	-0.679	**-0.033**
2003	-0.971	-0.768	0.404	-1.063	0.680	1.319	**-0.008**	-0.742	-0.510	-0.668	**-0.039**
2004	-0.983	-0.760	0.397	-1.025	-0.290	0.337	**-0.024**	-0.928	-0.635	-0.657	**-0.045**

RIE Index
Weighted Results
- Australia

Year	FWaterAA	InGdWtAA	WtrWdlA	OrgWtPtA	Weighted Water Contribution	FishCapA	FishConA	Weighted Fisheries Contribution	NBI_A	ThtMammA	ThtBirdA
1990	1.143	0.285	1.145	-0.636	**0.029**	0.761	-0.260	**0.015**	0.235	-1.102	0.633
1991	1.115	0.257	1.145	-0.555	**0.030**	0.755	-0.271	**0.015**	0.235	-1.144	0.554
1992	1.089	0.230	1.145	-0.431	**0.031**	0.751	-0.316	**0.013**	0.235	-1.186	0.475
1993	1.069	0.208	1.145	0.435	**0.043**	0.755	-0.362	**0.012**	0.235	-1.227	0.396
1994	1.034	0.170	1.145	0.437	**0.042**	0.768	-0.407	**0.011**	0.235	-1.269	0.312
1995	1.021	0.153	1.145	0.445	**0.042**	0.768	-0.390	**0.011**	0.235	-1.311	0.233
1996	0.994	0.126	1.145	0.482	**0.042**	0.771	-0.500	**0.008**	0.235	-1.391	0.154
1997	0.971	0.044	1.145	0.577	**0.042**	0.774	-0.546	**0.007**	0.235	-1.394	0.075
1998	0.950	0.082	1.145	0.573	**0.042**	0.768	-0.591	**0.005**	0.235	-1.435	-0.009
1999	0.927	0.055	1.145	0.569	**0.041**	0.768	-0.637	**0.004**	0.235	-1.478	-0.088
2000	0.904	0.033	1.145	0.569	**0.040**	0.774	-0.682	**0.003**	0.235	-1.405	-0.207
2001	0.877	0.005	1.145	0.571	**0.039**	0.774	-0.758	**0.000**	0.235	-1.561	-0.246
2002	0.854	-0.016	1.145	0.567	**0.039**	0.778	-0.775	**0.000**	0.235	-1.680	-0.252
2003	0.832	-0.044	1.145	0.559	**0.038**	0.778	-0.821	**-0.001**	0.235	-1.646	-0.409
2004	0.810	-0.066	1.145	0.555	**0.037**	0.781	-0.866	**-0.003**	0.235	-1.686	-0.528

RIE Index
Weighted Results
- Australia

Year	Weighted Biodiversity Contribution	Natural Resource Theme Contribution	NtDmCdtA	DmCdtBnA	FDINInfA	NetLndA	MktCptA	StksTdA	Real_IRA	RealXRtA
1990	**-0.005**	**0.000**	0.471	-0.133	1.152	-0.725	-0.075	0.234	-0.823	1.133
1991	**-0.007**	**-0.010**	0.508	-0.117	-0.115	-0.029	-0.661	0.092	-0.336	1.031
1992	**-0.010**	**-0.010**	0.639	-0.072	0.351	-0.552	-0.627	0.104	0.249	0.557
1993	**-0.012**	**0.010**	0.740	-0.059	-0.054	-0.752	-1.664	-0.480	0.492	0.219
1994	**-0.015**	**-0.023**	0.901	-0.012	-0.024	-2.756	-1.476	-0.879	0.591	0.421
1995	**-0.017**	**-0.009**	1.118	0.047	1.791	-1.502	-1.590	-0.802	0.543	0.349
1996	**-0.020**	**0.012**	1.364	0.139	0.027	-0.781	-2.057	-1.459	0.396	0.746
1997	**-0.022**	**0.000**	1.483	0.127	0.372	-1.683	-1.849	-1.926	0.751	0.701
1998	**-0.025**	**-0.001**	1.797	0.235	0.139	-3.378	-2.709	-2.090	0.606	0.307
1999	**-0.027**	**0.004**	2.069	0.304	-0.662	-3.113	-3.568	-2.456	1.101	0.329
2000	**-0.028**	**-0.007**	2.347	0.338	2.064	-0.793	-3.071	-3.223	1.572	0.134
2001	**-0.032**	**-0.014**	2.621	0.373	0.777	-0.972	-3.340	-3.743	1.142	-0.021
2002	**-0.034**	**-0.062**	3.159	0.532	2.855	-4.006	-2.864	-4.221	1.328	0.193
2003	**-0.037**	**-0.047**	3.569	0.590	0.402	-4.867	-3.797	-4.113	1.362	0.720
2004	**-0.040**	**-0.074**	4.127	0.712	5.257	-6.134	-4.328	-4.917	1.282	1.095

RIE Index
Weighted Results
- Australia

Year	Weighted Financial Contribution	M&TeqpA	GFCF_McA	Weighted Machinery Contribution	Generated Resource Theme Contribution	Resources Area Contribution	TphnMaiA	PCsA	RadiosA	TVsetsA
1990	**0.003**	-0.900	-0.132	**-0.011**	**-0.008**	**0.109**	0.395	0.232	0.051	0.124
1991	**0.001**	-1.050	-0.450	**-0.016**	**-0.015**	**0.109**	0.431	0.332	0.058	0.194
1992	**0.002**	-0.852	-0.132	**-0.011**	**-0.009**	**0.123**	0.456	0.553	0.064	0.262
1993	**-0.004**	-0.772	0.026	**-0.008**	**-0.012**	**0.154**	0.501	0.773	0.074	0.357
1994	**-0.009**	-0.693	0.742	**0.001**	**-0.008**	**0.151**	0.538	1.066	0.076	0.444
1995	**0.000**	-0.615	0.662	**0.001**	**0.000**	**0.131**	0.536	1.411	0.077	0.683
1996	**-0.004**	-0.535	0.503	**0.000**	**-0.005**	**0.176**	0.569	1.542	0.157	0.688
1997	**-0.005**	-0.456	0.662	**0.002**	**-0.003**	**0.153**	0.616	1.916	0.308	0.689
1998	**-0.014**	-0.376	0.424	**0.001**	**-0.013**	**0.153**	0.604	2.285	0.412	0.708
1999	**-0.016**	-0.297	0.503	**0.002**	**-0.014**	**0.172**	0.627	2.791	0.562	0.716
2000	**-0.002**	-0.219	0.265	**0.000**	**-0.001**	**0.174**	0.723	3.233	0.707	0.806
2001	**-0.008**	-0.140	0.185	**0.000**	**-0.008**	**0.160**	0.722	3.657	0.735	0.791
2002	**-0.008**	-0.055	0.583	**0.006**	**-0.002**	**0.124**	0.781	4.126	0.793	0.780
2003	**-0.016**	0.023	0.670	**0.007**	**-0.009**	**0.129**	0.768	4.489	0.795	0.768
2004	**-0.008**	0.099	0.726	**0.009**	**0.001**	**0.108**	0.724	5.224	0.797	0.756

RIE Index
Weighted Results
- Australia

Year	NewspapA	ICT_ExpA	Weighted ICT Theme Contribution	AirTpFtA	Air_PasA	ConPtTfA	RaRdGdA	RailPasA	RdVhclA	Weighted Transport Theme Contribution
1990	0.237	0.322	**0.005**	-0.510	0.009	1.033	-0.193	-0.680	1.147	**0.003**
1991	0.199	0.322	**0.005**	-0.483	0.289	1.033	-0.191	-0.678	1.103	**0.004**
1992	0.162	0.322	**0.006**	-0.467	0.408	1.033	-0.189	-0.676	1.225	**0.005**
1993	0.124	0.322	**0.008**	-0.448	0.597	1.033	-0.187	-0.675	1.078	**0.005**
1994	0.086	0.322	**0.009**	-0.434	0.575	1.033	-0.186	-0.673	1.128	**0.005**
1995	0.048	0.322	**0.011**	-0.424	0.681	1.033	-0.184	-0.671	1.125	**0.006**
1996	0.011	0.322	**0.012**	-0.412	0.736	1.033	-0.182	-0.669	1.093	**0.006**
1997	-0.027	0.322	**0.014**	-0.398	0.771	1.033	-0.179	-0.668	0.963	**0.005**
1998	-0.062	0.322	**0.015**	-0.404	0.702	1.033	-0.179	-0.666	1.047	**0.005**
1999	-0.109	0.322	**0.018**	-0.429	0.767	1.033	-0.177	-0.665	0.992	**0.005**
2000	-0.137	0.322	**0.020**	-0.424	0.806	1.033	-0.175	-0.660	1.054	**0.006**
2001	-0.178	0.322	**0.022**	-0.430	0.833	1.033	-0.174	-0.660	1.124	**0.006**
2002	-0.216	0.322	**0.023**	-0.446	1.144	1.033	-0.172	-0.659	1.189	**0.007**
2003	-0.253	0.322	**0.025**	-0.467	0.960	1.033	-0.170	-0.656	1.255	**0.007**
2004	-0.291	0.322	**0.027**	-0.405	1.243	1.033	-0.171	-0.656	1.322	**0.008**

RIE Index
Weighted Results
- Australia

Year	Infrastructure Area Contribution	SulphOxA	NitOxA	CarbMonA	Weighted Air Quality Contribution	CbDxEmA	CbDxTEmA	Weighted Greenhouse Gas Emissions Contribution	EcoFPtA	FnCnExpA
1990	**0.008**	-0.704	-0.470	-0.065	**-0.025**	-0.286	0.584	**0.009**	-0.159	-0.338
1991	**0.009**	-0.726	-0.424	0.032	**-0.023**	-0.266	0.583	**0.010**	-0.159	0.585
1992	**0.011**	-0.835	-0.401	0.081	**-0.023**	-0.328	0.579	**0.008**	-0.159	-0.024
1993	**0.013**	-0.879	-0.401	0.105	**-0.024**	-0.339	0.578	**0.007**	-0.159	0.987
1994	**0.014**	-0.923	-0.424	0.134	**-0.025**	-0.304	0.579	**0.008**	-0.159	-0.240
1995	**0.017**	-0.770	-0.401	0.153	**-0.021**	-0.319	0.579	**0.008**	-0.159	-0.338
1996	**0.017**	-0.813	-0.447	0.183	**-0.022**	-0.378	0.577	**0.006**	-0.159	-0.740
1997	**0.019**	-0.770	-0.540	0.183	**-0.023**	-0.541	0.568	**0.001**	-0.159	-0.732
1998	**0.021**	-0.748	-0.586	0.192	**-0.023**	-0.558	0.566	**0.000**	-0.159	-0.473
1999	**0.023**	-0.835	-0.563	0.231	**-0.024**	-0.644	0.562	**-0.002**	-0.159	-0.772
2000	**0.026**	-1.383	-0.563	0.279	**-0.034**	-0.637	0.564	**-0.002**	-0.159	-0.546
2001	**0.028**	-1.449	-0.540	0.367	**-0.033**	-0.696	0.561	**-0.004**	-0.159	-0.842
2002	**0.031**	-1.734	-0.563	0.357	**-0.039**	-0.721	0.560	**-0.005**	-0.159	-0.747
2003	**0.032**	-1.866	-0.586	0.386	**-0.042**	-0.685	0.567	**-0.004**	-0.159	-0.886
2004	**0.035**	-2.041	-0.609	0.415	**-0.045**	-0.750	0.568	**-0.006**	-0.159	-0.707

