Impact Project

Impact Centre
The University of Melbourne
153 Barry Street, Carlton
Vic. 3053 Australia
Phones: (03) 341 7417/8
Telex: AA 35185 UNIMEL
Telegrams: UNIMELB, Parkville

IMPACT is an economic and demographic research project conducted by Commonwealth Government agencies in association with the Faculty of Economics and Commerce at The University of Melbourne, the Faculty of Economics and Commerce and the Departments of Economics in the Research Schools at the Australian National University and the School of Economics at La Trobe University.

A HARRIS-STYLE MINIATURE VERSION OF ORANI

by

Peter Cory and Mark Horridge
Impact Project Staff

Preliminary Working Paper No. OP-54 Melbourne June 1985

ISBN 0 642 52642 7

CONTENTS

TABLES

FIGURES

A HARRIS-STYLE MINIATURE VERSION OF ORANI

by

Peter Cory and Mark Horridge

I INTRODUCTION

Recent years have seen increasing interest in the analysis of trade, protection, and industrial policy under conditions of scale economies and imperfect competition. It is now widely recognized that the impact of protection on output, trade levels, and welfare depends significantly on the exact specification of (i) market structure, at home and abroad, (ii) determinants of technology, including the extent of economies of scale, and (iii) the character of preferences (especially regarding the treatment of product variety). Indeed, the costs of protection appear to be considerably greater when domestic markets display imperfect competition and scale economies, than when the standard, competitive, constant-returns to scale environment is assumed.

The 1984 publication of Trade, Industrial Policy, and Canadian Manufacturing, by Richard Harris, marks a watershed in the above field of study. For the first time, the basic features of the 'industrial organization' approach - imperfect competition, scale economies and product variety - were successfully integrated into a computable, general equilibrium model of the Canadian economy. The model was used to study the implications of a wide range of policy packages, with some dramatic results. In particular, the potential welfare gains to Canada of unilateral free trade were estimated to be as high as 4 per cent of GNP, a number far larger than that yielded by traditional 'costs of protection' calculations. In the light of Harris' work, it seems highly desirable to pursue a similar line of inquiry in the Australian context. ORANI, an existing large-scale computable general equilibrium model (Dixon et al., (1982)) is a suitable basis for elaboration along Harris' lines.

This paper is a first step in that direction. It describes a miniature version of ORANI incorporating economies of scale and imperfect competition. It has been developed to investigate the longrun effects of trade policy changes, and replicates (in the Australian context) the analysis undertaken by Harris in the above-mentioned volume. Thus we follow his specification of economies of scale and firm behaviour closely. Our aim is twofold: first, to set out the main new features in the Harris model, and second, to evaluate the numerical significance of these innovations in the context of a plausible dataset reflecting the Australian economy. We refer to our model as a 'Harris-Style Miniature Version of ORANI'. Our longterm aim is to construct a fullsize version of ORANI along similar lines.

Correspondingly, the paper has two main sections. First, we describe in detail the theoretical structure of the model, explaining each of its equations. Second, we present an experimental database and discuss results of some initial trade policy experiments.

Here we provide an initial overview of our miniature model. In some respects it is a simplification of ORANI; there is no government sector, no margins, and the composition of the investment bundle is the same across industries. There are only 8 industries, each identified with a single commodity. The rental price of capital in each industry is indexed to the price of the investment bundle, enforcing an assumption of exogenous rates of return - which limits the model, as it stands, to longrun applications.

In other respects the miniature is more flexibly specified than ORANI itself. Increasing returns to scale are introduced in the following manner. All firms in an industry are assumed to be identical. There is a periodic cost incurred by each firm in maintaining its presence in the industry; this is a fixed (but not sunk) cost, invariant to output levels. There are also variable costs which, given input prices, increase proportionately with output. Unit total costs are thus an inverse function of output, with unit variable costs constant and unit fixed costs declining hyperbolically with output.

Each firm produces a single commodity output which is imperfectly substitutable in demand both for the products of its domestic competitors and for the imported product. Three distinct pricing hypotheses or rules are incorporated, and each industry may follow one, or combinations of more than one, of the three pricing rules.

