CSES Working Paper No. 5
July 1995

A NEW ERA OF WORLD ECONOMIC GROWTH

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ISSN: 1322-5138 ISBN: 1-86272-465-2

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ABSTRACT

This paper argues that the rate of growth of the world economy is likely to accelerate over the coming decade as a result of the impact of the new information technologies on productivity, improvements in the capacity of businesses to manage accelerating technological change, and a continuing increase in the contribution of the Asian economies to world growth.

The analysis employed in the paper is to focus on four major influences on the medium term growth of industrialised economies: the macroeconomic framework, microeconomic influences, technological change, and the role of management. These influences are analysed in terms of their contribution over the past few decades, and their likely future impact. The development path of the rapidly growing Asian economies, and the role played by the diffusion of advanced technology, is explored. Finally, some long term constraints on growth associated with environmental factors and ageing populations are identified.

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INTRODUCTION

The development of the world economy may be entering one of its strongest phases in history. The recessed conditions for demand in the major industrialised economies during the early 1990's have obscured important trends on the supply side of the world economy. A surge in the growth of world productivity is beginning based on:

- the impact of the information revolution;
- changes in the way in which enterprises are managed; and
- the rapid catch-up of many Asian economies to the standards of the industrialised economies.[1]

Analysing Economic Growth

In order to understand the basis for optimism about world growth prospects, it is necessary to analyse the determinants of economic growth over recent decades. This paper utilises relevant areas of applied and theoretical economics in order to identify the key influences on medium term growth trends in the world economy.

The traditional neoclassical growth model (Solow 1957, 1970) leaves unexplained the major determinants of productivity growth. However, historical statistics indicate that the trend of productivity in individual economies has varied considerably from one decade to the next, and the trend in particular time periods for individual economies has also varied. Tables 1 and 2 indicate the trend in productivity and GDP per capita for selected economies over the past one hundred and twenty years.

Table 1. Average Annual Rate of Growth of GDP per Man Hour, 1870 to 1989, Selected Major Industrialised Economies.

	U.S.A.	*Japan*	*W.Germany*	*U.K.*
1870-1890	1.6	2.0	1.9	1.4
1890-1913	2.2	1.7	1.9	1.0
1913-1929	2.4	3.5	1.4	1.5
1929-1938	1.4	2.4	2.4	0.9
1938-1950	3.2	-0.7	-0.4	2.2
1950-1960	2.5	5.7	6.9	2.3
1960-1973	2.5	9.1	5.2	3.9
1973-1989	1.1	3.2	2.7	2.1

Source: Derived from Maddison (1991).

[1]The exposure to market forces of the economies of Eastern Europe and the ex-Soviet Union is also providing a stimulus to the world economy, but the analysis of these so-called Economies in Transition is very complex, and this paper concentrates on the industrialised and developing economies.

Table 2. Average Annual Rate of Growth of GDP per Capita, 1900-87, Selected Industrialised and Developed Economies.

	1900-13	*1913-29*	*1929-50*	*1950-73*	*1973-87*
U.S.A.	2.0	1.7	1.5	2.2	1.5
W.Germany	1.6	0.8	0.7	4.9	2.0
U.K.	0.7	0.3	1.3	2.5	1.5
Japan	1.2	2.4	-0.2	8.0	2.8
S.Korea	0.8	1.3	-1.3	5.1	6.2
Taiwan	0.3	2.1	-0.9	6.2	6.0
Indonesia	0.5	1.4	-1.5	2.1	3.1
China	0.3	0.4	-1.3	3.7	6.0
India	0.4	0.1	-0.5	1.6	1.8
Mexico	1.8	0.1	1.6	3.1	0.9
Brazil	1.4	1.4	2.4	3.8	2.2
Argentina	2.5	0.9	0.6	2.1	-0.8

Source: Derived from Maddison (1989).

Denison (1985) analysed the sources of economic growth in the United States using a neoclassical production function but allowing for variations in the quality of factor inputs and the efficiency with which factors could be utilised. He was able to account for some 25-30% of the change in US productivity trend since 1973, but this still left a large unexplained residual contribution to the productivity trend.

The so-called new growth theories[2] have attempted to endogenise some of the previously exogenous elements in economic growth. They stress the importance of scale economies at both the plant and economy levels, externalities associated with investment in capital equipment, the importance of human capital formation, and the endogeneity of some aspects of technological change. However, these theories do not provide a satisfactory explanation for the dramatic slowing in productivity growth in the United States in the 1970s, nor do they account for some of the more fundamental differences in productivity trends among the developing economies.[3]

Denison (1985) suggested that changes in the rate technological progress and in management practices accounted for a significant proportion of the unexplained variations in residual productivity in the United States during the 1970s. In this paper, we explore some of the recent developments in the theory of innovation and in managerial economics in order to throw light on both the decline in productivity growth experienced by many industrialised economies during the 1970s, and the likely trend in economic growth in the coming decade.

[2]Surveys of these theories are contained in Bureau of Industry Economics (1992) and Sheehan (1993).
[3]Note the comparison between Hong Kong and Singapore in Young (1991).

Plan of Action

We begin by analysing the way in which the macroeconomic environment affects productivity growth in the industrialised economies, then examine the microeconomic determinants of productivity trends. The third section of the paper analyses the economics of innovation and its contribution to the economic growth of the industrialised economies. The fourth section discusses management and its role in economic growth, while the following section draws together the analysis of past and prospective productivity trends in the industrialised economies.

The sixth section of the paper examines the growth of the Asian economies with particular emphasis on the diffusion of innovation. The next section summarises some key determinants of growth in the other developing economies (including a brief discussion of the political economy of growth), while the final section examines some possible long term constraints on growth (political factors, international trade disputes, the physical environment, and ageing population structures).

THE MACROECONOMIC ENVIRONMENT AND MEDIUM TERM ECONOMIC GROWTH

The neoclassical growth model (Solow 1957 and 1970) allows only a limited role for macroeconomic developments to influence the medium term growth rate. Aggregate growth rates would be reduced by secular increases in the unemployment rate because they would imply a reduced rate of growth in labour inputs (demographic conditions being given) but this would also temporarily increase the rate of growth in productivity (through a higher capital/labour ratio), although the productivity trend would eventually return to its long term equilibrium. Macroeconomic disturbances that resulted in a secular reduction in the savings/investment ratio to GDP would temporarily reduce the rate of growth of productivity, but it would eventually return to the long term equilibrium rate.

The new growth models implicitly allow a greater role for macroeconomic disturbances as influences on medium term growth. Increasing returns to scale imply that continuing increases in unemployment or reductions in the savings/investment ratio will reduce the trend in productivity growth on an ongoing basis. The investment ratio can also have a direct impact on productivity growth (through the effects of externalities), and the rate of technological progress may be influenced by macroeconomic conditions (see Bureau of Industry Economics 1992 and Sheehan 1993). Macroeconomic analysis suggests that the growth process can be adversely affected by inflation and by financial crises because of their impacts on economic efficiency.

In the remainder of this section we will analyse the influence of the following factors on medium term productivity growth in the industrialised economies:

- demography;
- secular changes in unemployment rates;

- aggregate investment;
- world trade;
- inflation and the quality of investment; and
- financial crises and the quality of investment.

The main emphasis in the analysis will be to assess the direction of impacts in the period from 1960 to the present, and assess the possible outcomes for the next decade. Table 3 provides some statistics on the recent historical trends in productivity in the major industrialised economies.

Table 3. Annual Rates of Growth of Real GDP per Person Employed, G7 Economies, 1960 to 1995.

	1960-68	*1968-73*	*1973-79*	*1979-88*	*1988-95*
U.S.A.	2.6	1.0	0.0	1.1	1.0
Japan	8.5	7.6	2.9	3.0	1.2
W. Germany	4.2	4.1	2.9	1.7	2.1
U.K.	2.7	3.2	1.3	2.0	1.6
France	4.9	4.3	2.5	2.0	1.5
Italy	6.3	4.9	2.8	1.9	1.9
Canada	2.6	2.5	1.3	1.3	0.9
G7	4.0	3.2	1.5	1.7	1.4

Source: Derived from OECD (1990, 1994b), including OECD forecasts for 1994 and 1995.

Demographic Influences

Demographic factors, through their impact on the size of the labour force, can clearly influence the rate of economic growth in the medium and long term. Their impact on productivity growth is more difficult to analyse. There is a case for suggesting a slight direct relationship between labour force growth and productivity growth in the long term in the highly industrialised countries. This would occur principally because of economies of scale, although highly efficient education and training systems (including on-the-job training) can lead to a rapid accumulation of skills in younger workers, such that an acceleration in the rate of entry of young workers into the work force might lead to a lagged positive response from productivity in the longer term. Against these influences, younger workers are likely to have relatively low productivity while they are being trained, and immigration (an important influence on productivity in some industrialised countries) could have either positive or negative effects on productivity, depending on the skill composition of the immigrants and the ability of the country receiving those immigrants to utilise their skills.

For the G7 economies as a whole, the growth of the labour force accelerated in the 1968-73 and 1973-79 periods (note Table 4) implying that the downturn in productivity growth occurred despite the demographic influences. The subsequent reduction in the labour force growth may have made a very minor negative contribution to productivity growth in the 1980s and early 1990s.

Table 4. Rates of Growth of the Labour Force in the Major Industrialised Economies, 1960 to 2005.

	1960-68	*1968-73*	*1973-79*	*1979-88*	*1989-95*	*1995-00*	*2000-05*
U.S.A.	1.6	2.4	2.6	1.6	1.2	1.0/1.5	0.9/1.2
Japan	1.4	0.9	0.8	1.1	1.2	-0.2/0.1	-0.4/-0.2
Germany	-0.1	0.7	-0.2	0.6	0.4	-0.1/0.7	-0.5/0.1
U.K.	0.4	0.2	0.6	0.6	-0.2	0.2/0.6	0.3/0.5
France	0.6	1.1	0.9	0.4	0.4	-	-
Italy	-0.6	-0.2	1.1	1.0	-0.7	-	-
Canada	2.6	3.1	3.2	1.9	1.1	-	-
G7	1.0	1.4	1.5	1.2	0.7	-	-

Sources: OECD (1990, 1994b), and long term forecasts derived from World Bank (1994b).

Over the next decade, demographic projections (World Bank 1994b) imply a reduction in the numbers of young people entering the work force in the G7 economies. This effect is likely to be very pronounced in Europe and Japan. However, its impact on the size of the workforce may be reduced if participation rates continue to increase, and if immigration from outside the G7 area continues at recent high rates. In the United States, immigration from Latin America and Asia may keep the workforce expanding at moderate rates, although the skill composition of the migration (relatively low skilled from Latin America, and highly skilled from Asia) needs to be taken into account. The Japanese labour force is likely to be declining over the forecast period, and the consequent ageing of the work force could create some problems for productivity. In Germany, the contribution of reduced numbers of young entrants to the workforce may be offset by increased participation rates and continuing immigration from Eastern Europe.

Unemployment

In an efficient labour market, increases in unemployment associated with recession conditions would be offset by reductions in unemployment during the recovery from recession. In such circumstances, cyclical fluctuations would have no impact on the medium term trend in labour inputs into the growth process. Where labour markets are inflexible, however, short term problems with demand that result in increased unemployment can lead to longer term unemployment problems because distortions in the

market prevent the rehiring of unemployed workers.[4] Hence, recession conditions can have longer term implications for the growth process because they result in higher unemployment in both the short and longer term, thereby constraining the growth of effectively utilised labour inputs.

The impact of secular rises in unemployment rates on productivity growth is more complex to analyse. Higher unemployment rates will reduce productivity growth because they imply unexploited potential scale economies. However, higher aggregate unemployment rates are also associated with an increased incidence of long term unemployment in the workforce, and this concentration of unemployment tends to be on the less skilled members of the workforce. Hence, labour productivity may be actually increased because of the higher proportion of skilled workers remaining in employment.[5]

Table 5. Average Unemployment Rates in the Major Industrialised Economies, 1960-95.

	1960-67	*1968-73*	*1974-79*	*1980-88*	*1989-95*
U.S.A.	5.0	4.6	6.7	7.4	6.1
Japan	1.2	1.3	2.0	2.5	2.4
W.Germany	0.9	0.8	2.9	6.2	5.4
U.K.	1.7	3.2	5.2	11.7	8.7
France	1.0	n.a.	3.1	6.9	10.6
Italy	3.9	4.0	4.2	6.4	10.6
Canada	4.9	5.1	6.4	9.2	9.7
G7	3.0	3.2	4.9	7.0	6.7

Sources: OECD (1990, 1994b).