RIE Index
Weighted Results
- Australia

Year	DefExpA	Weighted Conspicuous Consumption Contribution	RoadPvdA	GFCF_A	AvNoOccA	HseStckA	Weighted Built Environment Contribution	PopAcDgA	PopAcWtA	PopAcSnA
1990	0.561	**0.001**	-0.581	1.083	0.473	0.369	**0.003**	0.577	0.577	0.577
1991	0.553	**0.020**	-0.531	1.083	0.488	0.448	**0.003**	0.577	0.577	0.577
1992	0.544	**0.007**	-0.480	1.083	0.503	0.448	**0.003**	0.577	0.577	0.577
1993	0.538	**0.028**	-0.430	1.083	0.533	0.448	**0.003**	0.577	0.577	0.577
1994	0.525	**0.003**	-0.372	1.083	0.556	0.448	**0.003**	0.577	0.577	0.577
1995	0.521	**0.000**	-0.322	1.083	0.563	0.448	**0.004**	0.577	0.577	0.577
1996	0.509	**-0.008**	-0.315	1.083	0.556	0.448	**0.004**	0.577	0.577	0.577
1997	0.505	**-0.008**	-0.315	1.083	0.571	0.448	**0.004**	0.577	0.577	0.577
1998	0.500	**-0.003**	-0.315	1.083	0.586	0.448	**0.004**	0.577	0.577	0.577
1999	0.506	**-0.009**	-0.315	1.083	0.593	0.527	**0.004**	0.577	0.577	0.577
2000	0.512	**-0.004**	-0.308	1.083	0.608	0.527	**0.004**	0.577	0.577	0.577
2001	0.518	**-0.010**	-0.308	1.083	0.608	0.527	**0.004**	0.577	0.577	0.577
2002	0.524	**-0.008**	-0.308	1.083	0.616	0.527	**0.004**	0.577	0.577	0.577
2003	0.531	**-0.010**	-0.308	1.083	0.638	0.606	**0.004**	0.577	0.577	0.577
2004	0.537	**-0.007**	-0.301	1.083	0.646	0.606	**0.004**	0.577	0.577	0.577

RIE Index
Weighted Results
- Australia

Year	Weighted Access to Essential Services Contribution	Physical Environment Theme Contribution	GpMembA	LifeSatA	HholdWkA	GNI_PPPA	GINI_A	YthUnptA	DivceRtA	P'snersA
1990	**0.034**	**0.022**	0.756	-0.972	-0.522	0.112	0.754	-0.806	-0.259	0.495
1991	**0.034**	**0.044**	0.756	-0.677	-0.522	0.157	0.754	-1.769	-0.442	0.485
1992	**0.034**	**0.029**	0.756	-0.349	-0.522	0.249	0.754	-2.361	-0.486	0.475
1993	**0.034**	**0.048**	0.756	-0.055	-0.522	0.354	0.754	-2.139	-0.531	0.464
1994	**0.034**	**0.024**	0.756	0.240	-0.522	0.453	0.754	-1.547	-0.586	0.454
1995	**0.034**	**0.025**	0.756	0.469	-0.522	0.579	0.754	-1.103	-0.679	0.443
1996	**0.034**	**0.014**	0.756	0.862	-0.522	0.681	0.754	-1.201	-0.871	0.436
1997	**0.034**	**0.008**	0.756	1.157	-0.522	0.803	0.754	-1.473	-0.805	0.423
1998	**0.034**	**0.012**	0.756	1.485	-0.522	0.941	0.754	-1.028	-0.731	0.414
1999	**0.034**	**0.003**	0.756	1.779	-0.522	1.050	0.754	-0.757	-0.707	0.386
2000	**0.034**	**-0.002**	0.756	2.074	-0.522	1.136	0.754	-0.461	-0.614	0.402
2001	**0.034**	**-0.009**	0.756	2.827	-0.522	1.279	0.754	-0.732	-1.062	0.380
2002	**0.034**	**-0.014**	0.756	2.500	-0.522	1.391	0.754	-0.683	-0.950	0.370
2003	**0.034**	**-0.018**	0.756	2.827	-0.522	1.531	0.754	-0.411	-0.889	0.360
2004	**0.034**	**-0.019**	0.756	3.286	-0.522	1.678	0.754	-0.436	-1.020	0.349

RIE Index
Weighted Results
- Australia

Year	ScdeRteA	**Weighted Social Connectedness Contribution**	CptnIndA	LawIndxA	GovEfIdA	PolStIdA	V&AindA	**Weighted Institutional Quality Contribution**	EmpRateA	AdUptRtA	LTUnptA
1990	-0.619	**-0.004**	0.653	0.550	0.615	0.726	0.660	**0.004**	0.421	-0.726	-1.135
1991	-0.669	**-0.008**	0.653	0.550	0.615	0.773	0.634	**0.004**	0.223	-2.095	-1.447
1992	-0.619	**-0.009**	0.653	0.550	0.615	0.819	0.608	**0.004**	0.129	-2.717	-2.349
1993	-0.385	**-0.005**	0.653	0.550	0.615	0.866	0.582	**0.004**	0.112	-2.903	-2.536
1994	-0.602	**-0.002**	0.653	0.550	0.615	0.913	0.556	**0.004**	0.232	-2.281	-2.519
1995	-0.468	**0.001**	0.653	0.550	0.615	0.959	0.530	**0.004**	0.386	-1.659	-1.994
1996	-0.669	**0.001**	0.653	0.550	0.615	1.021	0.490	**0.004**	0.386	-1.721	-1.773
1997	-0.853	**0.001**	0.653	0.550	0.615	1.053	0.471	**0.004**	0.378	-1.659	-1.984
1998	-0.819	**0.005**	0.653	0.550	0.615	1.084	0.445	**0.004**	0.438	-1.348	-2.350
1999	-0.652	**0.009**	0.653	0.550	0.615	1.146	0.418	**0.004**	0.464	-0.975	-1.941
2000	-0.552	**0.012**	0.653	0.550	0.615	1.208	0.412	**0.004**	0.541	-0.726	-1.836
2001	-0.585	**0.013**	0.653	0.550	0.615	1.068	0.366	**0.004**	0.524	-0.850	-1.097
2002	-0.435	**0.013**	0.653	0.550	0.615	0.928	0.340	**0.004**	0.558	-0.726	-1.181
2003	-0.318	**0.017**	0.653	0.550	0.615	0.835	0.314	**0.004**	0.609	-0.539	-1.219
2004	-0.201	**0.019**	0.653	0.550	0.615	0.726	0.275	**0.003**	0.661	-0.166	-1.047

RIE Index
Weighted Results
- Australia

Year	O_WkHrsA	JblessHA	RelPvRtA	RlPvEldA	Weighted Economic Security Contribution	Socio-Cultural Theme Contribution	Environment Area Contribution	RIE weighted result
1990	0.045	-1.087	1.070	0.806	**-0.004**	**-0.004**	**0.018**	**0.134**
1991	1.391	-1.122	1.070	0.806	**-0.007**	**-0.011**	**0.033**	**0.151**
1992	2.219	-1.156	1.070	0.806	**-0.012**	**-0.017**	**0.012**	**0.146**
1993	-0.369	-1.191	1.070	0.806	**-0.031**	**-0.032**	**0.016**	**0.183**
1994	-0.886	-1.225	1.070	0.806	**-0.030**	**-0.028**	**-0.005**	**0.161**
1995	-0.576	-1.216	1.070	0.806	**-0.020**	**-0.015**	**0.010**	**0.158**
1996	0.459	-1.206	1.070	0.806	**-0.012**	**-0.007**	**0.007**	**0.200**
1997	0.563	-1.196	1.070	0.806	**-0.013**	**-0.008**	**0.000**	**0.172**
1998	1.080	-1.187	1.070	0.806	**-0.009**	**0.000**	**0.012**	**0.186**
1999	0.666	-1.177	1.070	0.806	**-0.007**	**0.006**	**0.009**	**0.204**
2000	1.184	-1.167	1.070	0.806	**-0.001**	**0.016**	**0.013**	**0.213**
2001	3.047	-1.157	1.070	0.806	**0.015**	**0.031**	**0.022**	**0.210**
2002	4.392	-1.149	1.070	0.806	**0.023**	**0.040**	**0.026**	**0.181**
2003	5.427	-1.138	1.070	0.806	**0.031**	**0.052**	**0.034**	**0.194**
2004	5.220	-1.128	1.070	0.806	**0.034**	**0.056**	**0.037**	**0.180**

RIE Index
Weighted Results - Mexico

Year	LexpM	InfMortM	HALEM	PhysM	Weighted Health Contribution	PopnGwtM	FertRatM	Weighted Population Contribution	CalorieM	FatConsM	SugConsM	Weighted Food Consumption Contribution
1990	-1.107	-1.154	-1.102	-1.141	**-0.066**	1.025	1.148	**0.023**	0.965	1.154	0.341	**0.048**
1991	-0.906	-0.902	-0.964	-0.830	**-0.053**	0.973	1.004	**0.021**	0.804	0.981	0.876	**0.052**
1992	-0.838	-0.820	-0.919	-0.518	**-0.046**	0.894	1.004	**0.020**	0.719	0.983	0.769	**0.049**
1993	-0.738	-0.739	-0.848	-0.518	**-0.042**	0.841	0.729	**0.017**	0.634	0.931	0.647	**0.043**
1994	-0.637	-0.669	-0.780	-0.363	**-0.036**	0.762	0.676	**0.015**	0.629	0.910	0.815	**0.046**
1995	-0.604	-0.613	-0.757	-0.363	**-0.034**	0.710	0.585	**0.014**	0.779	0.960	0.937	**0.053**
1996	-0.570	-0.556	-0.736	-0.363	**-0.033**	0.131	0.415	**0.006**	0.624	0.884	0.830	**0.046**
1997	-0.436	-0.512	-0.644	-0.363	**-0.029**	-0.131	0.271	**0.001**	0.819	0.863	1.320	**0.059**
1998	-0.402	-0.468	-0.621	-0.363	**-0.027**	-0.263	0.179	**-0.001**	0.729	0.872	0.999	**0.051**
1999	-0.268	-0.411	-0.529	-0.363	**-0.023**	-0.289	0.087	**-0.002**	0.769	0.928	1.106	**0.055**
2000	-0.168	-0.342	-0.459	-0.363	**-0.020**	-0.210	-0.031	**-0.003**	0.543	0.898	1.014	**0.048**
2001	-0.067	-0.285	-0.391	-0.363	**-0.016**	-1.209	-0.122	**-0.014**	0.438	0.854	1.090	**0.047**
2002	0.034	-0.222	-0.323	-0.363	**-0.013**	-1.288	-0.214	**-0.016**	0.373	0.787	0.922	**0.041**
2003	0.134	-0.166	-0.255	-0.363	**-0.010**	-1.288	-0.292	**-0.017**	0.478	0.819	1.090	**0.047**
2004	0.235	-0.115	-0.184	-0.207	**-0.004**	-1.288	-0.305	**-0.017**	0.584	0.852	1.258	**0.053**

Note: The 'M' at the end of the variable code refers to Mexico.

RIE Index
Weighted Results - Mexico

Year	SchLexpM	NetEnrlM	PbExpEdM	TSSM&EM	PupilTcM	PISAsciM	**Weighted Education & Training Contribution**	R&DexpM	R&DrsrcM	HiTechXM	PatentsM
1990	-1.038	-1.154	-0.218	1.039	-1.098	-1.112	**-0.034**	-0.975	-1.103	-0.704	-0.863
1991	-1.000	-1.089	-0.218	1.039	-1.077	-1.112	**-0.033**	-0.951	-1.095	-0.688	-0.864
1992	-0.962	-1.024	-0.218	1.039	-1.057	-1.112	**-0.032**	-0.927	-1.089	-0.496	-0.847
1993	-0.924	-0.958	-0.218	1.039	-1.035	-1.112	**-0.030**	-0.919	-1.105	-0.469	-0.839
1994	-0.886	-0.893	-0.218	1.039	-1.015	-1.112	**-0.029**	-0.863	-1.079	-0.300	-0.846
1995	-0.848	-0.828	-0.218	1.039	-0.995	-1.112	**-0.028**	-0.847	-1.052	-0.209	-0.863
1996	-0.812	-0.762	-0.218	1.039	-0.974	-1.112	**-0.027**	-0.847	-1.052	-0.163	-0.866
1997	-0.774	-0.697	-0.218	1.039	-0.953	-1.112	**-0.026**	-0.823	-1.052	-0.036	-0.867
1998	-0.736	-0.632	-0.218	1.039	-0.932	-1.112	**-0.025**	-0.791	-1.079	0.089	-0.864
1999	-0.698	-0.557	-0.218	1.039	-0.906	-1.112	**-0.023**	-0.751	-1.052	0.198	-0.867
2000	-0.656	-0.513	-0.218	1.039	-0.896	-1.112	**-0.022**	-0.799	-1.044	0.323	-0.867
2001	-0.632	-0.438	-0.218	1.039	-0.870	-1.112	**-0.021**	-0.783	-1.039	0.294	-0.867
2002	-0.586	-0.372	-0.218	1.039	-0.854	-1.112	**-0.020**	-0.767	-1.033	0.249	-0.865
2003	-0.535	-0.292	-0.218	1.039	-0.823	-1.112	**-0.018**	-0.751	-1.028	0.246	-0.867
2004	-0.516	-0.245	-0.218	1.039	-0.808	-1.112	**-0.018**	-0.735	-1.023	0.236	-0.863

RIE Index
Weighted Results - Mexico

Year	Sci&TArM	Weighted Knowledge Renewal Contribution	NFBtertM	HSkImmM	NtTyGnM	Weighted Net Brain Gain Contribution	Human Resource Theme Contribution	FstAreaM	AgLandM
1990	-1.136	**-0.020**	-0.980	-0.969	-0.929	**-0.055**	**-0.104**	0.737	0.061
1991	-1.136	**-0.020**	-0.980	-0.969	-0.947	**-0.055**	**-0.088**	0.737	0.107
1992	-1.129	**-0.019**	-0.980	-0.969	-0.966	**-0.055**	**-0.083**	0.737	0.159
1993	-1.125	**-0.019**	-0.980	-0.969	-0.984	**-0.056**	**-0.087**	0.737	0.235
1994	-1.121	**-0.018**	-0.980	-0.969	-1.003	**-0.056**	**-0.078**	0.737	0.296
1995	-1.115	**-0.017**	-0.980	-0.969	-1.022	**-0.056**	**-0.070**	0.737	0.348
1996	-1.110	**-0.017**	-0.980	-0.969	-1.040	**-0.057**	**-0.082**	0.737	0.348
1997	-1.107	**-0.017**	-0.980	-0.969	-1.059	**-0.057**	**-0.068**	0.737	0.348
1998	-1.099	**-0.016**	-0.980	-0.969	-1.077	**-0.057**	**-0.075**	0.737	0.348
1999	-1.092	**-0.015**	-0.980	-0.969	-1.096	**-0.058**	**-0.067**	0.737	0.356
2000	-1.092	**-0.015**	-0.980	-0.969	-1.114	**-0.058**	**-0.069**	0.737	0.356
2001	-1.087	**-0.015**	-0.980	-0.969	-1.133	**-0.058**	**-0.078**	0.737	0.356
2002	-1.081	**-0.015**	-0.980	-0.969	-1.152	**-0.059**	**-0.082**	0.737	0.356
2003	-1.077	**-0.015**	-0.980	-0.969	-1.170	**-0.059**	**-0.072**	0.737	0.356
2004	-1.072	**-0.015**	-0.980	-0.969	-1.189	**-0.060**	**-0.060**	0.737	0.356

RIE Index
Weighted Results - Mexico

Year	ArblLanM	IrrigLnM	FertConM	TractUsM	AgPdnInM	FdPdnInM	**Weighted Land & Agricultural Use Contribution**	GDPEgUsM	RbleEgSM	ElecConM	**Weighted Energy Production Use Contribution**
1990	-0.065	1.054	-0.034	0.119	0.422	0.364	**0.020**	-1.128	1.146	1.100	**0.023**
1991	-0.057	1.131	-0.115	0.198	0.719	0.673	**0.026**	-1.088	1.114	1.097	**0.023**
1992	-0.050	1.239	-0.104	0.194	0.304	0.579	**0.023**	-1.195	1.177	1.096	**0.022**
1993	-0.013	1.206	-0.043	0.173	0.363	0.592	**0.025**	-1.328	1.239	1.091	**0.020**
1994	0.006	1.191	-0.085	0.166	0.937	0.902	**0.032**	-1.435	0.896	1.075	**0.011**
1995	0.024	1.178	-0.129	0.158	1.888	1.508	**0.043**	-1.301	1.239	1.072	**0.020**
1996	0.021	1.151	-0.059	0.158	1.274	0.983	**0.035**	-1.421	1.208	1.057	**0.017**
1997	0.003	1.199	-0.084	0.158	1.650	1.333	**0.041**	-1.568	0.989	1.037	**0.009**
1998	0.003	1.200	-0.254	0.158	1.492	1.225	**0.037**	-1.595	0.896	1.032	**0.007**
1999	-0.006	1.208	-0.232	0.158	2.007	1.683	**0.045**	-1.741	0.958	1.019	**0.005**
2000	-0.006	1.217	-0.291	0.160	1.848	1.629	**0.043**	-2.181	0.989	1.001	**-0.004**
2001	-0.006	1.225	-0.327	0.160	2.462	2.060	**0.051**	-2.074	0.864	1.001	**-0.004**
2002	-0.006	1.225	-0.164	0.160	1.888	1.737	**0.045**	-1.914	0.677	0.997	**-0.005**
2003	-0.006	1.225	-0.280	0.160	2.264	1.979	**0.049**	-1.821	0.677	1.002	**-0.003**
2004	-0.006	1.225	-0.299	0.160	2.759	2.289	**0.055**	-1.728	0.771	1.006	**0.001**

RIE Index
Weighted Results - Mexico

Year	FWaterAM	InGdWtAM	WtrWdlM	OrgWtPtM	**Weighted Water Contribution**	FishCapM	FishConM	**Weighted Fisheries Contribution**	NBI_M	ThtMammM	ThtBirdM
1990	-0.714	-1.111	-0.703	1.153	**-0.021**	0.371	1.104	**0.045**	0.862	0.252	0.520
1991	-0.720	-1.128	-0.703	1.165	**-0.021**	0.365	1.154	**0.046**	0.862	0.211	0.453
1992	-0.726	-1.144	-0.703	1.181	**-0.021**	0.447	1.230	**0.051**	0.862	0.169	0.391
1993	-0.732	-1.161	-0.703	1.220	**-0.021**	0.477	1.306	**0.054**	0.862	0.129	0.329
1994	-0.738	-1.177	-0.703	0.929	**-0.026**	0.477	1.381	**0.056**	0.862	0.088	0.267
1995	-0.743	-1.188	-0.703	0.976	**-0.025**	0.451	1.624	**0.063**	0.862	0.047	0.205
1996	-0.748	-1.205	-0.703	0.978	**-0.026**	0.424	1.537	**0.060**	0.862	0.007	0.160
1997	-0.752	-1.216	-0.703	0.968	**-0.026**	0.424	1.609	**0.062**	0.862	-0.036	0.075
1998	-0.757	-1.226	-0.703	0.962	**-0.026**	0.494	1.687	**0.066**	0.862	-0.076	0.013
1999	-0.761	-1.237	-0.703	0.962	**-0.026**	0.507	1.762	**0.069**	0.862	-0.118	-0.049
2000	-0.765	-1.248	-0.703	0.968	**-0.027**	0.487	1.838	**0.071**	0.862	-0.162	-0.207
2001	-0.769	-1.259	-0.703	0.966	**-0.027**	0.461	1.949	**0.073**	0.862	-0.200	-0.178
2002	-0.773	-1.270	-0.703	0.964	**-0.027**	0.437	2.066	**0.076**	0.862	-0.239	-0.133
2003	-0.777	-1.281	-0.703	0.966	**-0.027**	0.414	2.141	**0.078**	0.862	-0.283	-0.302
2004	-0.781	-1.292	-0.703	0.966	**-0.028**	0.391	2.217	**0.079**	0.862	-0.323	-0.398

RIE Index
Weighted Results - Mexico

Year	Weighted Biodiversity Contribution	Natural Resource Theme Contribution	NtDmCdtM	DmCdtBnM	FDINInfM	NetLndM	MktCptM	StksTdM	Real_IRM	RealXRtM	Weighted Financial Contribution
1990	**0.033**	**0.100**	-1.149	-0.927	-0.510	1.141	1.035	0.862	-0.290	-0.759	**-0.002**
1991	**0.031**	**0.105**	-1.044	-0.921	0.037	0.625	0.115	0.449	-0.099	-0.424	**-0.003**
1992	**0.029**	**0.104**	-0.924	-0.864	-0.267	0.029	-0.229	0.284	0.089	-0.136	**-0.005**
1993	**0.027**	**0.105**	-0.860	-0.857	-0.389	0.212	-0.798	0.039	0.724	0.121	**-0.005**
1994	**0.025**	**0.098**	-0.654	-0.705	1.142	-0.160	0.134	-0.279	0.130	-0.055	**-0.001**
1995	**0.023**	**0.124**	-0.525	-0.807	1.872	1.675	0.095	0.305	0.657	-1.284	**0.005**
1996	**0.021**	**0.107**	-0.672	-1.152	1.304	1.616	0.077	0.233	1.497	-0.983	**0.005**
1997	**0.018**	**0.104**	0.200	-0.630	1.750	1.238	-0.266	0.224	1.627	-0.530	**0.010**
1998	**0.016**	**0.100**	0.342	-0.707	1.497	0.597	0.578	0.599	0.244	-0.498	**0.007**
1999	**0.014**	**0.106**	0.455	-0.773	1.335	0.865	0.076	0.647	0.724	-0.181	**0.008**
2000	**0.010**	**0.093**	0.532	-0.880	1.487	0.673	0.590	0.623	1.502	0.134	**0.012**
2001	**0.010**	**0.103**	0.477	-0.891	3.017	0.789	0.651	0.726	0.963	0.394	**0.016**
2002	**0.010**	**0.099**	0.724	-0.831	0.919	1.061	0.867	0.891	2.260	0.403	**0.017**
2003	**0.006**	**0.102**	0.775	-0.854	0.453	1.328	0.706	0.936	2.892	-0.055	**0.017**
2004	**0.003**	**0.111**	0.909	-0.877	1.112	1.386	0.399	0.735	2.590	-0.206	**0.016**