The data in Table 5 show that there have been relatively small changes in average unemployment rates over the past three decades in Japan and the United States, but more significant changes (rises) in the major European economies and Canada. The tendency for increasing unemployment rates in the European economies has held back the growth of employed labour when compared with the total labour force (in the case of Germany, employment declined by 0.5% per annum between 1973 and 1979, compared with a decline of 0.2% per annum in the labour force, and employment rose by only 0.1% per annum between 1979 and 1988, compared with a growth of 0.6% per annum for the labour force). The impact of this trend on the average skills of the employed labour force may have been more important than the loss of potential scale economies, but the net impact on productivity trends has probably been fairly minor.

[4]The final section of this paper discusses these labour market issues in more detail.

[5]Another way of looking at this is that an inflexible labour market, when compared with a more flexible labour market in the absence of different conditions for the demand for labour, will result in equilibrium at higher wage rates and higher productivity levels.

Current labour market conditions suggest that unemployment rates in the medium term could fall slightly in Japan, the United Kingdom and Canada, while the outlook is uncertain in Germany, France and Italy.

Investment

The proportion of GDP devoted to investment can have a positive impact on the trend in productivity where scale economies and externalities associated with investment are of consequence. Macroeconomic difficulties, by increasing uncertainty, can lead to a reduction in the investment ratio in the medium term, and hence a decline in the rate of productivity growth.

Table 6 charts the medium term trend in the investment ratio in the G7 economies.

Table 6. Gross Fixed Capital Formation as a Percentage of GDP, Major Industrialised Economies, 1960 to 1995.

	1960-67	*1968-73*	*1974-79*	*1980-88*	*1989-95*
U.S.A.	18.0	18.4	18.7	17.8	16.7
Japan	31.0	34.6	31.8	29.2	30.7
W.Germany	25.2	24.4	20.8	20.5	20.5
U.K.	17.7	19.1	19.4	17.2	16.7
France	23.2	24.6	23.6	20.4	20.1
Italy	24.4	24.0	24.0	21.4	19.7
Canada	22.6	22.1	23.5	21.4	19.6
G7	21.0	22.3	21.9	20.6	20.3

Sources: OECD (1990, 1994b).

The dramatic slowing in American productivity growth in the late 1960s and the 1970s occurred despite a slight rise in the investment ratio. The decline in productivity growth in the other economies in the 1970s was accompanied by a significant reduction in the investment ratio only in West Germany and Japan. During the 1980s the investment ratio declined in all the G7 economies, and this decline continued for most economies into the first half of the 1990s. Current forecasts suggest that the investment ratio will recover somewhat in the remainder of the 1990s, particularly in the United States and Germany.

World Trade

The growth in the volume of world trade provides an important means for the major industrialised economies to achieve scale economies, particularly through learning by doing and the incentive to innovate.

Table 7 summarises the trend in world trade over the past thirty years. During the 1970s, the marked deceleration in the growth of world trade was associated with reduced capacity utilisation for some of the most capital intensive industries and generally declining productivity growth. It is interesting that the rate of productivity growth for the G7 economies reduced from 3.2% per annum between 1968 and 1973 to 1.5% between 1973 and 1979 (a decline of 1.7 percentage points), while it declined from 4.4% per annum to 2.2% per annum (down 2.2 percentage points) for the smaller European economies that were more dependent on world trade.

Table 7. Average Annual Growth in the Volume of World Trade, 1964 to 1995.

1964-68	8.3
1968-73	9.6
1973-79	4.6
1979-89	4.2
1989-95	6.1

Sources: Historical statistics derived from IMF (1994) and forecasts from OECD (1994b).

During the 1980s, the growth in world trade remained subdued. The G7 economies achieved productivity growth of 1.7% per annum (up 0.2 percentage points), while the smaller European economies achieved productivity growth of 1.4% per annum (down 0.8 percentage points).

Between 1989 and 1995, it is estimated that the growth of world trade has accelerated despite modest growth in the industrialised countries. Trade was boosted by the impetus provided by Asian economic growth, and the domestic nature of the industrialised countries' problems (their international trade held up, with the recession being most severe in non-tradeable construction activity). Trade volumes should continue to accelerate over the coming decade as the increasing importance of Asian economies in world trade continues, and the Economies in Transition become more open to international markets.

Inflation and the Quality of Investment

High and variable inflation rates can lead to great uncertainty about future inflation rates and have a distorting influence on the economy.[6] The efficiency costs of inflation occur as a result of:

- increased information costs in relation to corporate planning and investment decisions; and
- heightened uncertainty about future relative prices and real interest rates.

One consequence of inflation is that longer term investment is discouraged (greater risk and uncertainty implies higher discount rates and this penalises investment proposals that have long gestation periods and yield returns far into the future). A second consequence is that short term investments with quick paybacks are encouraged. The third consequence is that speculation on possible capital gains is encouraged at the expense of projects yielding a significant net operating surplus. Projects that might boost productivity in the long term (particularly those that improve the economic infrastructure) are foregone, and encouragement is given to projects that may have little positive impact on economic efficiency.

The distorting influence on inflation will occur with a lag since investment reacts to economic change with a lag (because of long gestation periods), and the impact of a deteriorating investment quality on productivity builds up over time. The inflation problem in the G7 economies developed during the late 1960s and early 1970s, reaching its peak in the mid-to-late 1970s, and reducing during the 1980s and into the 1990s (see Table 8).

Table 8. Average Annual Rates of Growth in GDP Deflators, Major Industrialised Economies, 1960 to 1995.

	1960-68	*1968-73*	*1973-79*	*1979-88*	*1989-95*
U.S.A.	2.5	5.3	8.0	4.8	3.3
Japan	5.4	6.9	8.1	1.6	1.6
W.Germany	3.1	6.3	4.8	3.0	3.3
U.K.	3.6	7.5	16.0	7.6	4.8
France	4.0	6.8	10.9	7.6	2.4
Italy	4.3	7.5	17.1	12.2	5.2
Canada	2.8	5.3	4.2	5.7	2.2
G7	3.2	6.1	8.6	4.9	3.2

Sources: OECD (1990, 1994b).

The negative impact of inflation on productivity growth was probably at its peak in the 1970s, with the problem gradually easing in the 1980s. Canada and Germany were less

[6]Fischer and Modigliani (1978) is the standard reference on this subject; Denison (1985) argues that increasing inflation in the 1970s may have reduced productivity growth in the American economy.

affected than the other G7 economies. Distortions in France and the United Kingdom and especially Italy remained longer than in the United States.

Financial Crises and the Quality of Investment.

It is interesting to note that the possible impact on economic efficiency of the problems experienced by financial institutions over the past fifteen years has not been taken into account in the analysis of growth determinants. During the early post-war period, the growth and progressive internationalisation occurring in financial markets may have contributed positively in a small way to productivity growth in the major industrialised economies. From the early 1980s, a series of crises in financial markets has raised concerns about the overall impact of the financial system on economic stability and efficiency.[7]

Following a long period of stability during the post-war period, the financial system began to encounter a series of major problems. In the early 1980s, the developing country debt crisis arose as a result of excessive lending by the banks in the industrialised countries. This was followed in the mid-1980s by the savings and loan crisis in the United States. In the late 1980s, banks in a large number of industrialised countries (particularly Finland, Sweden, Norway, the United States, and Japan) experienced significant difficulties.

These crises were associated with the liberalisation of financial markets. This liberalisation should have resulted in increased efficiency in financial markets with a consequent payoff for productivity growth in the economy. However, the immediate impact of liberalisation was that banks faced much greater competition and, in an effort to defend their market share, increased the riskiness of their lending portfolios.

The most recent crisis has had major consequences for the world economy. Loan losses by banks in Sweden in 1991-92 were 6.7% of GDP, in Finland 6.0%, Norway 4.2% and for commercial banks in the United States, 1.0%. Non-performing loans of the Japanese banks were 2.7% of GDP in 1992, for US commercial banks they were 2.5% and for banks in Finland 10.9%. Government support required for these banking systems was equivalent to 3.2% of GDP for the US savings and loans institutions, 0.5% for insurance loss cover for US commercial banks, 3.1% for Swedish banks, 2.8% for Norwegian banks, and 4.0% for Finnish banks (IMF 1993).

In addition to being the major contributor to the recessions experienced during the early 1990s in the United States, Japan, and Scandinavia, the financial crises also had an adverse impact on the trend in productivity. The sizeable volume of loan losses and non-performing loans suggest that substantial finance was provided for investments which have failed to generate adequate returns, implying a significant negative impact on the productivity of capital. By the 1990s, banks were under significant pressure to reduce

[7]The key reference on this topic is IMF (1993).

risks and improve the quality of their portfolios, and they therefore swung to highly conservative lending policies, which had a part in the subsequent decrease in overall investment ratios.

The problems experienced in the financial markets have had a significant negative impact on productivity trends in the United States, Japan, and several smaller European economies, and they also had an adverse impact on the United Kingdom, France and Italy. Germany was not affected. In most of the major industrialised economies the banks had returned to health by 1994, and so the negative productivity impact can be expected to cease over the next few years. The exception may be Japan, where the restoration to full health of the financial system is taking much longer.

The Macroeconomic Environment and Productivity

The preceding analysis suggests that changes in the macroeconomic environment can have a medium-term impact on productivity growth through a diverse range of influences.

The downturn in productivity growth after 1973 was influenced by slower growth in world trade volumes and a decline in the quality of investment associated with higher inflation. However, macroeconomic influences would not have been responsible for the major part of this reduction in productivity growth. In the United States, employment growth actually accelerated while productivity growth stopped, and a decline in the quality of investment associated with higher inflation appears to be the only significant negative macroeconomic influence on productivity.

During the 1980s lower investment ratios appeared to be the major macroeconomic influence on productivity, preventing a swifter recovery in productivity growth. The significant recovery in the productivity trend in the United States remains unexplained by macroeconomic influences. In the early 1990s, the key macroeconomic factor was probably the negative influence of financial problems on productivity; it is interesting to note that the only G7 economy not to experience problems in its financial sector was Germany, and the productivity trend strengthened in this economy over this period.

The next decade should see a positive contribution to the productivity trend from macroeconomic influences. Investment ratios appear to be increasing, world trade strengthening, lower inflation more entrenched, and the financial problems abating. Most of the major G7 economies should participate in this trend, the exception being Japan, where the rapidly ageing population, the lingering financial problems, and reduced investment ratios are likely to constrain economic growth.

THE MICROECONOMIC DETERMINANTS OF PRODUCTIVITY GROWTH

The four main groups of microeconomic determinants of productivity growth to be analysed in this paper are changes in economic structure, the quality of labour and human capital, the structure of investment, and regulatory issues. In the case of the structure of investment there is some overlap with the analysis of the previous section of the paper, the distinction being that where the influences form an important aspect of the macroeconomic framework (such as inflation and the health of the financial sector) they are considered as being macroeconomic influences, whereas other structural influences are discussed under the heading of microeconomic influences.

Economic Structure

Lewis (1955) analysed the process whereby labour was drawn from low-productivity agricultural activities and absorbed into an expanding industrial sector. This process was still contributing significantly to the productivity of continental European economies in the first two post-war decades, particularly in Italy and France. Tables 9 and 10 provide some relevant statistics on economic structure.

As the proportion of the workforce in agriculture declined, the potential for more productivity-boosting transfers reduced (Table 9). The rate of transfer of labour out of agriculture was still considerable in Japan, France and Italy in the late 1960s, but it has been of reducing importance since 1973. The narrowing in the productivity gap between agriculture and the rest of the economy in most G7 economies (Table 10, but note the exception of Japan) has also reduced the scope for productivity enhancement through labour transfers.

Table 9. Employment in Agriculture as a Percentage of Civilian Employment, Major Industrialised Economies, 1960 to 1988.

	1960-67	*1968-73*	*1974-79*	*1980-88*
U.S.A.	6.9	4.6	3.9	3.3
Japan	25.6	16.7	12.1	9.1
W. Germany	11.9	8.5	6.5	5.2
U.K.	4.2	3.2	2.8	2.5
France	19.3	13.3	9.8	7.7
Italy	27.7	20.4	16.1	11.9
G7	14.5	9.8	7.4	5.8

Source: OECD (1990).