RIE Index
Weighted Results - Mexico

Year	M&TeqpM	GFCF_McM	Weighted Machinery Contribution	Generated Resource Theme Contribution	Resources Area Contribution	TphnMaiM	PCsM	RadiosM	TVsetsM	NewspapM
1990	-0.176	1.060	**0.009**	**0.008**	**0.004**	-1.137	-1.096	-1.024	-1.056	-1.097
1991	-0.073	1.457	**0.015**	**0.011**	**0.028**	-1.111	-1.073	-1.035	-1.070	-1.110
1992	0.014	1.934	**0.021**	**0.015**	**0.036**	-1.083	-1.031	-1.034	-0.953	-1.122
1993	-0.304	0.821	**0.006**	**0.001**	**0.019**	-1.050	-1.002	-1.033	-0.946	-1.134
1994	-0.470	1.060	**0.006**	**0.005**	**0.025**	-1.018	-0.952	-1.031	-0.937	-1.147
1995	-0.460	0.026	**-0.005**	**0.001**	**0.055**	-1.011	-0.925	-1.029	-0.854	-1.159
1996	-0.087	1.060	**0.010**	**0.016**	**0.041**	-1.016	-0.878	-0.965	-0.796	-1.175
1997	0.117	1.934	**0.022**	**0.032**	**0.068**	-1.004	-0.853	-0.955	-0.726	-1.184
1998	0.249	2.808	**0.033**	**0.040**	**0.065**	-0.981	-0.828	-0.968	-0.703	-1.196
1999	0.200	2.729	**0.031**	**0.040**	**0.080**	-0.946	-0.755	-0.958	-0.667	-1.194
2000	0.345	2.570	**0.031**	**0.044**	**0.068**	-0.897	-0.627	-0.948	-0.632	-1.232
2001	0.449	1.695	**0.023**	**0.039**	**0.064**	-0.847	-0.521	-0.938	-0.625	-1.233
2002	0.543	1.060	**0.017**	**0.034**	**0.051**	-0.808	-0.395	-0.928	-0.629	-1.246
2003	0.637	0.742	**0.015**	**0.031**	**0.061**	-0.765	-0.256	-0.918	-0.633	-1.258
2004	0.733	0.424	**0.012**	**0.029**	**0.079**	-0.708	-0.160	-0.908	-0.654	-1.270

RIE Index
Weighted Results - Mexico

Year	ICT_ExpM	Weighted ICT Theme Contribution	AirTpFtM	Air_PasM	ConPtTfM	RaRdGdM	RailPasM	RdVhclM	Weighted Transport Theme Contribution	Infrastructure Area Contribution
1990	-1.121	**-0.023**	-0.642	-1.005	-0.963	-0.889	-0.468	-0.461	**-0.016**	**-0.039**
1991	-1.121	**-0.023**	-0.606	-1.001	-0.963	-0.879	-0.499	-0.406	**-0.016**	**-0.039**
1992	-1.121	**-0.023**	-0.607	-0.996	-0.963	-0.872	-0.494	-0.359	**-0.015**	**-0.038**
1993	-1.121	**-0.022**	-0.608	-0.987	-0.963	-0.869	-0.568	-0.334	**-0.015**	**-0.038**
1994	-1.121	**-0.022**	-0.599	-0.960	-0.963	-0.856	-0.632	-0.311	**-0.015**	**-0.038**
1995	-1.121	**-0.022**	-0.607	-1.014	-0.963	-0.853	-0.630	-0.319	**-0.016**	**-0.037**
1996	-1.121	**-0.021**	-0.606	-1.021	-0.963	-0.848	-0.635	-0.303	**-0.016**	**-0.037**
1997	-1.121	**-0.021**	-0.599	-0.991	-0.963	-0.844	-0.635	-0.274	**-0.015**	**-0.036**
1998	-1.121	**-0.021**	-0.592	-0.988	-0.963	-0.843	-0.636	-0.241	**-0.015**	**-0.036**
1999	-1.121	**-0.020**	-0.588	-0.957	-0.963	-0.832	-0.638	-0.203	**-0.015**	**-0.035**
2000	-1.121	**-0.019**	-0.589	-0.956	-0.963	-0.826	-0.639	-0.155	**-0.015**	**-0.034**
2001	-1.121	**-0.019**	-0.591	-0.968	-0.963	-0.820	-0.640	-0.052	**-0.014**	**-0.033**
2002	-1.121	**-0.018**	-0.586	-0.978	-0.963	-0.814	-0.642	0.034	**-0.014**	**-0.032**
2003	-1.121	**-0.018**	-0.585	-0.981	-0.963	-0.808	-0.643	0.067	**-0.014**	**-0.032**
2004	-1.121	**-0.017**	-0.579	-0.966	-0.963	-0.802	-0.644	0.128	**-0.014**	**-0.031**

RIE Index
Weighted Results - Mexico

Year	SulphOxM	NitOxM	CarbMonM	**Weighted Air Quality Contribution**	CbDxEmM	CbDxTEmM	**Weighted Greenhouse Gas Emissions Contribution**	EcoFPtM	FnCnExpM	DefExpM
1990	1.145	1.148	1.031	**0.067**	1.112	0.571	**0.051**	1.070	-0.787	0.594
1991	1.145	1.148	1.049	**0.068**	1.108	0.568	**0.051**	1.070	-0.170	0.590
1992	1.145	1.148	1.078	**0.068**	1.112	0.566	**0.051**	1.070	0.611	0.586
1993	1.145	1.148	1.107	**0.069**	1.115	0.566	**0.051**	1.070	1.140	0.583
1994	1.145	1.148	1.113	**0.069**	1.098	0.560	**0.050**	1.070	1.249	0.579
1995	1.145	1.148	1.165	**0.070**	1.124	0.567	**0.051**	1.070	-0.510	0.594
1996	1.145	1.148	1.196	**0.071**	1.117	0.566	**0.051**	1.070	-1.645	0.590
1997	1.145	1.148	1.224	**0.071**	1.102	0.562	**0.051**	1.070	-2.137	0.582
1998	1.145	1.148	1.263	**0.072**	1.081	0.554	**0.050**	1.070	-0.838	0.577
1999	1.145	1.148	1.282	**0.072**	1.097	0.559	**0.050**	1.070	-0.845	0.568
2000	1.145	1.148	1.311	**0.073**	1.080	0.556	**0.050**	1.070	-0.838	0.555
2001	1.145	1.148	1.340	**0.074**	1.088	0.557	**0.050**	1.070	0.162	0.544
2002	1.145	1.148	1.369	**0.074**	1.085	0.557	**0.050**	1.070	-0.024	0.540
2003	1.145	1.148	1.413	**0.075**	1.084	0.561	**0.050**	1.070	-0.218	0.531
2004	1.145	1.148	1.428	**0.075**	1.095	0.568	**0.051**	1.070	-0.816	0.523

RIE Index
Weighted Results - Mexico

Year	Weighted Conspicuous Consumption Contribution	RoadPvdM	GFCF_M	AvNoOccM	HseStckM	Weighted Built Environment Contribution	PopAcDgM	PopAcWtM	PopAcSnM
1990	**0.018**	-0.574	-0.888	-1.149	-1.132	**-0.007**	-1.155	-1.155	-1.155
1991	**0.030**	-0.559	-0.818	-1.066	-1.053	**-0.007**	-1.155	-1.052	-1.093
1992	**0.046**	-0.545	-0.680	-0.976	-0.974	**-0.006**	-1.155	-0.949	-1.031
1993	**0.057**	-0.509	-0.542	-0.901	-0.974	**-0.006**	-1.155	-0.846	-0.969
1994	**0.059**	-0.869	-0.369	-0.826	-0.974	**-0.006**	-1.155	-0.742	-0.907
1995	**0.023**	-0.847	-1.060	-0.743	-0.974	**-0.007**	-1.155	-0.639	-0.845
1996	**0.000**	-0.811	-0.888	-0.721	-0.895	**-0.007**	-1.155	-0.536	-0.784
1997	**-0.010**	-0.962	-0.715	-0.698	-0.895	**-0.007**	-1.155	-0.433	-0.722
1998	**0.016**	-0.631	-0.611	-0.676	-0.816	**-0.005**	-1.155	-0.330	-0.660
1999	**0.016**	-0.739	-0.507	-0.661	-0.816	**-0.005**	-1.155	-0.227	-0.598
2000	**0.016**	-0.725	-0.369	-0.638	-0.816	**-0.005**	-1.155	-0.124	-0.536
2001	**0.036**	-0.710	-0.438	-0.616	-0.816	**-0.005**	-1.155	-0.020	-0.474
2002	**0.032**	-0.689	-0.438	-0.601	-0.737	**-0.005**	-1.155	0.083	-0.412
2003	**0.028**	-0.689	-0.403	-0.586	-0.737	**-0.005**	-1.155	0.186	-0.351
2004	**0.016**	-0.689	-0.369	-0.563	-0.737	**-0.005**	-1.155	0.289	-0.289

RIE Index
Weighted Results - Mexico

Year	Weighted Access to Essential Services Contribution	Physical Environment Theme Contribution	GpMembM	LifeSatM	HholdWkM	GNI_PPPM	GINI_M	YthUnptM	DivceRtM	P'snersM
1990	**-0.068**	**0.061**	-1.134	-0.055	1.153	-1.051	-1.134	1.119	1.104	0.656
1991	**-0.065**	**0.077**	-1.134	0.044	1.153	-1.010	-1.134	1.119	1.107	0.639
1992	**-0.062**	**0.097**	-1.134	0.306	1.153	-0.979	-1.134	1.119	1.111	0.624
1993	**-0.058**	**0.112**	-1.134	0.568	1.153	-0.961	-1.134	1.119	1.114	0.619
1994	**-0.055**	**0.117**	-1.134	0.830	1.153	-0.923	-1.134	0.699	1.118	0.625
1995	**-0.052**	**0.086**	-1.134	1.059	1.153	-0.972	-1.134	0.082	1.121	0.590
1996	**-0.049**	**0.067**	-1.134	0.961	1.153	-0.930	-1.134	0.551	1.125	0.553
1997	**-0.045**	**0.060**	-1.134	1.583	1.153	-0.872	-1.134	0.872	1.128	0.517
1998	**-0.042**	**0.091**	-1.134	1.845	1.153	-0.931	-1.134	1.119	1.132	0.480
1999	**-0.039**	**0.095**	-1.134	2.107	1.153	-0.795	-1.134	1.613	1.132	0.449
2000	**-0.036**	**0.098**	-1.134	2.565	1.153	-0.724	-1.134	1.366	1.095	0.404
2001	**-0.032**	**0.122**	-1.134	2.598	1.153	-0.716	-1.134	1.440	1.039	0.372
2002	**-0.029**	**0.122**	-1.134	2.860	1.153	-0.705	-1.134	1.242	0.983	0.335
2003	**-0.026**	**0.122**	-1.134	3.122	1.153	-0.686	-1.134	1.144	0.936	0.299
2004	**-0.023**	**0.114**	-1.134	3.351	1.153	-0.627	-1.134	0.872	0.886	0.263