Table 10. Average Annual Rate of Growth in Real GDP per Person Employed and Real Value Added per Person Employed, Major Industrialised Economies, 1960 to 1988

	GDP per Person Employed	*V.A. in Agriculture p.p.e.*
U.S.A.	1.3	3.3
Japan	5.3	3.7
France	3.3	5.5
Italy	3.9	5.6
G7	2.5	4.5

Source: OECD (1990).

Human Capital and the Quality of Labour.

Arguably improvements in the reach and quality of education and the efficiency of training exercise a fairly steady (and most likely positive) contribution to growth which changes fairly slowly over time. This is not to suggest that the efficiency of education and training frameworks does not change significantly, but, because they are impacting on only a small proportion of the workforce at any one time, the impacts will cumulate slowly. Denison (1985) suggested that the contribution of education to productivity growth in the United States actually increased by 0.05 percentage points per annum in 1973-82 when compared with 1948-73. Odagiri (1994) analyses the striking contribution that on-the-job training makes to productivity in Japan.

The Quality of Investment

Barro (1989) assumed that public infrastructure investment is effectively provided free of charge to potential users and can therefore be treated as an externality for these users. His empirical analysis indicated that the level of infrastructure investment was a significant determinant of growth. This argument is particularly relevant to road construction and improvement, since charges for their services (through toll roads) are fairly rare, and where they occur, do not capture the external benefits from road improvements accruing to users of alternative roads (through reduced congestion). Denison (1985) indicated that the extension of the American federal highway system had a positive impact on productivity in the early post-war period, but that it began to deteriorate post-1973 as a result of reduced investment, and this contributed to the change in overall productivity trends. Gross public capital formation as a proportion of GDP in the United States averaged 2.90% in 1965-73, 2.65% in 1974-82, 2.34% in 1983-89, and 2.49% in 1990-93 (IMF 1994).

The world energy crises of 1973 and 1979 led to urgent pressures for energy savings. Short-term solutions were probably less efficient than long-term solutions. Denison (1985) calculates that productivity in the United States (as measured through conventional national accounts) was reduced as a result of energy-saving changes to capital equipment by 0.1 percentage points per annum between 1973 and 1979 and 0.2 percentage points per annum between 1979 and 1982. Since then, there has been little impact on productivity

from energy savings as more efficient approaches to energy savings have been adopted and there has been less urgency as real energy prices abated.

Denison (1985) has estimated that modifications to capital equipment to meet pollution abatement requirements has led to a reduction of 0.1 percentage points per annum in American productivity growth (between 1948-73 and 1973-82). The impact was somewhat higher from the late 1960s to the mid 1970s when the tightening of environmental regulations led to the adoption of expensive end-of-pipe solutions. In the longer-run, more fundamental changes in design are possible to meet environmental standards without necessarily diminishing other aspects of economic performance.

Denison (1985) also argues that the non-neutrality of tax treatment of investment can result in the misallocation of investible funds. In the United States, changes in the taxation system between the mid 1950s and the early 1980s successively weakened the nexus between tax and economic rates of depreciation, and tax shelters proliferated (note also Goode 1984 and King and Fullerton 1984).

The Regulatory Regime

Problems associated with government regulation can impose constraints on economic efficiency. Eight major sources of inefficiency are identified.

The reduction of international trade barriers has led to more efficient resource allocation and increased competition since the Second World War (IMF 1989, pp. 43-45). During the 1950s and 1960s it provided a positive impetus to productivity in the industrialised economies. In the 1970s the thrust towards free trade was blunted somewhat by the introduction of an international regime of non-tariff protection in the textiles, clothing and footwear sector, voluntary export restraints for motor vehicles, a variety of protection barriers for trade in steel, increased agricultural protectionism, and government purchasing arrangements in a variety of goods and services. Trade policies would have provided a neutral, or even negative, impact on productivity. During the 1980s a reduction in restrictions on capital flows, including direct investment, has encouraged the development of global competition, and the results of the Uruguay Round of trade negotiations will provide a stimulus to productivity in the coming decade.

Regulatory constraints on hiring and the efficiency of employment have been a barrier to productivity growth in some economies (OECD Jobs Study 1994). This has become a negative influence on productivity growth in the 1970s and 1980s. In the United States, Denison (1985) notes the efficiency losses associated with regulatory constraints on the use of job recruitment and placement tests. The way in which civil rights legislation was administered may also have reduced the efficiency of the labour market. A further constraint would be restrictive work practices negotiated between employers and employees. It is difficult to assess whether or not this factor has changed in its incidence over time. Restrictive trade practices pursued by companies are a further constraint on

productivity growth. Competition policies are aimed at this problem, and the efficiency of such policies over time may have improved, to the benefit of productivity, although it is difficult to find evidence for this.

The failure to consider the broader economic impacts of regulation can constrain productivity. As a consequence, regulatory reforms can contribute to enhanced economic efficiency. Denison (1985) has analysed the impact of occupational health and safety regulations on productivity growth in the United States. He found that they contributed 0.02 percentage points to the slow-down in US productivity growth after 1973. The OECD Jobs Study (1994) argues that regulatory constraints prevented the growth of jobs in the services sector, particularly in Europe. It may also have had a more general negative impact on efficiency. The deregulatory policies pursued in the United States in the first half of the 1980s may have brought efficiency gains in the 1980s and into the 1990s after allowing for lags in the adjustment of markets to reduced constraints (IMF 1989, p. 47). In the European Union, measures to harmonise regulations were progressively introduced from the early 1990s, and are likely to have beneficial effects on productivity growth over the next decade. Japan has also been cautiously pursuing regulatory reforms over recent years in its highly regulated services sector. This reform agenda is likely to continue over the next decade and yield continuing benefits to productivity. The cost of compliance with regulations and with the requirements of government administration has diverted staff and management time from more efficiency-enhancing tasks. There have been attempts to address this problem in the past decade, but it is difficult to ascertain how successful they have been.

As with regulation, government administration can impact on economic growth. Efficiency in the administration of law and order is an important background condition for economic progress. In particular, corporate crime is an important issues. Denison (1985) estimated that worsening corporate crime has cost the United States 0.05 percentage points in reduced productivity growth in the years 1973-82 compared with the 1948-73 period.

The Microeconomic Determinants of Productivity Growth: An Overview

During the 1960s a number of microeconomic influences provided a significant stimulus to productivity growth in the industrialised economies. These included the release of labour from low productivity agriculture to high productivity manufacturing, the development of human capital, the reduction in international trade barriers, and improvements in the public infrastructure, particularly highway systems.

In the 1970s, microeconomic influences contributed to the reduction in the rate of productivity growth. Changes in the economic structure exercised a smaller positive influence, regulatory constraints (including those operating in the labour market, as well as environmental regulations) had a negative impact, and urgent attempts at energy savings also reduced productivity growth.

During the 1980s, the direction of microeconomic influences has been less clear. Regulatory reforms and the increased efficiency of responses to environmental regulation may have enhanced productivity, but labour market distortions and the declining effectiveness of the public infrastructure tended to reduce productivity.

From the 1990s into the first decade of next century, microeconomic influences are expected to have a positive impact on productivity growth. The key influences are expected to be regulatory reforms in the United States, Japan and Europe, along with the impact of the Uruguay Round.

INNOVATION

Technological progress and innovation is the exogenous element in neoclassical theories of growth. New growth theory has attempted to endogenise it. In this section we examine the Schumpeterian notion of waves of innovation, the new microeconomics of innovation, the possible impact of the information revolution, and some implications of the measurement problem occurring as a result of product innovation.

Schumpeter

For Schumpeter (1943), the driving force for economic growth was the innovating capitalist entrepreneur. The path of long-term growth has been the result of 'waves' of innovation, sometimes functionally linked with each other. This produces discontinuities in growth. The introduction of a strategically significant innovation by one entrepreneur leads to the diffusion of knowledge and makes it easier for other entrepreneurs to make decisions about their own production possibilities. Eventually, however, the pace of innovation associated with the initial break-through will slacken and, with it, the rate of economic development. Eventually, the introduction of another fundamental innovation starts a new phase of development.

The Economic Framework for Innovation

Innovation is responsive to the overall economic framework. The key conditions supportive of innovation in modern economies are the scientific infrastructure, research and development programs, the quantity and quality of aggregate demand in the economy, the structure of industry, and the stock of human capital.

The quality of a country's scientific base (the scientific education framework, and the quality of research institutions) provides ideas, an educational base for industry, and the possibility of cross-fertilisation with industry. The cumulative expansion of the knowledge base provides a possibility frontier for innovation. Scientific knowledge has steadily

increased in importance as a basis for innovation from the second half of the nineteenth century.

As the basis of innovation has become more firmly based on science, research and development has become more important. Research and development is a discontinuous process by its very nature, but it ultimately rests on the scientific infrastructure. Over the past decade or so, the efficiency of research and development has been augmented by an improvement in the quality of scientific instruments, the use of computer software for data processing, storage, retrieval and networked transmission, and an increased locational mobility facilitated by the use of standardised scientific equipment.[8] The ability to utilise international research and development is also important; the next sub-section of the paper considers the diffusion of innovation.

Aggregate demand is important to innovation because of the market opportunities and the possibility of scale economies in the refinement of innovations. The quality of demand in the economy is important, particularly the sophistication of customers and their receptiveness to change. The industrial structure of the economy is also an important influence on innovation, particularly competition within industry, and the sophistication of industrial users of technology. Finally, the ability of the workforce to make full use of the new technology is an important consideration.

The endogenous aspects of innovation are that it is encouraged by the rate of economic growth, it can be embodied in new investment and hence the investment ratio is important, it is responsive to structural change in the economy that increases the importance of the more technologically receptive industries, and it is encouraged by investment in human capital.

The Diffusion of Innovation: The New Microeconomics

The conventional wisdom holds that the uncertainties associated with technological change are much reduced after the first commercial use of the new technology (the point of innovation). The history of innovation shows otherwise (see Rosenberg forthcoming). The dispersion of new technology is both slow and uncertain even after the first commercial adaptations have been realised. The first commercial application is often primitive. Subsequent applications can achieve a substantial refinement of the technology, and the adaptation to a wider range of uses can lead to connections with other technologies.

David (1975) has shown that if innovations are to be fully exploited, other related activities have to adjust to exploit the change fully. These include new job specifications,

[8]See David (1993). Note that the increased optimum scale required in some research processes associated with expensive specialised equipment has been compensated for by the growth of collaborative research.

adaptation of institutions, perhaps relocations. Learning by doing is a key aspect of the widening impact of the initial innovation (see Young 1991).

David (1993) provides a useful summary of the new microeconomics of innovation. New technologies may be profitable for some firms and not others, depending on cost structures, locations, supporting facilities, the capacities of employees and other factors. The spread of the technology to new applications increases as the refinement and broadening of the technology occurs. The initial version of the technology first commercially adopted is likely to have flaws in its design and manufacture. Learning by doing is vital to developing the potential of the technology (David refers to it as 'learning by using' in the context of new technologies). The accumulation of experience through the diffusion of technology makes possible a flow of incremental improvements.

The international diffusion of technology is facilitated by networking, the movement of researchers, trade linkages (giving rise to competitive pressures, knowledge transmitted through the goods traded, and the provision of ancillary services to traded goods), the growth in international trade volumes, the increased mobility of people, and the more ready transmission of information electronically (see Grossman and Helpman 1991).

The Information Revolution

As steam power was to the first industrial revolution of the eighteenth and early nineteenth centuries, and electricity was to the second industrial revolution of the late nineteenth and early twentieth century, so the information technologies are to the third wave of new technology that is changing the world economy late in the twentieth century. Richard Lipsey is quoted as saying 'we are living through one of those fundamental and profound changes in the economic paradigm built around the transmission, retrieval, and analysis of data and falling transport and communication costs' ('Bullish New Theories on Economic Growth' 1994).

The new information technologies have given rise to major changes in the structure of contemporary industrialised economies, the full consequence of which is yet to be fully appreciated. Among those changes are:

- the introduction of new products (the personal computer, new telecommunications products, and a range of entertainment products);
- the use of computer technology to transform existing products (scientific equipment, transport equipment and other capital equipment;);
- product improvements through cost reductions, improved quality, better customer service, faster responses to market requirements, and improved design capability;
- new methods of manufacturing through the use of computer aided design and computer aided manufacturing systems;
- utilisation of the technology in primary production (the computer as an aid to farm management and to resource development);

- the application of this technology to the services sector, particularly in the management of data and in the new micro-management techniques (outlined in the next section of the paper);
- technology as an aid to managers; and
- computers as an aid to research and to product testing.