RIE Index
Weighted Results - Mexico

Year	ScdeRteM	Weighted Social Connectedness Contribution	CptnIndM	LawIndxM	GovEfIdM	PolStIdM	V&AindM	Weighted Institutional Quality Contribution	EmpRateM	AdUptRtM
1990	1.154	**0.007**	-1.151	-1.154	-1.154	-1.141	-1.151	**-0.007**	-1.142	1.141
1991	1.137	**0.008**	-1.151	-1.140	-1.154	-1.141	-1.092	**-0.007**	-0.292	1.078
1992	1.104	**0.009**	-1.151	-1.127	-1.154	-1.141	-1.033	**-0.007**	-0.215	1.016
1993	1.087	**0.010**	-1.151	-1.106	-1.154	-1.141	-0.981	**-0.007**	-0.146	0.892
1994	1.053	**0.009**	-1.151	-1.092	-1.154	-1.141	-0.922	**-0.007**	-0.086	0.394
1995	1.003	**0.007**	-1.151	-1.078	-1.154	-1.141	-0.869	**-0.007**	-0.275	-0.290
1996	0.986	**0.009**	-1.151	-1.065	-1.154	-1.141	-0.791	**-0.006**	-0.197	0.394
1997	0.936	**0.012**	-1.151	-1.051	-1.154	-1.141	-0.758	**-0.006**	-0.017	0.892
1998	0.953	**0.014**	-1.151	-1.023	-1.154	-1.141	-0.752	**-0.006**	0.026	1.078
1999	0.970	**0.018**	-1.151	-1.023	-1.154	-1.141	-0.641	**-0.006**	0.000	1.327
2000	0.953	**0.019**	-1.151	-1.023	-1.154	-1.141	-0.582	**-0.006**	-0.026	1.514
2001	0.903	**0.018**	-1.151	-0.989	-1.154	-1.141	-0.530	**-0.006**	-0.086	1.452
2002	0.874	**0.018**	-1.151	-0.975	-1.154	-1.141	-0.405	**-0.006**	-0.077	1.327
2003	0.853	**0.019**	-1.151	-0.961	-1.154	-1.141	-0.418	**-0.006**	-0.120	1.265
2004	0.829	**0.018**	-1.151	-0.940	-1.154	-1.141	-0.405	**-0.006**	-0.026	1.016

RIE Index
Weighted Results - Mexico

Year	LTUnptM	O_WkHrsM	JblessHM	RelPvRtM	RlPvEldM	Weighted Economic Security Contribution	Socio-Cultural Theme Contribution	Environment Area Contribution	RIE weighted result
1990	0.752	-1.022	0.881	-0.911	-1.119	**-0.009**	**-0.008**	**0.052**	**0.017**
1991	0.756	-0.750	0.884	-0.911	-1.119	**-0.002**	**-0.001**	**0.076**	**0.065**
1992	0.760	-0.478	0.887	-0.911	-1.119	**0.000**	**0.002**	**0.099**	**0.097**
1993	0.764	-0.206	0.890	-0.911	-1.119	**0.001**	**0.004**	**0.117**	**0.098**
1994	0.767	0.066	0.893	-0.911	-1.119	**0.000**	**0.003**	**0.120**	**0.107**
1995	0.775	2.736	0.888	-0.911	-1.119	**0.011**	**0.012**	**0.098**	**0.115**
1996	0.775	-1.093	0.882	-0.911	-1.119	**-0.008**	**-0.006**	**0.061**	**0.065**
1997	0.764	0.880	0.877	-0.911	-1.119	**0.008**	**0.015**	**0.075**	**0.106**
1998	0.821	1.080	0.872	-0.911	-1.119	**0.011**	**0.019**	**0.110**	**0.139**
1999	0.738	1.425	0.866	-0.911	-1.119	**0.014**	**0.026**	**0.121**	**0.165**
2000	0.797	0.149	0.861	-0.911	-1.119	**0.008**	**0.020**	**0.118**	**0.152**
2001	0.799	2.633	0.856	-0.911	-1.119	**0.023**	**0.035**	**0.157**	**0.188**
2002	0.813	0.149	0.850	-0.911	-1.119	**0.006**	**0.019**	**0.141**	**0.160**
2003	0.802	3.357	0.845	-0.911	-1.119	**0.026**	**0.038**	**0.161**	**0.190**
2004	0.796	4.288	0.839	-0.911	-1.119	**0.030**	**0.043**	**0.157**	**0.205**

RIE Index Weighted Results - USA

Year	LexpU	InfMortU	HALEU	PhysU	**Weighted Health Contribution**	PopnGwtU	FertRatU	**Weighted Population Contribution**	CalorieU	FatConsU	SugConsU	**Weighted Food Consumption Contribution**
1990	0.268	0.546	0.253	0.415	**0.022**	-0.973	-0.463	**-0.015**	-1.032	-0.621	-1.126	**-0.055**
1991	0.335	0.564	0.300	0.570	**0.026**	-0.421	-0.489	**-0.010**	-1.172	-0.671	-1.202	**-0.060**
1992	0.402	0.590	0.347	0.570	**0.028**	-0.289	-0.502	**-0.008**	-1.338	-0.709	-1.340	**-0.066**
1993	0.335	0.596	0.300	0.570	**0.027**	-0.473	-0.541	**-0.011**	-1.554	-0.738	-1.508	**-0.075**
1994	0.402	0.621	0.347	0.570	**0.029**	-0.710	-0.567	**-0.014**	-1.849	-0.791	-1.646	**-0.084**
1995	0.402	0.646	0.347	0.726	**0.031**	-0.815	-0.593	**-0.015**	-1.574	-0.703	-1.768	**-0.079**
1996	0.537	0.665	0.439	0.726	**0.035**	-0.894	-0.593	**-0.016**	-1.639	-0.627	-1.982	**-0.083**
1997	0.671	0.671	0.533	0.881	**0.041**	-0.789	-0.606	**-0.015**	-1.935	-0.682	-2.349	**-0.097**
1998	0.738	0.671	0.580	0.881	**0.042**	-0.868	-0.567	**-0.015**	-1.995	-0.779	-2.425	**-0.102**
1999	0.738	0.678	0.580	0.726	**0.040**	-0.920	-0.554	**-0.016**	-2.201	-0.894	-2.135	**-0.103**
2000	0.771	0.690	0.603	0.881	**0.043**	-0.973	-0.489	**-0.016**	-2.763	-1.143	-2.471	**-0.125**
2001	0.872	0.697	0.674	1.037	**0.048**	-1.078	-0.528	**-0.017**	-2.602	-1.190	-2.364	**-0.121**
2002	0.906	0.684	0.698	0.881	**0.047**	-1.157	-0.554	**-0.018**	-2.507	-1.155	-2.486	**-0.121**
2003	1.006	0.690	0.768	1.037	**0.052**	-1.735	-0.515	**-0.024**	-2.446	-1.122	-2.303	**-0.115**
2004	1.040	0.703	0.792	1.037	**0.053**	-1.393	-0.515	**-0.020**	-2.386	-1.090	-2.119	**-0.110**

Note: The 'U' at the end of the variable code refers to the USA.

RIE Index Weighted Results - USA

Year	SchLexpU	NetEnrlU	PbExpEdU	TSSM&EAU	PupilTcU	PISAsciU	**Weighted Education & Training Contribution**	R&DexpU	R&DrsrcU	HiTechXU	PatentsU	Sci&TArU
1990	0.080	0.596	1.091	-0.956	0.859	0.286	**0.019**	1.023	0.848	1.145	1.096	0.746
1991	0.080	0.596	1.091	-0.956	0.859	0.286	**0.019**	1.071	0.947	1.161	1.226	0.745
1992	0.080	0.596	1.091	-0.956	0.859	0.286	**0.019**	1.015	0.931	1.193	1.240	0.765
1993	0.080	0.596	1.091	-0.956	0.859	0.286	**0.019**	0.919	0.974	1.109	1.252	0.726
1994	0.080	0.596	1.091	-0.956	0.859	0.286	**0.019**	0.839	1.014	1.100	1.338	0.725
1995	0.080	0.596	1.091	-0.956	0.859	0.286	**0.019**	0.911	0.947	1.081	1.299	0.732
1996	0.080	0.596	1.091	-0.956	0.859	0.286	**0.019**	0.943	1.099	1.111	1.481	0.700
1997	0.080	0.596	1.091	-0.956	0.859	0.286	**0.019**	0.967	1.134	1.129	1.475	0.639
1998	0.080	0.596	1.091	-0.956	0.859	0.286	**0.019**	0.999	1.182	1.195	2.149	0.621
1999	0.080	0.596	1.091	-0.956	0.859	0.286	**0.019**	1.031	1.267	1.279	2.249	0.606
2000	0.080	0.596	1.091	-0.956	0.859	0.286	**0.019**	1.095	1.267	1.262	2.257	0.606
2001	0.080	0.596	1.091	-0.956	0.859	0.286	**0.019**	1.111	1.320	1.187	2.315	0.588
2002	0.080	0.596	1.091	-0.956	0.859	0.286	**0.019**	1.023	1.347	1.129	2.259	0.572
2003	0.080	0.596	1.091	-0.956	0.859	0.286	**0.019**	1.047	1.389	1.068	2.265	0.554
2004	0.080	0.596	1.091	-0.956	0.859	0.286	**0.019**	1.047	1.432	1.043	2.106	0.537