The information technologies have a scope that is so large, they are more than comparable to the importance of steam in the first industrial revolution and electricity in the second industrial revolution.

A second characteristic of the information revolution relates to lags in the innovation process. Steam power was developed for application in mine pumps in the eighteenth century, but the technology was developed and used for a broad range of stationary engines, railways, shipping, and electric power; a development which took more than a century. Electrification as a technology took some fifty years to reach its full scope. The computer mainframe was commercialised in the 1960s and its utilisation spread in the following two decades. The personal computer was introduced in 1981 and has spread rapidly in the next fourteen years.

The introduction of computer technology in industry was accompanied by a strong marketing push from the suppliers of the technology, but complementary factors of production were not in place, and the early users of the technology faced problems. In its initial form, the technology was not user friendly, management lacked the experience and training to utilise its potential, employees were generally in a similar position to management with respect to lack of experience with computer technology and lack of requisite skills. As a consequence, the returns from the early investments in this technology were often disappointing, and a period of adjustment was needed in order to improve the complementary factor skills to enable computer technology to make a more fundamental positive impact. Stephen Roach (quoted in *The Economist*, 'What computers are for' 1994) has highlighted the stagnation of productivity in the American services sector during the 1980s, despite the expenditure of more than US$900 billion on information technology. During the American recovery after the 1990-91 recession, productivity growth in the services sector has matched that of manufacturing, a markedly improved trend that suggests service industries are now obtaining significant productivity improvements from information technology.

Improving returns from the investment in information technology are now beginning to flow as a result of modifications to the technology to make it more user-friendly, the greater capacity of management and employees to harness the technology effectively, the realisation of economies stemming from learning by doing, and the generally more customer driven focus of the technology.[9]

[9]A study by Brynjolfsson (1994) suggests that the firms that invested most heavily in information technology over the period 1987-91 achieved stronger sales growth than their competitors because the investment enabled them to produce a variety of higher-quality products at high speed.

The importance of appropriate investments in human capital, an appropriate industrial structure and the need for accumulated learning by doing have all been important factors in determining the improving returns from investment in information technology.

Measurement Issues

There has been a tendency for official price indexes to overestimate inflation, implying an underestimate of the growth of productivity and the aggregate economy (see OECD 1994a and Nordhaus forthcoming). Two of the factors contributing to this problem are new goods bias (the introduction of new goods raises living standards, but is not readily captured in conventional price indices) and quality bias (the tendency to underestimate the contribution design changes can make to the performance of products (note Nordhaus forthcoming)).

The information revolution has delivered a range of new products, contributed significantly to the improved design and quality of existing products, and enabled greater customer focus in service delivery. There is a tendency for price indices and measures of real economic growth to underestimate the positive contribution made by the information revolution to productivity. This has become a significant consideration during the 1980s and the early 1990s.

The Contribution of Innovation to Productivity Growth: Past, Present, and Future

The first industrial revolution was essentially a mechanical revolution. It was not significantly scientific in its basis, it was dependent on the skills of specialist craftspeople, and its transmission (both within countries and between countries) was slow and expensive given its embodiment in specialised skills and the regulatory, cultural and political barriers that impeded the transfer of such skills. The first industrial revolution had been preceded by considerable change in technology in the sixteenth and seventeenth centuries. The Netherlands had been the leader in this change, and had achieved growth in productivity per man hour of 0.43% per annum between 1580 and 1700 (Maddison 1991). The changes in the first industrial revolution were pioneered in the United Kingdom, which had overtaken the Netherlands in productivity by 1820. Productivity growth in the United Kingdom was 0.27% per annum between 1700 and 1780, when the first major technological changes of the revolution occurred. By the period 1780 to 1820, productivity growth in Britain had accelerated to 0.43% per annum, and it accelerated further to 1.15% per annum between 1820 and 1870, by which time Belgium, the United States and Australia were all leading players in the technological revolution (Maddison 1991). By later standards, however, the pace of change was slow, and confined to a very small number of countries, reflecting the high transmission costs for innovation at that time.

The second industrial revolution differed quite significantly from its predecessor (Amsden 1989). It had a much higher scientific content which increased the extent to which the technology could be codified, and this, in turn, greatly reduced the costs of technological diffusion. The application of science to transportation, communications and management greatly assisted the transfer of technology. Science led to the decline of the traditional skilled crafts which had been the repositories of earlier technological advances, and transformed industrial technology from art to applied science. As a result of these factors, the pace of change accelerated. The United States, taking over from the United Kingdom as the world technological leader, achieved annual productivity growth of 1.58% between 1870 and 1890, 2.23% between 1890 and 1913, and 2.44% between 1913 and 1960 (Maddison 1991). The reduced cost of technological dispersion enabled a broader group of countries to participate in this revolution, including Germany, France, Switzerland, Canada, Denmark and Austria between 1870 and 1890, Italy, Sweden and other parts of Scandinavia between 1890 and 1913, and Japan between 1913 and 1929. The 1960s represented the last gasp of the second industrial revolution. The geographic spread of advanced technology encompassing a number of Asian economies also increased.

By the 1970s, there were signs, particularly in the United States, that the long wave of innovations characterising the second industrial revolution was losing momentum, and demand conditions were constraining innovation. Baily and Chakbrabarti (1985) argue that, following the abundant opportunities for innovation that had opened up after World War II, innovation in the United States subsequently slowed as the readily available opportunities were exhausted. This slow-down in innovation, beginning in the mid-to-late 1960s, did not occur in all industries, but was particularly evident in the capital-intensive industries, including chemicals, basic metals, petroleum refining and cement. Mansfield et al. (1982) also suggested that there was a slackening in the pace of innovation in America during the 1970s, although indicating that the evidence on this matter was incomplete. Key factors influencing this situation included slower growth in aggregate demand, a reduction in the proportion of resources devoted to research and development, diminishing returns to research as the frontier was reached at certain points, and regulatory bottlenecks impeding innovation.

Investment in computers in the United States rose from US$0.9 billion in 1972 to US$33.5 billion in 1984 (measured in 1982 prices), by which time they represented 11.9% of all equipment used in industry. This represented a growth of 35.8% per annum over those twelve years (Bureau of Economic Analysis, U.S.A. 1985). The returns on this initial investment in computers were often disappointing as the complementarities between the technology and its users (both management and employees) had yet to be firmly established.

During the 1970s it seems likely that the contribution to growth made by innovation reduced significantly in the world's technological leader, the United States. Some reduction in the impact from innovation in the other industrialised economies is also likely to have occurred, given the constraints imposed by demand trends and the loss of impetus

from the United States. During the 1980s there were probably further problems experienced in digesting the computer revolution.

A new technological wave based on a more productive use of information technology should provide a major boost to productivity over the next ten to twenty years. In the tradition of earlier waves of innovation, it is based on learning by using, the development of new applications, and changes in training and management which facilitate a more efficient utilisation of the technology. This process is being led by the United States, but the other industrialised economies will share in its future development. Other new technologies, particularly biotechnology, could make significant contributions to productivity growth. The spread of innovations is becoming more rapid as global transmission networks improve, and management of accelerating technological change becomes a priority issue for companies.[10]

NEW APPROACHES TO MANAGEMENT

The incremental improvements to productivity made through innovations occur within enterprises and are in large part a reflection of the skill endowments available to the enterprise and the focus of management. The way in which management handles technology is of vital importance to the contribution that technology can make to productivity.

In this section, we address the issue of management and productivity growth. We begin by discussing the problems faced by management in the 1970s and 1980s and then discuss the new approaches to management in the 1990s, with special attention being paid to organisational change, the management of accelerating technological change, globalisation, and the new micro-management techniques being applied in the services sector.

The Problems of the 1970s and 1980s

Denison (1985), while unable to provide quantification, suggested that advances in managerial knowledge and practices made a significant contribution to the productivity growth experienced in the American economy between 1948 and 1973, but that this contribution reduced after 1973. Several factors may have contributed to this trend, particularly in the United States.

Firstly, the attention of top-level managers may have been diverted away from the efficient production and distribution of goods and services. Rapid changes in government regulations and tax codes have necessitated the development of strategies to cope with them, and resources have been diverted to the anticipation of future changes. Risks and

[10]See the next section of this paper.

uncertainties associated with increasing inflation, changes in the structure of interest rates, fluctuating exchange rates, and increased economic volatility in general increased the need to develop appropriate financial strategies, further absorbing the attention of senior management.

Secondly, management perceptions that corporate acquisitions were a cheaper means of expansion than asset building within a corporation encouraged an emphasis on acquisitions, diversification and conglomeration. The threat of unwanted corporate takeovers focussed attention on short term indicators to the exclusion of longer term considerations (Hayes and Garvin 1982). These problems were particularly evident in the 1970s. By the 1980s, the focus in acquisitions was shifting towards achieving synergy, but 'short-termism' remained a problem.

Thirdly, Hayes and Abernethy (1980) argue that management doctrines were responsible for much of the slow-down in American productivity that occurred during the 1970s. Attention was not focussed on an organisational commitment to compete in the marketplace on technological grounds. Preference was given to analytical detachment rather than insight coming from hands-on experience.[11] Short term cost reduction held precedence over long term development of technological competence. American management was reputed to be the world leader in the mid-1960s. This situation had changed by the 1970s. Attention was diverted from creating new markets towards focussing on short term financial measurements. Management became risk-averse in the extreme. Priority was given to financial expertise as a desirable attribute for senior management, and technological expertise was downplayed.

Fourthly there was a failure to pursue quality control techniques in the rigorous way they were tackled in Japan (Deming 1982). Poor quality not only impairs customer acceptance of products, but it also lowers productivity since the costs of ex-post correction of defects usually exceeds the ex-ante prevention of quality lapses. Product quality also has ramifications for the users of such products.

Fifthly, labour market constraints are an important influence on management. The human capital base of the enterprise is of vital importance to the diffusion of technology, learning by doing, and productivity growth. The Japanese style of reliance on internal labour markets to provide the training of staff and a promotable base for senior management (Odagiri 1994) contrasts with the external aspects of the enterprise labour market in the United States, where turnover of staff is comparatively high, external recruitment of senior management frequent, and there are regulatory constraints on staff recruitment. This difference is of consequence for the diffusion and improvement of technology: witness the superior performance of the Japanese manufacturing sector to that of America over recent decades.

[11]The latter having proved the key to Japanese economic success: Odagiri (1994).

Management in the Nineties

During the 1990s the focus of management has changed. The organisational regime has changed, with some of the problems of the 1970s being tackled. Techniques for managing accelerating technological change have been refined. Globalisation has become a major facet of enterprise development. Finally, there has been a revolution in the management of services industries with the introduction of micro-management techniques. *The Economist* ('A Survey of Management Education' 1991) provides a useful summary of these trends.

Organisational Changes

A movement towards regulation reform, the simplification of government administration, and some stabilisation in the macroeconomic environment (at least in comparison with the 1970s) has enabled management to focus more on enterprise development. Although short-termism pressures remain a feature of American management, the focus of acquisitions is now emphasizing the creation of new competitive advantages. The introduction of flexible manufacturing systems has changed the way in which manufacturing is organised. Greater attention is being given to quality control. The relationship with suppliers has also changed, with closer linkages occurring with key suppliers and customers, permitting suppliers and customers to make inputs into product design. Business process engineering (in *The Economist*, 'Management Focus' 1994) is replacing the traditional bureaucratic structure, which had focussed on discrete tasks (such as sales, marketing and accounts), with an organisational structure focussing on continuous business processes aimed at getting the product to the customer. This normally involves by-passing middle management and devolving responsibility to multi-disciplinary teams of shop floor workers.

Managing Accelerating Technological Change

Current market trends place a premium on speed, flexibility, responsiveness and adaptation. Customisation of products is of increasing importance, and quality, design and the service element have become more prominent. Environmental issues are of growing significance to customers. These trends support a process of continuous innovation, greater value added in manufacturing and service, and employee commitment to continuous product and service improvement and ongoing training. Information technology is the key to effecting these improvements, particularly in customisation, ongoing design and quality programs, and more efficient service.

Globalisation

After fifty years of international trade reform accompanied by significant reductions in the real costs of communications and transport, global competition has become a key facet of

business reality. Trade reforms have led to firms utilising the principles of comparative advantage in choosing sources of supply and locations for production. The speed with which such decisions are put into effect has also greatly increased. Advances in computers and communications technology have reduced the costs of acquiring information and exposed markets to greater international influence. The new technologies have enabled small enterprises to operate more freely across frontiers. Global competition has increased the pressure on enterprises to match world best practice and to undertake continuous innovation. Companies are developing policies of global sourcing of supply, international product development strategies, and global marketing frameworks. For large companies, the transnational method of management is coming into vogue. This involves the development of a common worldwide vision and identity, continuous travel for the chief executive, a multinational composition of senior executives, and decisions taken at an appropriate level of the multinational enterprise to expedite corporate goals.

Micro-Management of Services

Productivity in the service sector is benefiting from both microeconomic reform and a new approach to the management of service businesses known as micro-management (Quinn and Paquette 1990). Microeconomic reform has reduced some of the regulatory bottlenecks to improvement.

Micro-management is about achieving the gains of standardisation and mass production by concentrating on ever smaller units of business. Common factors in tasks are identified, specialisation adopted (including the use of sub-contractors on particular tasks, and the more efficient utilisation of capital equipment), computers used as a vital support, and staff time freed to concentrate on tailoring service to individual customer requirements. As technology is harnessed to perform repetitive tasks, employees have become more oriented towards personal service to customers, and lower level jobs upgraded. The larger the enterprise, the greater are the economies of scale in replicating service components. Micro-management as a technique is highly dependent on the computer; data processing provides the evidence of scope for replicable services.

PRODUCTIVITY GROWTH IN THE INDUSTRIALISED ECONOMIES

An acceleration in the rate of productivity growth is expected in the major industrialised economies between 1995 and 2010. This forecast is based on five main factors.

1. Greater stability in the macroeconomic environment.
In the long run, the world economy will be stabilised by the growth of the services sector, just-in-time inventory management, the automatic stabilisation of unchanged taxation and transfer payment schedules, and innovations that reduce the gestation period for major construction projects. Current forecasts suggest that investment ratios are recovering, the

growth of world trade accelerating, and the distortions imposed by inflation and the instability of financial institutions easing.

2. Microeconomic reform.
The recent Uruguay Round of international trade negotiations has resulted in reduced barriers to international trade. Regulatory reforms in the European Union and Japan should further stimulate productivity growth.

3. An increased contribution to productivity growth from innovation.
The information revolution is proceeding, with high rates of investment in the technology and improved utilisation by industry leading to an enhanced positive contribution to productivity. A stronger economic climate would further encourage innovation. Finally, the costs of international transmission of new technologies is declining.

4. An enhanced contribution from management to productivity growth.
Globalisation is creating a new impetus to efficiency, the management of accelerating technological change is receiving greater emphasis, and micro-management techniques are increasing productivity in the services sector.

5. Growth multipliers.
Most of the changes described above represent an increase in the long term rate of productivity growth in relation to given trends in factor inputs. If we assume stable demand trends in the long run such that unemployment and capacity utilisation rates remain unchanged, there will be a further secondary source of increased productivity growth resulting from higher investment growth, the realisation of additional scale economies, and increased potential for innovation.

ECONOMIC GROWTH IN ASIA

The optimistic outlook for economic growth in the industrialised economies will provide additional opportunities for the rapidly growing economies of Asia. There will be faster growth in demand for the goods and services of Asia, and a greater capacity for the transfer of advanced technologies.

In the past, linkages on the demand side appear to have been less important than supply linkages. Table 11 indicates that, while there was a correlation between the strong growth of the industrialised economies and the take-off of the Asian economies in the 1950s and 1960s, at other times the trends for economic growth were divergent (for example, the 1930s saw a very weak performance by the industrialised economies, but significant growth in Japan, Korea, and Taiwan, and the slower growth of the industrialised economies in the 1970s and 1980s has been accompanied by a strong performance in Asia, with China, Thailand and Malaysia making particular progress.

Table 11. Average Annual Rates of Growth of Real GDP in Selected Asian Economies.

	1900-1913	*1913-1929*	*1929-1938*	*1938-1950*	*1950-1960*	*1960-1968*	*1968-1979*	*1979-1989*	*1989-1995*
Industrialised Countries	3.0	2.3	0.6	3.0	4.4	5.0	3.5	2.7	1.9
Japan	2.5	3.7	3.6	-0.7	8.8	9.9	5.8	3.7	1.8
Korea	2.0	3.0	5.5	-2.7	6.1	7.7	9.7	8.0	7.5
Taiwan	1.8	3.8	4.7	-0.3	8.0	9.5	10.0	7.6	6.3
Thailand	1.7	1.7	2.9	2.4	5.1	8.1	7.4	7.2	8.7
Indonesia	1.9	2.8	1.5	-2.1	3.5	3.1	7.6	5.8	7.0
China	0.8	1.2	0.5	-1.7	6.1	3.7	6.8	9.3	10.1
Philippines	4.4	2.6	1.9	0.7	4.5	5.4	6.0	1.8	2.3
India	1.0	0.6	0.5	0.9	4.0	3.3	3.5	5.9	4.3

Sources: Derived from Maddison (1989, 1991), IMF (1994), Consensus Forecasts (1995) and Asia Pacific Consensus Forecasts (1995).
Notes: Industrialised Countries as defined by the IMF, including Japan.

One of the theories purporting to explain differences in rates of growth between individual economies is that relative technological backwardness confers benefits in that the backward countries can achieve relatively rapid growth as they absorb the more advanced technologies. The empirical evidence does not support this as a broad proposition. More recent developments in the theory (outlined later in this section) suggest that technology transfer is a complex process, requiring significant investments in human capital and supporting structures on the part of recipients for it to be successful. Some economies are able to achieve such a transfer and, with it, rapid growth, while others remain backward.

Table 12 indicates the divergent levels and trends in per capita GDP among the Asian economies over the past century. Japan was the first of the Asian economies to industrialise. In the early years of the century, the Philippines appeared to have bright prospects for economic advancement, but it has since fallen behind in relative terms. The so-called 'Four Dragons' (South Korea, Taiwan, Hong Kong and Singapore) were advancing rapidly by the 1960s, and rapid development later spread to Malaysia, Thailand, Indonesia, and China. The 'Four Dragons' now have per capita GDP levels of US$10 000 to 20 000 (Table 12), Malaysia and Thailand have per capita GDP between US$5000 and 10 000, and China and Indonesia between US$3000 and 5000. The Philippines has failed to raise per capita GDP on a sustained basis beyond US$2500, while India's per capita GDP is less than US$1200, although rising. North Korea is experiencing a rapid reduction in per capita GDP following the major structural changes in its trade patterns associated with the break-up of the Soviet Union, and its per capita GDP is probably around US$1250. Myanmar is even poorer, with a per capita GDP of US$700, while Vietnam has a per capita GDP of only US$500.

Table 12. GDP per Capita in US$ 1990 at Purchasing Power Parities, Selected Asian Economies, 1900 to 1995.

1900	*1913*	*1929*	*1938*	*1950*	*1960*	*1968*	*1979*	*1989*	*1995*

Japan	1104	1297	1895	2292	1837	3770	7416	12133	16991	18637
Sth Korea	718	797	980	1387	737	1106	1603	3661	6996	10231
Taiwan	613	640	892	1063	743	1118	1885	4263	7710	10534
Hong Kong	-	-	-	-	-	2424	4043	8939	16019	19836
Singapore	-	-	-	-	-	2211	3354	7901	14216	20454
Malaysia	-	-	-	-	-	2087	2674	4381	5936	8382
Thailand	862	898	848	913	900	1092	1575	2544	4280	6448
Indonesia	838	887	1108	1107	812	899	940	1669	2330	3199
China	556	575	616	594	469	697	783	1302	2716	4499
Philippines	1083	1486	1645	1597	1341	1542	1848	2579	2423	2422
India	517	546	552	510	490	606	654	742	1073	1200

Average Annual Rates of Change in GDP per Capita.

	1900-13	*1913-29*	*1929-38*	*1938-50*	*1950-60*	*1960-68*	*1968-79*	*1979-89*	*1989-95*
Japan	1.3	2.4	2.1	-1.8	7.5	8.8	4.6	3.4	1.6
Sth.Korea	0.8	1.3	3.9	-5.1	4.1	4.8	7.8	6.7	6.4
Taiwan	0.3	2.1	2.0	-3.0	4.2	6.7	7.7	6.1	5.3
HongKong	-	-	-	-	-	8.2	7.5	6.0	3.6
Singapore	-	-	-	-	-	5.4	8.1	6.1	6.3
Malaysia	-	-	-	-	-	3.2	4.6	3.1	5.9
Thailand	0.3	-0.4	0.8	-0.1	2.0	4.7	4.5	5.3	7.1
Indonesia	0.5	1.4	0.0	-2.6	1.0	0.6	5.4	3.4	5.4
China	0.3	0.4	-0.4	-2.0	4.1	1.5	4.7	7.7	8.8
Philippines	2.5	0.6	-0.3	-1.5	1.4	2.3	3.1	-0.6	0.0
India	0.4	0.1	-0.9	-0.3	2.1	1.0	1.2	3.8	1.9

Sources: Derived from Maddison (1989, 1991), IMF (1994), Consensus Forecasts (1995) and Asia Pacific Consensus Forecasts (1995).

The Diffusion of Advanced Technology: Learning as a Mode of Industrialisation

Amsden (1989) stresses that economies that did not begin to industrialise until the twentieth century did so on the basis of borrowed technology, and she describes the basis on which they managed to compete as *learning.* This contrasts with the nature of change in the economies that industrialised in the nineteenth century where indigenous innovation was a key factor.

David (1993) shows that there are two aspects of the transfer of complex modern technologies to developing countries. The first is the transfer of codified technological information which is relatively straight-forward, although usually at a price. The second is what is termed *tacit knowledge.* Tacit knowledge is uncodified and complementary to codified knowledge. It is required for production processes established in the developing economy to deliver output at the expected quality and anticipated rate. It consists partly of details and material specifications that have been omitted from the blueprints (either intentionally, or because they were the recognised standard in the country where the design originated) and partly of the operational expertise required of local production engineers and shop-floor workers. Tacit knowledge can be expensive to acquire. Experience on-the-job is important. Differences in the availability of individual

components and subtle changes in design to meet local requirements may necessitate quite substantial modification of production processes.

Bell and Pavitt (1993) stress that the diffusion of technology to developing countries needs to be seen in a dynamic context. In the country of origin, the initial innovation will be continuously modified and improved as part of the normal learning-by-doing or learning-by-using process. The developing economy needs to have the capability of achieving incremental improvements and, perhaps, more fundamental modifications to remain competitive.

Amsden (1989) indicates that, whereas in industrialised countries the corporate offices and research and development facilities are the keys to understanding corporate ability to compete on the basis of innovation, in the developing countries, the shopfloor has become the strategic focus of firms competing on the basis of borrowed technology. It is the shopfloor where the technology is first made operational and later optimised. Salaried engineers are particularly important as the gatekeepers of foreign technology transfers, and more important than entrepreneurs.

The leaders in Asian economic development (Japan, South Korea, Taiwan and Hong Kong) developed their technological advance through the efforts of domestic enterprises. Later developers (Malaysia, Thailand, Indonesia, and China, as well as one of the earlier developers, Singapore) made greater use of foreign investment. In the earlier post-war period, there were some limitations on the efficiency of technological transfers through direct investment. Multinational enterprises were run on fairly bureaucratic lines, and technology transfers were often incomplete, or failed to consider adaptation to local requirements. Improvements in the efficiency with which multinational enterprises are run, including greater scope for competition within the enterprise between subsidiaries, have increased the efficiency with which direct investment can be used as a medium of technological transfer.