RIE Index Weighted Results - USA

Year	Weighted Knowledge Renewal Contribution	NFBtertU	HSkImmU	NtTyGnU	Weighted Net Brain Gain Contribution	Human Resource Theme Contribution	FstAreaU	AgLandU	ArblLanU	IrrigLnU
1990	**0.021**	-0.039	-0.060	-0.130	**-0.004**	**-0.013**	0.401	-1.029	1.031	-0.118
1991	**0.022**	-0.039	-0.060	-0.097	**-0.004**	**-0.007**	0.401	-1.029	1.031	-0.118
1992	**0.022**	-0.039	-0.060	-0.063	**-0.003**	**-0.009**	0.401	-1.053	1.006	-0.078
1993	**0.021**	-0.039	-0.060	-0.030	**-0.002**	**-0.022**	0.401	-1.092	0.987	-0.063
1994	**0.021**	-0.039	-0.060	0.004	**-0.002**	**-0.031**	0.401	-1.121	0.974	-0.045
1995	**0.021**	-0.039	-0.060	0.037	**-0.001**	**-0.025**	0.401	-1.137	0.974	-0.039
1996	**0.023**	-0.039	-0.060	0.071	**-0.001**	**-0.024**	0.401	-1.198	0.930	-0.006
1997	**0.023**	-0.039	-0.060	0.104	**0.000**	**-0.030**	0.401	-1.219	0.912	0.052
1998	**0.026**	-0.039	-0.060	0.137	**0.001**	**-0.030**	0.401	-1.237	0.899	0.053
1999	**0.028**	-0.039	-0.060	0.171	**0.001**	**-0.031**	0.401	-1.264	0.880	0.057
2000	**0.028**	-0.039	-0.060	0.204	**0.002**	**-0.049**	0.401	-1.264	0.880	0.053
2001	**0.028**	-0.039	-0.060	0.238	**0.003**	**-0.041**	0.401	-1.290	0.855	0.061
2002	**0.027**	-0.039	-0.060	0.271	**0.003**	**-0.043**	0.401	-1.305	0.843	0.062
2003	**0.027**	-0.039	-0.060	0.305	**0.004**	**-0.038**	0.401	-1.307	0.841	0.063
2004	**0.026**	-0.039	-0.060	0.338	**0.005**	**-0.028**	0.401	-1.310	0.838	0.064

RIE Index Weighted Results - USA

Year	FertConU	TractUsU	AgPdnInU	FdPdnInU	**Weighted Land & Agricultural Use Contribution**	GDPEgUsU	RbleEgSU	ElecConU	**Weighted Energy Production Use Contribution**	FWaterAU	InGdWtAU
1990	-0.982	0.935	0.719	0.767	**0.013**	0.777	-0.698	-0.855	**-0.016**	-0.429	0.827
1991	-1.010	0.926	0.383	0.458	**0.008**	0.817	-0.635	-0.934	**-0.015**	-0.437	0.788
1992	-1.063	0.921	1.769	1.508	**0.026**	0.724	-0.573	-0.911	**-0.015**	-0.445	0.750
1993	-1.278	0.928	-0.053	0.229	**0.000**	0.671	-0.667	-0.958	**-0.019**	-0.453	0.712
1994	-1.138	0.933	2.422	1.885	**0.033**	0.564	-0.698	-0.994	**-0.023**	-0.461	0.679
1995	-1.246	0.935	1.036	0.996	**0.015**	0.537	-0.667	-1.032	**-0.024**	-0.467	0.646
1996	-1.332	0.950	1.710	1.427	**0.022**	0.484	-0.635	-1.067	**-0.025**	-0.475	0.619
1997	-1.330	0.957	2.244	1.791	**0.029**	0.324	-0.698	-1.073	**-0.029**	-0.482	0.586
1998	-1.286	0.966	2.026	1.818	**0.028**	0.191	-0.729	-1.127	**-0.034**	-0.488	0.553
1999	-1.275	0.976	2.145	1.831	**0.029**	0.124	-0.792	-1.149	**-0.037**	-0.494	0.526
2000	-1.286	0.984	2.343	2.006	**0.031**	0.124	-0.823	-1.221	**-0.039**	-0.501	0.498
2001	-1.310	0.996	1.828	1.535	**0.023**	-0.049	-0.979	-1.101	**-0.043**	-0.507	0.471
2002	-1.274	1.005	1.452	1.387	**0.020**	-0.129	-0.979	-1.119	**-0.045**	-0.513	0.443
2003	-1.290	1.005	1.749	1.575	**0.023**	-0.342	-0.917	-1.111	**-0.048**	-0.517	0.422
2004	-1.291	1.005	2.719	2.114	**0.035**	-0.569	-0.917	-1.102	**-0.052**	-0.523	0.400

RIE Index Weighted Results - USA

Year	WtrWdlU	OrgWtPtU	Weighted Water Contribution	FishCapU	FishConU	Weighted Fisheries Contribution	NBI_U	ThtMammU	ThtBirdU	Weighted Biodiversity Contribution	Natural Resource Theme Contribution
1990	-0.442	-0.516	**-0.009**	-1.133	-0.844	**-0.060**	-1.097	0.850	-1.153	**-0.028**	**-0.100**
1991	-0.442	-0.433	**-0.008**	-1.102	-0.844	**-0.059**	-1.097	0.832	-1.226	**-0.030**	**-0.105**
1992	-0.442	-0.429	**-0.009**	-0.997	-0.844	**-0.056**	-1.097	0.815	-1.294	**-0.032**	**-0.086**
1993	-0.442	-0.413	**-0.009**	-1.040	-0.844	**-0.057**	-1.097	0.797	-1.361	**-0.034**	**-0.119**
1994	-0.442	-0.394	**-0.009**	-0.901	-0.844	**-0.053**	-1.097	0.779	-1.429	**-0.035**	**-0.088**
1995	-0.442	-0.407	**-0.010**	-0.762	-0.844	**-0.049**	-1.097	0.761	-1.502	**-0.037**	**-0.105**
1996	-0.442	-0.378	**-0.010**	-0.647	-0.844	**-0.045**	-1.097	0.749	-1.547	**-0.038**	**-0.097**
1997	-0.442	-0.388	**-0.011**	-0.624	-0.844	**-0.045**	-1.097	0.725	-1.637	**-0.041**	**-0.097**
1998	-0.442	-0.378	**-0.011**	-0.607	-0.844	**-0.044**	-1.097	0.707	-1.705	**-0.042**	**-0.104**
1999	-0.442	-0.329	**-0.011**	-0.524	-0.844	**-0.042**	-1.097	0.389	-1.778	**-0.050**	**-0.112**
2000	-0.442	0.128	**-0.005**	-0.475	-0.844	**-0.040**	-1.097	0.671	-1.846	**-0.046**	**-0.099**
2001	-0.442	0.309	**-0.003**	-0.541	-0.844	**-0.042**	-1.097	0.653	-1.913	**-0.048**	**-0.112**
2002	-0.442	0.545	**0.001**	-0.310	-0.844	**-0.035**	-1.097	0.609	-2.071	**-0.052**	**-0.112**
2003	-0.442	0.785	**0.004**	-0.306	-0.844	**-0.035**	-1.097	0.616	-2.049	**-0.051**	**-0.107**
2004	-0.442	0.821	**0.004**	-0.243	-0.844	**-0.033**	-1.097	0.618	-2.054	**-0.051**	**-0.098**

RIE Index Weighted Results - USA

Year	NtDmCdtU	DmCdtBnU	FDINInfU	NetLndU	MktCptU	StksTdU	Real_IRU	RealXRtU	**Weighted Financial Contribution**	M&TeqpU	GFCF_McU	**Weighted Machinery Contribution**
1990	0.678	1.060	-0.642	-0.416	-0.960	-1.096	1.113	-0.375	**-0.002**	1.076	-0.927	**0.002**
1991	0.669	1.132	-1.098	0.838	-1.727	-1.575	1.381	-0.439	**-0.002**	1.067	-1.245	**-0.002**
1992	0.697	1.201	-1.169	-0.315	-1.856	-1.301	1.608	-0.511	**-0.004**	1.027	-1.245	**-0.002**
1993	0.753	1.317	-0.703	-1.352	-2.168	-2.645	1.666	-0.463	**-0.010**	1.120	-0.927	**0.002**
1994	0.845	1.323	-0.824	-1.880	-1.895	-2.644	1.349	-0.457	**-0.011**	1.271	-0.689	**0.006**
1995	0.987	1.521	-0.693	-1.011	-2.934	-4.072	0.934	-0.508	**-0.015**	1.309	-0.371	**0.010**
1996	1.095	1.650	-0.368	-1.002	-3.714	-5.757	1.031	-0.403	**-0.020**	1.242	-0.291	**0.010**
1997	1.272	1.848	-0.196	-0.785	-5.075	-8.195	0.932	-0.225	**-0.028**	1.179	-0.291	**0.010**
1998	1.510	2.173	0.595	-0.636	-5.940	-10.278	0.811	0.063	**-0.031**	1.116	-0.212	**0.010**
1999	1.685	2.452	1.689	-1.579	-7.205	-14.102	0.980	0.012	**-0.043**	1.053	-0.132	**0.010**
2000	1.959	2.510	1.841	-1.918	-5.939	-23.584	0.874	0.134	**-0.065**	0.990	-0.132	**0.009**
2001	2.164	2.616	0.189	-2.035	-5.096	-20.689	1.475	0.361	**-0.056**	0.926	-0.768	**0.002**
2002	2.365	2.586	-0.713	-4.116	-3.569	-17.263	1.823	0.366	**-0.050**	0.831	-1.404	**-0.006**
2003	2.536	2.928	-0.875	-5.752	-4.742	-9.574	1.996	0.117	**-0.036**	0.829	-1.563	**-0.008**
2004	2.773	3.113	-0.571	-7.718	-5.189	-11.344	2.139	-0.051	**-0.045**	0.827	-1.245	**-0.004**

RIE Index Weighted Results - USA

Year	Generated Resource Theme Contribution	Resources Area Contribution	TphnMaiU	PCsU	RadiosU	TVsetsU	NewspapU	ICT_ExpU	Weighted ICT Theme Contribution	AirTpFtU
1990	**0.000**	**-0.113**	0.742	0.864	0.974	0.932	0.860	0.799	**0.018**	1.152
1991	**-0.004**	**-0.115**	0.765	1.014	0.970	0.927	0.788	0.853	**0.019**	1.057
1992	**-0.007**	**-0.102**	0.795	1.185	0.965	0.922	0.779	0.903	**0.020**	1.188
1993	**-0.008**	**-0.148**	0.838	1.360	0.963	0.941	0.738	0.957	**0.021**	1.272
1994	**-0.005**	**-0.124**	0.891	1.589	0.962	1.034	0.698	1.010	**0.022**	1.590
1995	**-0.005**	**-0.135**	0.956	1.866	0.942	1.055	0.657	1.064	**0.023**	1.653
1996	**-0.010**	**-0.130**	1.006	2.190	0.960	1.096	0.691	1.114	**0.025**	1.891
1997	**-0.018**	**-0.145**	1.083	2.576	0.953	1.135	0.587	1.168	**0.027**	2.333
1998	**-0.022**	**-0.155**	1.159	3.042	0.939	1.127	0.519	1.222	**0.029**	2.365
1999	**-0.033**	**-0.176**	1.182	3.565	0.934	1.119	0.472	1.271	**0.030**	2.543
2000	**-0.055**	**-0.203**	1.277	4.176	0.920	1.119	0.436	1.325	**0.033**	2.877
2001	**-0.055**	**-0.207**	1.237	4.677	0.925	1.230	0.413	1.429	**0.035**	2.616
2002	**-0.056**	**-0.211**	1.178	5.005	0.920	1.268	0.372	1.361	**0.036**	3.062
2003	**-0.044**	**-0.189**	1.071	5.276	0.916	1.324	0.332	1.469	**0.037**	3.453
2004	**-0.050**	**-0.176**	0.980	5.852	0.911	1.380	0.291	1.568	**0.039**	3.723