So far as domestic enterprises are concerned, Bell and Pavitt (1993) indicate that the first steps in the acquisition of technology may be visiting industrial expositions, attending conferences and lectures, reading technical journals, hiring workers with experience in using new technologies, visiting overseas plants, engaging foreign consultants and technical assistants, training domestic employees abroad, consulting machinery suppliers, and begging, borrowing or stealing foreign designs. The ongoing process of successfully embedding the technology in the local operations and developing the capacity to make incremental improvements is achieved through:

- learning-by-doing (the receptiveness of the workforce to on-the-job training, is particularly important);
- enterprises having organisational structures receptive to the process of technological diffusion (involvement of the shopfloor, focus on quality control, an ability to integrate design skills and research and development into the strategic focus of the enterprise);

- the presence of such key expertise as production design capability (requiring skills in process and production engineering), engineers and scientists with problem-solving skills and a familiarity with research, and participation in informal international networks; and
- the more formal processes of reverse engineering and imitative research and development.

Market factors of importance to the diffusion of advanced technology are the presence of competitive pressures to innovate, and the potential scale economies associated with the availability of international markets and expanding domestic markets.

Government has also played an important role in the diffusion of technology through Asia. Key aspects of this role have been:

- the provision of a framework of commercial law and clearly defined property rights;
- education and training (particularly in relation to the core competencies required in an industrial workforce and the education of production and process engineers);
- sound macroeconomic management;
- the encouragement of exports;
- where industry policies have been adopted, the reward of strong performers and the penalising of poor performers; and
- the development of a scientific infrastructure and collaborative research and development.

Finally, the accumulation of technological competence creates additional opportunities for further technological diffusion and the capacity of independent innovation. Diffusion generates external economies in terms of pressures for new initiatives in education and training (and the practical experience to support such initiatives), inter-industry linkages, and networking. Regional agglomeration economies develop over time, and technological competence can eventually become a source of comparative advantage.

The Features of Asia's Economic Success

Relative backwardness provides no surety of rapid development, even though the scope for technological catch-up is great. Other pre-conditions for development need to be present. The later developing economies of Asia have achieved higher rates of growth than the later developing economies of Western Europe (such as Sweden, Norway, Finland, and Italy) did in the nineteenth century. However, the extraordinarily high rates of growth achieved in the first stage of sustained post war development in South Korea, Taiwan, Hong Kong and Singapore have not been quite matched in the equivalent stage of development in the economies of South East Asia (Tables 11 and 12). This sub-section of the paper draws heavily on the analysis of the World Bank (1993).

Initial Conditions

The World Bank (1993) highlights the importance of certain initial conditions in the Four Dragons:

- an adaptable and disciplined labour force, a high level of education in relation to initial income levels, an ability to attract expatriates, and a capacity to import technology;
- national vulnerability which made economic success mandatory (particularly for South Korea, Taiwan, and Singapore);
- the relative equality of income (large land reform schemes in Korea and Taiwan had a considerable impact on income distribution in the early post war period; an egalitarian income distribution was important for the broad incentives it offered to the population, the flow-on of income gains from the initial development into local demand, and the lack of pressures from a narrow oligarchy to defend privilege at the cost of competition and openness to international technology); and
- the abundance of labour to support the growth of manufacturing in the first stage of development (released from agriculture in Korea and Taiwan, the closure of the defence facility in Singapore, and immigration from China to Hong Kong).

Export Focus

Governments embraced an export-oriented development by ensuring the neutrality of export and import prices and the availability of imports of capital goods into the export sectors. International conditions were particularly favourable when the Four Dragons were undertaking the first stage of their economic development, with world trade booming, and international trade barriers being reduced. The export focus provided a means of achieving scale economies in industry and a focus and means for acquiring necessary technology.

A Stable Macroeconomic Environment.

Fiscal discipline has been a common attribute of government during the rapid development of the Four Dragons. Budget deficits have been kept under control, exchange rates were not overvalued (in contrast to many developing economies in other parts of the world), real interest rates were positive (encouraging domestic savings), and the quality of public finances has been high (relatively low spending on public consumption and reasonable levels of public investment in infrastructure). The consequences have been the absence of major problems with external debt problems and inflation, the ready inflow of foreign capital, and relatively stable growth in demand. The high quality of public infrastructure investment has been ensured by good project selection and swift implementation, and this has provided significant external economies to the private sector. Private investment has been encouraged by macroeconomic stability, and low tariffs on capital goods imports.

Human Capital Development

The attainment of mass primary and secondary education was a prerequisite for development in the Four Dragons, and has been followed by a progressive deepening of the education system. Strength in technical education and the training of engineers has

been particularly important. Sound universal health standards have also been a pre-condition for the development of a productive workforce.

Government
Key features of government performance in the Four Dragons have been:

- political stability (continuity in policy and administration, an ability to maintain law and order);
- leadership (the primacy of economic development as a political objective);
- the high quality of government (based in large part on the quality and prestige of the bureaucracy);
- flexibility and pragmatism in policy (the ability to learn from previous mistakes);
- selective industrial policies offering rewards for successful exporters and penalising failures;
- ensuring competition in industry; and
- support for the growth of scientific infrastructure and collaborative research organisations in the second stage of economic development.

Regional Contagion
Japan has been a catalyst in the economic development of the Asia Pacific region through direct investment, the transfer of technology, contributions to infrastructure development, and as a market for exports. The Overseas Chinese have also been important, both in the economies that they dominate (Singapore, Taiwan and Hong Kong, which have in turn become international investors along the lines of Japan) and for the role they have played in the development of Thailand, Indonesia and Malaysia. Intra-regional trade is now becoming increasingly important.

Future Prospects for Growth in Asia

Much of the analysis presented in this section of the paper applies most closely to the Four Dragons. These economies can now be classified as industrialised, although, in the case of South Korea and Taiwan, considerable scope exists for further growth in GDP per capita (see Table 12). The acceleration in the growth of productivity expected in the industrialised countries should assist the growth of these economies in a number of ways. The faster rate of technological progress expected in the industrialised economies will flow directly to the Four Dragons as the rate of international technological diffusion has now reached a high level (witness the rapid take-up by Taiwan of new computer design features).

The South East Asian economies of Thailand, Malaysia and Indonesia form a distinctive economic sub-group. Resource endowments have played a far greater part in their economic development than was the case with the Four Dragons. Key features of the South East Asian development experience include macroeconomic stability, political stability and a strong bureaucracy (Indonesia since 1968, Malaysia from the 1970s, and

Thailand, despite frequent changes in the political regime has managed some degree of continuity in economic policies), investment in human resources, but a relatively low rate of intervention in industry policy.

China has benefited from a strong reserve labour supply for modern expansion, significant investments in health and education, the absence of major income inequality in the past, the Dengist pro-development policies applied since the late 1960s, the export focus of the coastal provinces (now deepening to other provinces), a renaissance of Chinese entrepreneurial abilities (which had been repressed in earlier decades), linkages with the Overseas Chinese , and an aggressive approach to the acquisition of foreign technology. Despite the rapid development of the past decade, China faces a number of uncertainties, both political (the stability of politics in the post-Deng era) and economic (the future macroeconomic situation with reference to public finances and monetary policy, the pace of microeconomic reform, and the rate of deepening in education).

The prospects for India, the Philippines and Vietnam are less certain than for other parts of Asia.[12] However, for Asia as a whole, the broad momentum of rapid growth should continue for the next decade, augmented by the improving rate of technological progress that is likely to flow from the industrialised economies. Asia is also likely to make an increasing contribution to world economic growth even if it only maintains recent growth, because its size is becoming more significant to world markets.

GROWTH IN THE OTHER DEVELOPING ECONOMIES

There is a striking contrast between the successful Asian economies (Japan, South Korea, Taiwan, Hong Kong, Singapore, Indonesia, Malaysia, Thailand and China) and most other developing economies. In the former case, the economic take-off, once launched, has been both speedy and irreversible. With the latter, there have been major discontinuities in the development process. In Latin America, Argentina had become one of the wealthiest economies in the world by the turn of the century, and most of the leading Latin American economies had made more progress in raising living standards in the first half of the century than any of the Asian economies. The period 1950 to 1968 saw further significant growth, but the 1970s saw structural problems increase, and GDP per capita has since been declining in many Latin American economies, although Chile and Argentina have made significant recent progress. Oil has been a powerful catalyst for development in the Middle East, with the rapid expansion in the volume of oil production in the early post war period being followed by escalating prices in the 1970s, both of which facilitated a rapid expansion in the oil-exporting economies of the region. However, with a less buoyant oil market in the 1980s and early 1990s, the Middle Eastern economies have fared less well, being unable to diversify the basis of their economic growth. In Africa, the stagnation

[12]The uncertainty over the prospects of these economies relates to past failures in development strategies, the need to achieve greater reform to ensure consistent economic growth in the future, and the existence of political resistance to implementing further reforms.

experienced in South Africa in the 1980s and early 1990s, and the marked fluctuations of the Nigerian economy are noteworthy.

One of the striking features of these other developing economies has been the big differences in GDP per capita experienced over recent years, differences which have tended to widen over the past century. In Latin America, the average per capita GDP of US$5206 in 1989 concealed differences that range from Argentina with US$6227 and Brazil with US$6075 to Nicaragua with US$1384 and Haiti US$833 (derived from IMF, 1994). In the Middle East, the average per capita GDP was US$4049 in 1989, varying from US$19 392 in the United Arab Emirates and US$11 611 in Kuwait to Turkey US$3229 and Egypt US$1698. In Africa as a whole GDP per capita was US$1495 in 1989, but in Sub-Saharan Africa (which excludes South Africa, Nigeria, Algeria, Morocco, and Tunisia) was only US$893, ranging from US$1616 in Cote d'Ivoire and US$1605 in Cameroon to US$601 in Zaire and US$401 in Ethiopia (where current GDP per capita levels would most probably have been regarded as low by world standards as long ago as the eighteenthth century). Further information on economic growth in selected developing economies is contained in Table 13.

Table 13. Gross Domestic Product Per Capita, US$1990 at Purchasing Power Parities, Selected Developing Economies, 1900 to 1995.

	1900	*1913*	*1929*	*1938*	*1950*	*1960*	*1968*	*1979*	*1989*	*1995*
Mexico	1307	1656	1681	1706	2354	3230	4270	5944	5770	5955
Brazil	688	823	1033	1293	1694	2362	3305	5839	6075	5975
Argentina	3044	4194	4824	4498	5508	6355	6845	7725	6227	7995
Chile	1397	1834	2816	2699	3434	4059	4853	5032	5997	7693
Turkey	-	774	774	1063	1027	1434	1865	2665	3229	3449
Israel	-	-	-	-	2363	3466	5002	9901	11404	12600
Egypt	-	-	-	-	-	850	963	1097	1698	1790
Saudi Arabia	-	-	-	-	-	3932	6565	15051	9589	9584
South Africa	-	-	-	-	3344	3995	5084	5633	5226	4719
Nigeria	-	-	-	-	416	981	755	1503	1349	1417

Average Annual Rates of Growth of GDP per Capita.

	1900-13	*1913-29*	*1929-38*	*1938-50*	*1950-60*	*1960-68*	*1968-79*	*1979-89*	*1989-95*
Mexico	1.8	0.1	0.2	2.7	3.2	3.6	3.1	-0.3	0.5
Brazil	1.4	1.4	2.5	2.3	3.4	4.3	5.3	0.4	-0.3
Argentin	2.5	0.9	-0.8	1.7	1.4	0.9	1.1	-2.1	4.3
Chile	2.1	2.7	-0.5	2.0	1.7	2.3	0.3	1.8	4.2
Turkey	-	0.0	3.6	-0.3	3.4	3.3	3.3	1.9	1.1
Israel	-	-	-	-	3.9	4.7	6.4	1.4	1.7
Egypt	-	-	-	-	-	1.6	1.2	4.5	0.8
Saudi	-	-	-	-	-	6.6	7.8	-4.4	0.0
S.Africa	-	-	-	-	1.8	3.1	0.9	-0.8	-1.7
Nigeria	-	-	-	-	9.0	-3.2	6.5	-1.1	0.8

Sources: Maddison (1989, 1991), IMF (1994), Consensus Forecasts (1995), Latin American Consensus Forecasts (1995).

The Political Economy of Growth

In order to understand the diversity of the growth experience in the other developing economies, it is necessary to understand the political economy of growth.[13]Rapid growth in the developing economies rests on the ability to achieve increased investment ratios on a sustainable basis, higher skills in the working population, and the adoption and adaptation of higher technologies. As the survey of Asian economies shows, the ability to achieve such development is enhanced by the attainment of a stable macroeconomic framework and the rapid growth of exports. The quality of government, particularly efficiency in policy development, continuity in the administration of policies, and the maintenance of law and order, is of crucial importance to the achievement of sustained development.

The successful developing economies have been able to implement policies that have provided a stable framework for economic growth. The unsuccessful developing economies have experienced major failures in economic policy, and this has resulted in such occurrences as macroeconomic instability, significant external debt burdens, and an unfavourable environment for long term investment and the transfer of advanced technologies. The literature on the political economy of growth focuses on the connection between policy failures and the institutional basis of policy. It highlights the connection between significant political instability, the inequality of income distribution, the conduct of economic policy, and the rate of economic development.

The literature on the political economy of growth suggests that sociopolitical instability can be evidenced by riots, political demonstrations against the government of the day, assassinations and the frequency of coups d'etat or other significant changes in the political regime. The usual consequence of sociopolitical instability observed is poor economic management, with myopia in fiscal policy, problems with inflation and external debt, low incentives to save, difficult conditions for entrepreneurship in the private sector, and lack of a long term focus in the private business sector. The results are likely to be macroeconomic instability, low rates of investment, and major difficulties in accessing and using advanced technologies. Hence, the economic growth performance is likely to be poor. Political instability can also lead to an erosion of the standards of public institutions, such as inefficiency, incompetence and corruption in the bureaucracy, and a failure to maintain law and order. Poverty and a poor economic performance also increases the likelihood of political instability, so many countries are caught in a vicious circle. The continuation of political instability (as defined above) appears likely in large parts of Africa, and the outlook for the Middle East is not promising. There has been an improvement in some parts of Latin America (Chile and Argentina are the prime examples) although in other parts of the Western Hemisphere, future conditions are uncertain (for example, Mexico).

[13]This sub-section draws heavily on Alesino and Perotti (1994)

Major inequalities in income can constitute an important barrier to economic growth. They give rise to the following problems:

- a failure to establish a mass consumption base;
- an inability of a large part of the population to acquire acceptable minimum standards of education (education is not free in poorer economies, lower income groups cannot afford to pay education charges, and poor families need to have their children at work while they are still quite young);
- pressures for the large numbers of poor to engage in illegal activities, with a threat to property rights; and
- social unrest and instability in the political sphere.

Future Prospects for Other Developing Economies

Faster growth in the industrialised economies and an increasing contribution to world economic growth from Asia over the next decade or more will increase the demand for commodities, basic manufactures, and tourism, with consequent benefits to many of the other developing economies. However, the big gains from growth occur as a result of the transfer of technology, and in this respect continuing sociopolitical instability is likely to prevent many, if not most, of these other developing economies from achieving a sustained breakthrough.

A few economies may be successful in achieving sustained growth. Signs to look for are the achievement of political stability on a long term sustainable basis, measures to reduce extreme income inequalities, and improving economic policies in areas such as fiscal discipline, export orientation, quality of public infrastructure, human capital development, improved framework of government (bureaucracy, law and order, incorruptibility, pro-competition) and improved linkages with industrialised economies. On this basis, the economies to watch will, perhaps, be Chile, Argentina, Brazil, several other Latin American economies, Asian economies such as India, Vietnam and the Philippines and South Africa. The risk of a significant economic deterioration needs to be taken into account with respect to North Africa and parts of the Middle East, with the possibility of political strife impeding the ability to maintain coherent development strategies.

LONG TERM CONSTRAINTS ON GROWTH

The growth of productivity in the industrialised economies is likely to be boosted by the impact of information technology and improved efficiency in management. The diffusion of enhanced technological progress to the rapidly developing economies of Asia is expected to be rapid. Doubts remain about the prospects for other developing economies, but the overall prospects for the growth of the world economy look excellent so long as this wave of new technology maintains its momentum.

Are there any significant constraints on economic growth that have been overlooked in the analysis presented so far? In this final section of the paper, we will examine the possible significance of political factors, international trade disputes, the environment, ageing populations, and macroeconomic problems as constraints on long term world growth.

Political Factors

In the previous section of the paper we have indicated that political instability can be a major constraint on the economic growth of developing economies, and indicated that for many economies in Africa and the Middle East, this constraint is likely to curtail productivity growth.

For the world economy as a whole, the biggest political threat would be global political conflict that resulted in the sort of economic damage sustained in the period from 1914 to 1945. The world wars of this period resulted from shifts in alliances in a multi-power world in which no single power or group was clearly dominant. After forty-five years of cold war between two dominant world powers, a situation which produced a type of balance and predictability in the world political situation, we now have a situation in which there is only one dominant power. This has produced a degree of uncertainty so far as local conflicts are concerned (such as in Bosnia), but it does not provide a basis for global conflict. Over the next few decades, a multi-power situation could re-emerge, with the United States being joined by the European Union (if it manages to achieve a coordinated foreign policy and a military capacity independent of the United States), China (if economic growth and military modernisation continues at its recent pace for the next decade or so), and Russia (if it does not disintegrate politically, and if it is able to restructure its economy). However, the United States is likely to retain great leverage because of the sophistication of its military and economic technology and its capacity to forge alliances with Europe and other significant countries such as Japan. Hence the return of the sort of unstable multi-power rivalry that led to the first world war is most unlikely. As a result, we can conclude that the threat posed to world economic growth from global political tensions is negligible.

A second source of political instability affecting the world economy might arise from a surge in oil prices that resulted from serious political instability in the Middle East. This would be a reprise of 1973 and 1979, but with differences. The events of the 1970s showed that macroeconomic stability could be threatened by a marked reduction in oil supplies, but part of the problems experienced in the world economy at that time lay in the errors made in economic policy. In 1990, the Gulf War reduced oil production from Iraq and Kuwait, but other producers lifted their production, and precautionary stocks were utilised such that a major economic crisis was averted. The danger to the future stability of the world economy would come from a combination of political crises north of the Persian Gulf (involving Iran, Iraq or Turkey) with a breakdown of political authority in Saudi Arabia (or other major oil producers among the Gulf States). In such circumstances, oil supplies would be significantly reduced, with producers outside the Middle East being

unable to speedily make up the shortfall in supplies. Such changes in the oil market could lead to stagflationary pressures on the industrialised economies and exacerbate external debt problems for the oil importing developing economies.

A third possible source of political instability affecting world economic conditions might occur as a result of changes in China following the eventual death of Deng Xiaoping. The continuation of rapid growth in the Chinese economy is a key factor underpinning accelerating growth in the world economy over the next decade. The continuation of such rapid growth will necessitate continuing transfers of technology from abroad, the upgrading of human capital, the further development of mangement skills, and the improved efficiency of the current state owned enterprises. Economic policies are required to provide a favourable environment for such developments to occur. Improvements in such areas as macroeconomic management, education and training will be needed. The central question is can such improvements occur in the post-Deng political environment? Two specific sources of political change may disrupt growth. The first would be a retreat from the economic liberalism of the Deng era. This could create problems with respect to the flow of technology from abroad, and for the development of the private sector, as well as creating difficulties for the management of the public finances. The second possibility would be a collapse of central political authority to the point where independent military regional commands become the de facto poltical authority. This would seriously impede progress in achieving a more efficient internal market within China as well as pose problems for the inflow of foreign technology.[14] On the whole, these pessimistic scenarios for China's political and economic future appear to be too alarmist. The historical similarities between China today and South Korea, Taiwan and Singapore earlier in the post-war period are striking, and need to be taken into account. In all three locations, the preservation of the state and the future of a political elite was identified as being dependent on the continuation of rapid economic growth. This is why pro-growth policies have such an attraction to the leadership in China. Also, as in the other three economies, pro-growth policies have commanded widespread popular support to a population focussing on improved material standards of life.

International Trade Disputes

The reduction in international trade barriers over the past fifty years has significantly increased the degree of competition in the world economy and brought with it significant improvements in the efficiency of the world economy (note IMF 1989). The ultimate response to this trend has been the globalisation of the world economy as practised by an increasing number of internationally-focussed enterprises around the world. A return to

[14]This is not to deny that regionalism has not been a beneficial influence on the development of the Chinese economy over the past decade or more, as the growth of the special economic zones indicates. However, a major collapse of central political authority (similar to what occurred in the first half of this century), as is feared by some political analysts, would pose significant problems for the future development of the Chinese economy.

protectionism would therefore risk losing much that has been gained in the post-war period and some of the considerable gains anticipated over the next decade.

Is a breakdown of the world trade regime likely? Current trade frictions between the European Union and the United States, China and America, and the United States and Japan have been accompanied by significant protectionism in many developing economies. The use of anti-dumping measures, the threat of bilateral trade sanctions, the failure to acknowledge intellectual property rights in many parts of the world, threats to use issues like labour and environmental standards as conditions for trade access, and differences in national approaches to competition policies, all have adverse implications for international trade.

Despite these threats, negotiations have succeeded in averting any serious breakdown in trading relations so far. The recent Uruguay Round of international trade negotiations under the General Agreement on Tariffs and Trade (GATT) was concluded and will result in reduced restrictions on international trade in services, some reduction in agricultural protectionism, and a more efficient enforcement of international trade rules.

Large numbers of influential businesses now have a vested interest in the maintenance of a liberal international trade regime because they have invested in a global approach to their operations. The politics of international trade in the industrialised and rapidly industrialising countries of the world is therefore changing. Other economies, such as India, China, South Africa, leading Latin American countries, and the Economies in Transition, now have an expanding interest in open world trade. A major retreat into protectionism appears unlikely.

The Environment

Future stresses to the physical environment may become a significant constraint on world economic growth (see Nordhaus 1992). Problems may include the exhaustion of high grade non-renewable resources, the depletion of biological resources, and the need to reduce pollution and clean up the wastes from past pollution. In order to meet these challenges, technologies need to be adapted. If markets were working efficiently, price signals would provide incentives for the development of efficient technological solutions to these problems, and transition costs minimised. The problem is that markets are not necessarily efficient (particularly in relation to many biological resources), and property rights do not exist for some of the basic environmental ‘goods’ such as clean air. Moreover policy intervention in the past has been counter-productive (e.g. the effective subsidisation of consumption of resources in many countries), or inappropriate (as in many attempts at environmental regulation).

Prior to the 1970s, technological progress had led to declining real prices for most non-renewable resources, and anti-pollution policies had not had a major economic cost. In the 1970s, the energy crises resulted in major short term measures to decrease energy usage,

and pollution controls also impacted on costs of production. Nordhaus (1992) estimates that these factors reduced the rate of productivity in the United States by 0.25% per annum in 1973-1982 compared with 1948-1973.[15] By the 1980s, such losses in productivity growth had probably been substantially reduced as a result of declining real energy prices, some reduction in the rate of increase in anti-pollution regulations, and more efficient approaches by industry to achieving environmental goals.[16]

Nordhaus (1992) forecasts that environmental constraints will reduce the rate of productivity in the United States by 0.309 percentage points per annum over the period 1980 to 2050. These losses would relate to scarcities of energy fuels (0.155 percentage points), non-fuel minerals (0.029 p.p.), land (0.052 p.p.), and to greenhouse warming (0.029 p.p.) and local pollutants (0.044 p.p.). The constraint on productivity is unlikely to be evenly felt through the whole period. The timing of political responses will be important. As a rough guess, scarcities of resources will be of minor importance over the next decade, but more significant thereafter, and interventions on greenhouse warming will only gradually become significant over the next two decades.

The estimated impact on productivity growth of environmental factors presented by Nordhaus is naturally subject to many qualifications. On the pessimistic side, the contribution of scarcity of land to reduced productivity would be enhanced by failure to arrest losses associated with erosion and salinity. Scarcity of biological resources could become a significant constraint in its own right (particularly in relation to forest resources), and new sources of policy failures could emerge (for example, inefficient interventions that lead to unnecessarily large losses in economic growth).

Against these pessimistic views, there is cause for optimism about the potential for technological solutions to many of the problems if the policy settings permit consistent signals to be given to potential innovators (for example, prices reflect real scarcity of resouces, property rights to environmental goods are extended, and regulatory intervention is both consistent and encourages innovative responses). As we have seen, the history of innovation suggests that the eventual scope of technological change that can emerge from an initial innovation is often enormous. Hence, the benefit of consistent market and regulatory signals that are maintained for lengthy periods is that they can encourage major improvements in technology.

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[15]This estimate is broadly consistent with that of Denison (1985).