RIE Index Weighted Results - USA

Year	Air_PasU	ConPtTfU	RaRdGdU	RailPasU	RdVhclU	Weighted Transport Theme Contribution	Infrastructure Area Contribution	SulphOxU	NitOxU	CarbMonU
1990	0.995	-0.071	1.082	1.148	-0.687	**0.013**	**0.031**	-0.441	-0.678	-0.966
1991	0.907	-0.071	1.104	1.113	-0.695	**0.012**	**0.031**	-0.353	-0.632	-0.850
1992	0.947	-0.071	1.189	1.113	-0.713	**0.013**	**0.033**	-0.309	-0.632	-0.743
1993	0.932	-0.071	1.281	1.140	-0.716	**0.014**	**0.034**	-0.265	-0.609	-0.627
1994	1.109	-0.071	1.434	1.141	-0.682	**0.016**	**0.038**	-0.222	-0.563	-0.515
1995	1.164	-0.071	1.489	1.127	-0.678	**0.017**	**0.040**	0.020	-0.516	-0.418
1996	1.302	-0.071	1.400	1.173	-0.661	**0.018**	**0.043**	0.041	-0.470	-0.302
1997	1.356	-0.071	1.369	1.196	-0.662	**0.020**	**0.046**	0.020	-0.470	-0.229
1998	1.316	-0.071	1.491	1.189	-0.654	**0.020**	**0.049**	0.041	-0.424	-0.171
1999	1.484	-0.071	1.537	1.197	-0.656	**0.022**	**0.052**	0.151	-0.285	-0.074
2000	1.575	-0.071	1.526	1.205	-0.646	**0.023**	**0.056**	0.261	-0.239	-0.031
2001	1.364	-0.071	1.627	1.213	-0.630	**0.022**	**0.057**	0.283	-0.146	0.047
2002	1.249	-0.071	1.673	1.221	-0.623	**0.023**	**0.059**	0.348	-0.077	0.090
2003	1.305	-0.071	1.718	1.229	-0.620	**0.025**	**0.062**	0.428	-0.099	0.255
2004	1.526	-0.071	1.764	1.237	-0.613	**0.027**	**0.066**	0.493	-0.050	0.344

RIE Index Weighted Results - USA

Year	Weighted Air Quality Contribution	CbDxEmU	CbDxTEmU	Weighted Greenhouse Gas Emissions Contribution	EcoFPtU	FnCnExpU	DefExpU	Weighted Conspicuous Consumption Contribution	RoadPvdU	GFCF_U
1990	**-0.042**	-0.826	-1.155	**-0.060**	-0.911	1.125	-1.155	**-0.019**	1.155	-0.196
1991	**-0.037**	-0.773	-1.148	**-0.058**	-0.911	1.169	-1.241	**-0.020**	1.155	-0.473
1992	**-0.034**	-0.789	-1.191	**-0.060**	-0.911	1.494	-1.327	**-0.015**	1.155	-0.473
1993	**-0.030**	-0.805	-1.205	**-0.061**	-0.911	1.603	-1.409	**-0.015**	1.155	-0.438
1994	**-0.026**	-0.807	-1.217	**-0.062**	-0.911	1.322	-1.503	**-0.022**	1.155	-0.369
1995	**-0.019**	-0.805	-1.203	**-0.061**	-0.911	1.016	-1.588	**-0.030**	1.155	-0.334
1996	**-0.015**	-0.859	-1.228	**-0.063**	-0.911	0.826	-1.667	**-0.036**	1.155	-0.196
1997	**-0.014**	-0.860	-1.219	**-0.063**	-0.911	0.403	-1.831	**-0.047**	1.155	-0.058
1998	**-0.011**	-0.848	-1.236	**-0.063**	-0.911	0.195	-1.992	**-0.055**	1.155	0.081
1999	**-0.004**	-0.851	-1.232	**-0.063**	-0.911	0.300	-2.131	**-0.056**	1.155	0.219
2000	**0.000**	-0.892	-1.232	**-0.065**	-0.911	0.366	-2.356	**-0.059**	1.155	0.323
2001	**0.004**	-0.838	-1.186	**-0.062**	-0.911	0.954	-2.512	**-0.050**	1.155	0.357
2002	**0.007**	-0.822	-1.166	**-0.060**	-0.911	1.695	-2.683	**-0.038**	1.155	0.184
2003	**0.012**	-0.821	-1.094	**-0.058**	-0.911	2.012	-2.855	**-0.036**	1.155	0.288
2004	**0.016**	-0.842	-1.034	**-0.057**	-0.911	2.092	-3.028	**-0.037**	1.155	0.392

RIE Index Weighted Results - USA

Year	AvNoOccU	HseStckU	Weighted Built Environment Contribution	PopAcDgU	PopAcWtU	PopAcSnU	Weighted Access to Essential Services Contribution	Physical Environment Theme Contribution	GpMembU
1990	0.676	0.763	**0.005**	0.577	0.577	0.577	**0.034**	**-0.083**	0.378
1991	0.668	0.763	**0.004**	0.577	0.577	0.577	**0.034**	**-0.077**	0.378
1992	0.668	0.684	**0.004**	0.577	0.577	0.577	**0.034**	**-0.071**	0.378
1993	0.668	0.763	**0.004**	0.577	0.577	0.577	**0.034**	**-0.068**	0.378
1994	0.661	0.763	**0.004**	0.577	0.577	0.577	**0.034**	**-0.072**	0.378
1995	0.683	0.763	**0.005**	0.577	0.577	0.577	**0.034**	**-0.071**	0.378
1996	0.676	0.763	**0.005**	0.577	0.577	0.577	**0.034**	**-0.075**	0.378
1997	0.683	0.763	**0.005**	0.577	0.577	0.577	**0.034**	**-0.085**	0.378
1998	0.691	0.763	**0.005**	0.577	0.577	0.577	**0.034**	**-0.090**	0.378
1999	0.698	0.842	**0.006**	0.577	0.577	0.577	**0.034**	**-0.083**	0.378
2000	0.698	0.763	**0.006**	0.577	0.577	0.577	**0.034**	**-0.084**	0.378
2001	0.751	0.842	**0.006**	0.577	0.577	0.577	**0.034**	**-0.068**	0.378
2002	0.751	0.842	**0.006**	0.577	0.577	0.577	**0.034**	**-0.052**	0.378
2003	0.773	0.842	**0.006**	0.577	0.577	0.577	**0.034**	**-0.042**	0.378
2004	0.766	0.921	**0.006**	0.577	0.577	0.577	**0.034**	**-0.038**	0.378

RIE Index Weighted Results - USA

Year	LifeSatU	HholdWkU	GNI_PPPU	GINI_U	YthUnptU	DivceRtU	P'snersU	ScdeRteU	**Weighted Social Connectedness Contribution**	CptnIndU	LawIndxU	GovEfIdU	PolStIdU
1990	1.026	-0.631	0.940	0.380	-0.313	-0.845	-1.151	-0.535	**-0.003**	0.498	0.605	0.539	0.415
1991	0.993	-0.631	0.991	0.391	-0.856	-0.845	-1.191	-0.502	**-0.005**	0.498	0.584	0.539	0.477
1992	0.961	-0.631	1.108	0.308	-1.053	-0.845	-1.232	-0.468	**-0.006**	0.498	0.563	0.539	0.555
1993	0.961	-0.631	1.214	0.266	-0.856	-0.845	-1.272	-0.485	**-0.005**	0.498	0.543	0.539	0.617
1994	0.928	-0.631	1.361	0.214	-0.634	-0.845	-1.313	-0.451	**-0.004**	0.498	0.522	0.539	0.679
1995	0.895	-0.631	1.467	0.194	-0.535	-0.845	-1.353	-0.401	**-0.003**	0.498	0.501	0.539	0.741
1996	0.895	-0.631	1.612	0.163	-0.510	-0.845	-1.394	-0.368	**-0.003**	0.498	0.474	0.539	0.773
1997	0.895	-0.631	1.781	0.038	-0.337	-0.845	-1.434	-0.351	**-0.002**	0.498	0.467	0.539	0.881
1998	0.862	-0.631	1.928	0.048	-0.115	-0.845	-1.460	-0.251	**0.000**	0.498	0.460	0.539	0.959
1999	0.862	-0.631	2.104	0.059	0.008	-0.845	-1.544	-0.201	**0.001**	0.498	0.425	0.539	1.006
2000	0.830	-0.631	2.288	0.080	0.156	-0.845	-1.541	-0.268	**0.002**	0.498	0.405	0.539	1.146
2001	0.797	-0.631	2.371	0.090	-0.165	-0.845	-1.596	-0.301	**0.000**	0.498	0.384	0.539	1.130
2002	0.797	-0.631	2.473	0.100	-0.510	-0.845	-1.636	-0.351	**-0.001**	0.498	0.356	0.539	1.146
2003	0.764	-0.631	2.465	0.121	-0.609	-0.845	-1.677	-0.401	**-0.002**	0.498	0.343	0.539	1.270
2004	0.764	-0.631	2.905	0.131	-0.461	-0.845	-1.717	-0.451	**0.000**	0.498	0.329	0.539	1.332

RIE Index Weighted Results - USA

Year	V&AindU	Weighted Institutional Quality Contribution	EmpRateU	AdUptRtU	LTUnptU	O_WkHrsU	JblessHU	RelPvRtU	RlPvEldU	Weighted Economic Security Contribution
1990	0.490	**0.003**	0.721	-0.415	0.382	0.977	0.206	-0.159	0.314	**0.013**
1991	0.471	**0.003**	0.601	-1.099	0.311	2.012	0.228	-0.159	0.314	**0.014**
1992	0.445	**0.003**	0.575	-1.535	-0.142	1.805	0.250	-0.159	0.314	**0.007**
1993	0.418	**0.003**	0.592	-1.161	-0.183	1.080	0.273	-0.159	0.314	**0.005**
1994	0.399	**0.003**	0.652	-0.664	-0.252	0.666	0.295	-0.159	0.314	**0.005**
1995	0.373	**0.003**	0.670	-0.353	-0.012	-0.265	0.317	-0.159	0.314	**0.003**
1996	0.360	**0.003**	0.678	-0.228	0.010	0.666	0.371	-0.159	0.314	**0.010**
1997	0.327	**0.003**	0.721	0.021	0.077	-0.472	0.425	-0.159	0.314	**0.006**
1998	0.281	**0.003**	0.721	0.270	0.148	-0.369	0.479	-0.159	0.314	**0.009**
1999	0.275	**0.003**	0.730	0.456	0.261	-0.265	0.533	-0.159	0.314	**0.012**
2000	0.255	**0.003**	0.807	0.518	0.332	1.287	0.587	-0.159	0.314	**0.023**
2001	0.229	**0.003**	0.721	0.083	0.325	3.564	0.590	-0.159	0.314	**0.034**
2002	0.222	**0.003**	0.627	-0.539	0.097	4.185	0.627	-0.159	0.314	**0.032**
2003	0.183	**0.003**	0.601	-0.664	-0.212	5.013	0.666	-0.159	0.314	**0.035**
2004	0.150	**0.003**	0.601	-0.415	-0.293	4.806	0.703	-0.159	0.314	**0.035**