[16]Two aspects of this more efficient approach are worth remarking upon. The first is that some companies identified environmental goals as being part of their corporate citizenship responsibilities, while others saw marketing advantages in pursuing responsible environmental strategies. In both cases, companies have seen benefits in internalising what had previously been external diseconomies. The second is connected with the microeconomics of innovation. Initial corporate responses involved relatively inefficient end-of-pipe solutions. More fundamental changes in the design of plant, equipment, and production systems followed later, and often succeeded in reconciling environmental goals with improved physical productivity. The mechanism for the diffusion of innovation and further incremental improvements in technology are resulting in further gains in the efficiency with which corporations meet environmental goals.

Ageing Populations

Table 14 provides some data on the trend towards ageing populations in a number of larger economies. This table indicates that Italy, the United Kingdom, Germany, France and Japan currently have the oldest populations in terms of proportions aged 65 or older. Between 1995 and 2000, Japan and Italy will have the most rapidly ageing populations, by 2000 and 2005, Germany, Japan, Italy and South Korea will be ageing most rapidly, between 2005 and 2010, Japan and Germany, and 2010 and 2020, countries like the United States, Canada, France, Taiwan and China will join this group.

The economic problems associated with ageing populations are associated with current problems in social security systems combined with the future increase in old-age populations. The World Bank (1994a) observes that the traditional community and family-based arrangements for old-age security in the developing countries are weakening, while the formal social security programs in the industrialised countries are likely to experience escalating costs that are largely unsustainable. Meanwhile, many developing economies are on the verge of adopting the sort of programs that are out of control in the higher income economies. Noord and Herd (1993) indicate that the projected share of state pensions, in the absence of policy changes, are set to rise from 11% of GDP in Italy in 1990 to 23% by 2040, and in France , from 9% to 15% over the same time period.

Table 14. Percentage of Population Aged 65 or Above, Selected Economies, 1995 to 2020.

	1995	*2000*	*2005*	*2010*	*2020*
U.S.A.	12.6	12.5	12.7	13.6	17.5
Canada	11.9	12.4	12.9	14.0	18.3
Japan	14.1	16.5	18.7	21.1	25.6
U.K.	15.8	15.9	16.2	17.0	19.7
France	14.5	15.5	15.9	16.3	20.2
Germany	15.2	16.2	18.6	20.2	22.5
Italy	16.3	17.9	19.5	20.6	23.6
Sth.Korea	5.7	6.8	8.3	9.5	12.6
Taiwan	7.4	8.3	9.1	9.7	13.8
Thailand	4.3	4.8	5.3	5.6	7.5
Indonesia	4.4	4.5	5.0	5.5	6.7
China	6.3	6.9	7.3	7.7	10.7
India	4.8	5.2	5.5	5.8	7.1

Source: Derived from World Bank (1994b).

The World Bank (1994a) argues the need for a three-pronged strategy for aged security comprising a highly targeted social security net available for those not covered by other

measures, a large compulsory occupational savings scheme, and incentives for additional voluntary savings plans. Such a strategy would take decades to put into total effect. In the interim, problems will remain for governments forced to either raise taxes (slowly but markedly over time, or sharply in the short term to create an additional savings pool), borrowing, reduce future pension entitlements, or raise the minimum age for pensions. Most likely, a combination of all of these means will be used, although there will be significant constraints on the further expansion of public debt burdens in most of the leading industrialised economies. However, the adjustments will be significant. The next generation of aged will bear unforeseen burdens, and retirees will reduce savings by consuming nest eggs. With public finances already under stress in many of the industrialised economies, higher tax rates will be necessary. The dividend from faster than anticipated growth arising from the factors canvassed earlier in this paper will help to avert strains in the coming years, but as with the environmental constraints on growth, there are potential long term costs to be borne.

These problems will hit Japan and Italy in the coming decade, but will impact more gradually on other leading European economies, and may not impact on the United States until the second decade of next century. Savings rates will come under pressure, with adverse implications for real long term interest rates, and higher tax rates in some countries could be an additional deterrent to investment.

Macroeconomic Management

The supply side fundamentals for the industrialised economies look good for the next decade, although longer run problems associated with ageing populations and environmental pressures could eventually emerge as significant constraints on growth. On the demand side of the equation, there is always the possibility that fluctuations could have adverse implications for the supply side because they impact on investment and unemployment.

The industrialised economies have become less prone to sharp fluctuations in demand since the early 1950s. For the industrialised economies as a whole, recessions have only occurred in 1974-1975, 1980-1982 and 1990-1993. Each of these has been related to unusual shocks to the economic environment: the oil crises of 1973 and 1979, and the problems experienced by many financial institutions at the end of the 1980s. The stabilising factors in world demand include the greater importance of automatic fiscal stabilisers, the increased importance of services in the economy, the reduced amplitude of the inventory cycle (associated with the introduction of just-in-time systems of supply), and technological advances which are reducing the lags involved in construction projects. Strong growth on the supply side can also be a stabilising factor, as it was in the 1950s and 1960s for the industrialised countries, and as it is currently for many of the Asian economies. It encourages greater attention to long term investment plans, and a greater proportion of investment that is autonomous of fluctuating short term circumstances.

However, the three recessions experienced in the last two decades indicate that macroeconomic difficulties can still arise. The failure to prevent stagflation emerging contributed significantly to the instability of the 1970s, while failure to monitor speculative tendencies in the asset markets in the 1980s led ultimately to the recession of the early 1990s. Stagflation as a problem appears to have been largely resolved, and the close attention being paid to asset markets by a number of monetary authorities in the past twelve months is also encouraging.

The capacity of governemnts to deal with macroeconomic instability in the future may have been impaired as a result of a number of developments. Fiscal policy over recent times has been almost immobilised as a tool for macroeconomic stabilisation. This has occurred as a result of the increasing recognition of efficiency constraints on changing government spending for short term reasons, and international competition and political pressures have constrained tax rates in the short term. On top of this, medium term public debt problems (severe for Italy, but significant for the United States, Germany, France, the United Kingdom, and Canada, and potentially serious for Japan with its ageing population) may prevent fiscal expansion in times of recession.

Monetary policy has now become the main tool available for short term stabilisation. Operating primarily through short term interest rates, monetary policy currently operates with significant lags which reduce its effectiveness as a means of stabilisation (in terms of both slowness of response and the likelihood of miscalculation). Moreover, with financial deregulation has come a loss of powers to directly control the volume of credit, which, in the past, has been the most speedy means by which monetary policy can influence economic activity. Also, the reliance on monetary policy for macroeconomic stabilisation creates problems where there are more than one major objective of policy (for example, external balance as well as internal balance). Finally, monetary policy is often less efficient than fiscal policy in promoting a recovery. The one ray of hope has been the increased recognition by central banks that the announcement effects of monetary policy change can be used as a weapon to affect current expectations, and hence economic activity.

Macroeconomic fluctuations are not an immediate problem for the industrialised economies, whose individual cycles of demand are now desynchronised (with the United States near the end of a lengthy period of expansion, and Japan not having begun a clearly defined recovery). Macroeconomic instability could conceivably become a problem later in the decade.

Unemployment

Macroeconomic instability has led to increased long term unemployment in many European economies (and Canada and Australia) because of hysteresis in labour markets. While the prospects for economic growth in the industrialised economies over the coming decade look good, a fundamental improvement in labour market conditions is not

guaranteed.[17] Faster growth does not guarantee lower rates of unemployment. The non-accelerating wage inflation rate of unemployment (NAWRU) has risen significantly in a number of economies over the past two decades, as indicated in Table 15. The rise in the NAWRU has been concentrated in certain European economies, while the United States and Japan have experienced relatively minor changes. The analysis by the OECD shows that this rise in structural unemployment has not been associated with any marked increase in the rate of job losses (i.e. unemployment inflow) but rather reflects the reductions in rates of job-finding and hiring (unemployment outflow).[18] It argues that labour market reforms in the United Kingdom, Italy and Spain may result in a reduced NAWRU in those economies in the next decade.

Table 15. The NAWRU in Selected Groups of Industrialised Economies, 1970 to 1994.

	1970-79	*1980-89*	*1990-93*	*1994*
OECD Non-Europe (a)	4.8	5.8	5.4	5.5
Major European (b)	4.3	8.4	9.0	9.4
Small EU (c)	4.6	12.5	14.1	15.0
Other Europe (d)	1.3	2.1	3.5	5.1

Source: OECD (1994b).
Notes: (a) USA, Japan, Australia and New Zealand.
(b) Germany, France, the United Kingdom, and Italy.
(c) Netherlands, Luxembourg, Denmark, Spain and Portugal.
(d) Switzerland, Austria, Sweden and Norway.

The OECD Jobs Study (1994) characterised the labour market situation in the following terms:

- the European Union has experienced a secular rise in unemployment rates, failing to find jobs for the less-skilled;[19]
- the United States has had buoyant hiring of both skilled and unskilled labour, but wage differentials between the skilled and unskilled have widened, with growing numbers experiencing working poverty;[20] and

[17] While unemployment as such is not a constraint on growth but arises as a result of structural conditions associated with the development of the economy, the coexistence of rising unemployment with substantial economic growth is an important social problem facing a number of industrialised economies over the coming decade.
[18] For the economies of the European Union, the aggregate unemployment rate rose from 5.6% in 1979 to 9.6% in 1991, which decomposed into a reduced rate of unemployment inflow (0.5%) and a decreased rate of unemployment outflow (4.5%); OECD (1994b).
[19] Regulations in the EU labour markets have had an adverse impact on the hiring rates of the low skilled once they become unemployed.
[20] Workers have been forced to accept low wages, poor working conditions, and a lack of health and other benefits because they lacked the skills to obtain higher-paid jobs; management and the education/training system has failed to keep pace with the changing technological requirements in the labour market.

- Japan has retained low unemployment rates through its well developed internal labour market, firms adjusting to competition by shifting into higher value added products, upgrading their workforces in the process; wage differentials remain relatively compressed.

The accelerating rate of technological change associated with the information revolution in particular has increased the demand for highly skilled jobs making a contribution to high value added activities, while diminishing the demand for low skilled, low productivity jobs. Adjustments in the education, off-the job, and on-the job training regimes is required to avert the problems of unskilled unemployment encountered in Europe and widening wage differentials in the United States. Information technology has therefore brought with it extra opportunities for skilled employment in all countries, but only in Japan, with its efficient internal market, has it brought widespread opportunities for upgrading jobs. There are lessons to be learned from this experience in relation to the provision of education and external training, and in the capacity of enterprises to improve their internal training systems.

Education and Training

The OECD Jobs Study (1994) indicates the importance of structural change in education and training as a means of addressing labour market problems. They indicate that this is a difficult area because the payoffs occur over such a long time period and responsibilities are spread between the individuals, enterprises, educational and training institutions, and government administration. The objective must be to reduce the barriers to upgrading the skills of the unemployed and to do this through widening the access to further education and training and improve the efficiency with which education and training programs are delivered to selected clients.

The OECD Jobs Study (1994) identifies a number of promising avenues for policy:

- the pay-off from special efforts to assist disadvantaged children at the pre-primary stage;
- the reduced drop-out rates from secondary education where more relevant curricula, teaching methods and assessment frameworks are employed to meet special needs;
- work-based learning is important to a successful transition from school to work;
- the need to pay more attention to vocational (particularly technologically based) studies in post-secondary education; and
- the enhancement of on-the-job training for adults.

CONCLUSIONS

The rate of growth of the world economy is likely to accelerate over the period 1995 to 2010 when compared with its trend in the 1980s and early 1990s. The growth of the industrialised economies and of the currently rapidly expanding economies of Asia is expected to contribute to the strengthening trend in world growth. Greater stability in the macroeconomic environment, microeconomic reform, the contribution of innovations to productivity growth (particularly through the information revolution), greater efficiency in management techniques, and the enhanced contribution of Asia to world economic growth will all have a positive effect on the world economy over the next decade.

Despite the anticipated acceleration in world economic growth, social problems will remain severe. The prospects for developing economies in Africa, the Middle East, and Latin America remain mixed at best. Moreover, the social difficulties associated with high unemployment in Europe and the increased incidence of working poverty in the United States will not be automatically resolved by faster economic growth, and will need fundamental reforms in education and training (and in labour market regulations in Europe) if they are to be resolved.

In the very long run (beyond 2010) world economic growth may be constrained by the problems associated with ageing populations and the increased costs of dealing with environmental problems. In the absence of a new wave of technological change following on from the information revolution, the rate of growth in the world economy can be expected to ease.

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