RIE Index Weighted Results - USA

Year	Socio-Cultural Theme Contribution	Environment Area Contribution	RIE weighted result
1990	0.013	-0.070	-0.152
1991	0.012	-0.066	-0.150
1992	0.004	-0.067	-0.137
1993	0.003	-0.065	-0.179
1994	0.004	-0.067	-0.153
1995	0.003	-0.068	-0.163
1996	0.011	-0.064	-0.151
1997	0.007	-0.078	-0.177
1998	0.012	-0.078	-0.185
1999	0.016	-0.068	-0.191
2000	0.028	-0.055	-0.203
2001	0.038	-0.030	-0.180
2002	0.034	-0.017	-0.169
2003	0.036	-0.006	-0.133
2004	0.038	0.000	-0.110

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Appendix F: Coefficient of Variation Results

Coefficient of Variation (CV) Results Used for Sensitivity Analysis Testing [Top 5]

Australia CV Results		
Variable	**CV**	**Rank**
Overwork hours	297.440	**1**
Foreign direct investment, net inflows	0.621	**2**
Stocks traded – total value	0.538	**3**
Personal computers	0.471	**4**
Net lending/Net borrowing	-0.460	5

Mexico CV Results		
Variable	**CV**	**Rank**
Overwork hours	2.345	**1**
Voice and Accountability index	-2.204	**2**
Personal computers	0.721	**3**
Real interest rate	0.661	**4**
Net lending/Net borrowing	-0.587	5

USA CV Results		
Variable	**CV**	**Rank**
Overwork hours	-39.236	**1**
Foreign direct investment, net inflows	0.743	**2**
Stocks traded – total value	0.718	**3**
Net lending/Net borrowing	-0.592	**4**
Personal computers	0.412	5

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Appendix G: Correlation Results

Correlation Results - Australia

Year	EPU	Biodiversity	Blt Envt	Transport
1990	-0.007	-0.005	0.003	0.003
1991	-0.007	-0.007	0.003	0.004
1992	-0.012	-0.01	0.003	0.005
1993	-0.008	-0.012	0.003	0.005
1994	-0.014	-0.015	0.003	0.005
1995	-0.017	-0.017	0.004	0.006
1996	-0.012	-0.02	0.004	0.006
1997	-0.015	-0.022	0.004	0.005
1998	-0.023	-0.025	0.004	0.005
1999	-0.025	-0.027	0.004	0.005
2000	-0.025	-0.028	0.004	0.006
2001	-0.032	-0.032	0.004	0.006
2002	-0.033	-0.034	0.004	0.007
2003	-0.039	-0.037	0.004	0.007
2004	-0.045	-0.04	0.004	0.008

	EPU	*Biodiversity*
EPU	1	
Biodiversity	**0.959176852**	1

	Blt Envt	*Transport*
Blt Envt	1	
Transport	**0.665771382**	1

Correlation Results - Australia

Year	HR	NR
1990	0.117	0.000
1991	0.134	-0.01
1992	0.142	-0.01
1993	0.157	0.01
1994	0.183	-0.023
1995	0.139	-0.009
1996	0.168	0.012
1997	0.156	0.000
1998	0.167	-0.001
1999	0.183	0.004
2000	0.182	-0.007
2001	0.182	-0.014
2002	0.188	-0.062
2003	0.185	-0.047
2004	0.181	-0.074

Year	ICT	Transport
1990	0.005	0.003
1991	0.005	0.004
1992	0.006	0.005
1993	0.008	0.005
1994	0.009	0.005
1995	0.011	0.006
1996	0.012	0.006
1997	0.014	0.005
1998	0.015	0.005
1999	0.018	0.005
2000	0.02	0.006
2001	0.022	0.006
2002	0.023	0.007
2003	0.025	0.007
2004	0.027	0.008

Year	NR	Phys Envt
1990	0.000	0.022
1991	-0.01	0.044
1992	-0.01	0.029
1993	0.01	0.048
1994	-0.023	0.024
1995	-0.009	0.025
1996	0.012	0.014
1997	0.000	0.008
1998	-0.001	0.012
1999	0.004	0.003
2000	-0.007	-0.002
2001	-0.014	-0.009
2002	-0.062	-0.014
2003	-0.047	-0.018
2004	-0.074	-0.019

	HR	*NR*
HR	1	
NR	**-0.456683**	1

	ICT	*Transport*
ICT	1	
Transport	**0.8415759**	1

	NR
NR	1
Phys Envt	**0.65083555**

Correlation Results - Australia

Year	HR	SCE
1990	0.117	-0.004
1991	0.134	-0.011
1992	0.142	-0.017
1993	0.157	-0.032
1994	0.183	-0.028
1995	0.139	-0.015
1996	0.168	-0.007
1997	0.156	-0.008
1998	0.167	0.000
1999	0.183	0.006
2000	0.182	0.016
2001	0.182	0.031
2002	0.188	0.04
2003	0.185	0.052
2004	0.181	0.056

Phys Envt
1

	HR	*SCE*
HR	1	
SCE	**0.5653862**	1

Correlation Results - Mexico

Year	EPU	Biodiversity
1990	0.023	0.033
1991	0.023	0.031
1992	0.022	0.029
1993	0.02	0.027
1994	0.011	0.025
1995	0.02	0.023
1996	0.017	0.021
1997	0.009	0.018
1998	0.007	0.016
1999	0.005	0.014
2000	-0.004	0.01
2001	-0.004	0.01
2002	-0.005	0.01
2003	-0.003	0.006
2004	0.001	0.003

Blt Envt	Transport
-0.007	-0.016
-0.007	-0.016
-0.006	-0.015
-0.006	-0.015
-0.006	-0.015
-0.007	-0.016
-0.007	-0.016
-0.007	-0.015
-0.005	-0.015
-0.005	-0.015
-0.005	-0.015
-0.005	-0.014
-0.005	-0.014
-0.005	-0.014
-0.005	-0.014

	EPU	*Biodiversity*
EPU	1	
Biodiversity	**0.927756354**	1

	Blt Envt	*Transport*
Blt Envt	1	
Transport	**0.825722824**	1

Correlation Results - Mexico

Year	HR	NR	ICT	Transport	NR	Phys Envt
1990	-0.104	0.100	-0.023	-0.016	0.100	0.061
1991	-0.088	0.105	-0.023	-0.016	0.105	0.077
1992	-0.083	0.104	-0.023	-0.015	0.104	0.097
1993	-0.087	0.105	-0.022	-0.015	0.105	0.112
1994	-0.078	0.098	-0.022	-0.015	0.098	0.117
1995	-0.070	0.124	-0.022	-0.016	0.124	0.086
1996	-0.082	0.107	-0.021	-0.016	0.107	0.067
1997	-0.068	0.104	-0.021	-0.015	0.104	0.06
1998	-0.075	0.100	-0.021	-0.015	0.100	0.091
1999	-0.067	0.106	-0.02	-0.015	0.106	0.095
2000	-0.069	0.093	-0.019	-0.015	0.093	0.098
2001	-0.078	0.103	-0.019	-0.014	0.103	0.122
2002	-0.082	0.099	-0.018	-0.014	0.099	0.122
2003	-0.072	0.102	-0.018	-0.014	0.102	0.122
2004	-0.060	0.111	-0.017	-0.014	0.111	0.114

	HR	*NR*
HR	1	
NR	**0.261786**	1

	ICT	*Transport*
ICT	1	
Transport	**0.8060584**	1

	NR	*Phys Envt*
NR	1	
Phys Envt	**-0.1667564**	1

Correlation Results - Mexico

Year	HR	SCE
1990	-0.104	-0.008
1991	-0.088	-0.001
1992	-0.083	0.002
1993	-0.087	0.004
1994	-0.078	0.003
1995	-0.07	0.012
1996	-0.082	-0.006
1997	-0.068	0.015
1998	-0.075	0.019
1999	-0.067	0.026
2000	-0.069	0.020
2001	-0.078	0.035
2002	-0.082	0.019
2003	-0.072	0.038
2004	-0.06	0.043

	HR	*SCE*
HR	1	
SCE	**0.738747**	1

Correlation Results - USA

Year	EPU	Biodiversity	Blt Envt	Transport
1990	-0.016	-0.028	0.005	0.013
1991	-0.015	-0.03	0.004	0.012
1992	-0.015	-0.032	0.004	0.013
1993	-0.019	-0.034	0.004	0.014
1994	-0.023	-0.035	0.004	0.016
1995	-0.024	-0.037	0.005	0.017
1996	-0.025	-0.038	0.005	0.018
1997	-0.029	-0.041	0.005	0.020
1998	-0.034	-0.042	0.005	0.020
1999	-0.037	-0.05	0.006	0.022
2000	-0.039	-0.046	0.006	0.023
2001	-0.043	-0.048	0.006	0.022
2002	-0.045	-0.052	0.006	0.023
2003	-0.048	-0.051	0.006	0.025
2004	-0.052	-0.051	0.006	0.027

	EPU	*Biodiversity*
EPU	1	
Biodiversity	**0.967020621**	1

	Blt Envt	*Transport*
Blt Envt	1	
Transport	**0.889177**	1

Correlation Results - USA

Year	HR	NR
1990	-0.013	-0.100
1991	-0.007	-0.105
1992	-0.009	-0.086
1993	-0.022	-0.119
1994	-0.031	-0.088
1995	-0.025	-0.105
1996	-0.024	-0.097
1997	-0.03	-0.097
1998	-0.03	-0.104
1999	-0.031	-0.112
2000	-0.049	-0.099
2001	-0.041	-0.112
2002	-0.043	-0.112
2003	-0.038	-0.107
2004	-0.028	-0.098

	HR	*NR*
HR	1	
NR	**0.277921**	1

ICT	Transport
0.018	0.013
0.019	0.012
0.02	0.013
0.021	0.014
0.022	0.016
0.023	0.017
0.025	0.018
0.027	0.020
0.029	0.020
0.03	0.022
0.033	0.023
0.035	0.022
0.036	0.023
0.037	0.025
0.039	0.027

	ICT	*Transport*
ICT	1	
Transport	**0.9747523**	1

NR	Phys Envt
-0.100	-0.083
-0.105	-0.077
-0.086	-0.071
-0.119	-0.068
-0.088	-0.072
-0.105	-0.071
-0.097	-0.075
-0.097	-0.085
-0.104	-0.09
-0.112	-0.083
-0.099	-0.084
-0.112	-0.068
-0.112	-0.052
-0.107	-0.042
-0.098	-0.038

	NR	*Phys Envt*
NR	1	
Phys Envt	**-0.136852**	1

Correlation Results - USA

Year	HR	SCE
1990	-0.013	0.013
1991	-0.007	0.012
1992	-0.009	0.004
1993	-0.022	0.003
1994	-0.031	0.004
1995	-0.025	0.003
1996	-0.024	0.011
1997	-0.03	0.007
1998	-0.03	0.012
1999	-0.031	0.016
2000	-0.049	0.028
2001	-0.041	0.038
2002	-0.043	0.034
2003	-0.038	0.036
2004	-0.028	0.038

	HR	*SCE*
HR	1	
SCE	**-0.625161**	1