The first, average cost pricing, mimics the conventional competitive ORANI model, when this pricing rule is combined with unitary scale elasticities. The latter can be easily enforced within the model by constraining the number of firms in each industry to move in line with industry output. Then, since fixed and variable costs for the whole industry are proportional to output, so too are total costs. Prices merely satisfy the zero-pure profits condition. The second, the monopolistic-competitive, or Negishi pricing hypothesis, is similar to the Lerner markup formula. It permits each firm to set a monopolists' markup over marginal (= unit variable) cost according to its perception of the elasticity of demand for its product. With free entry and exit in the long run, this amounts to specifying a monopolistic-competitive environment. The third, Eastman-Stykolt or (landed duty paid) import parity pricing, assumes that domestic firms collude to set prices at the level of competing imports. Again, however, free entry and exit in the long run enforces zero profits. In situations characterized by the second and third pricing rules, the zero profits equilibrium will be characterized, to a greater or lesser degree, by unexploited scale economies and industry 'fragmentation'.

Simulations of policy initiatives under each of the three pricing hypotheses, as well as within various 'mix-and-match' combinations of the three, will be presented in section 2 of the paper. In addition, the effects of parameter and database variation will be investigated within the above contexts.

Central to the analysis will be the comparison of results from the model 'mimicking' the conventional ORANI (competitive, constant returns) outcome with results from a model with mixed Negishi/Eastman-Stykolt pricing behaviour.

II EQUATIONS OF HARRIS-STYLE MINIATURE ORANI

The model described below uses ORANI-style notation whenever possible (see Dixon et.al. (1982)); like ORANI it is specified in terms of percentage changes in variables - we distinguish these from absolute values by writing them in lower case. Whilst convenient, this method gives rise to a multiplicity of share parameters, not all of which are represented by a unique symbol. Thus S_d and S_m are used repeatedly to represent the shares of the domestic and imported components of some flow. Their meaning depends on the context, and so they are redefined in the text each time they appear.

Actual model equations are asterisked in this section and presented en bloc in Appendix I; all variables are listed and described in Appendix II. Equations borrowed directly from ORANI, such as the commodity demand equations are not derived from first principles; such derivations are provided in Dixon et.al.(1982) and need not be repeated here. On the other hand, where the Harris-style miniature version of ORANI departs from conventional longrun ORANI (see Horridge (1985)), more complete derivations are included. The structure of the model is presented in four main sections: commodity demands in section (a), factor demands in (b), costs and pricing in (c), and all other equations in (d).

(a) Commodity Demands

(i) Intermediate Demands

In standard ORANI, industry production functions are made up of a series of 'nests'. At the outermost level, all commodities (measured appropriately) and an aggregate primary factor are used in direct proportion to industry output. At a second level of nesting, the aggregate primary factor is a CES/CRESH combination of various types of primary factor. In section (b) we describe how we alter ORANI's factor demand equations to incorporate non-constant returns to scale. Here, on the other hand, we retain from ORANI the idea that each intermediate input commodity is a CES combination of domestic and imported substitutes. Cost minimizing yields these percentage change (p.c.) forms of the intermediate input demand equations:

* $$x_{ijd} = z_j - \sigma_i S_m (p_{id} - p_{im}), \qquad i=1,g \quad j=1,h \qquad (1)$$

* $$x_{ijm} = z_j + \sigma_i S_d (p_{id} - p_{im}), \qquad i=1,g \quad j=1,h \qquad (2)$$

where x_{ijd}, x_{ijm} are demands by industry j for commodity i from, respectively, domestic and imported sources ; p_{id}, p_{im} are their respective prices; z_j is the output of industry j; σ_i is the Armington elasticity; and S_m is the share of imports in expenditure on commodity i by industry j, and $S_d = 1 - S_m$. This specification provides for the input of commodity i into industry j to move in proportion to the output of j; however, commodity i can be sourced domestically or from imports. The two are imperfect substitutes, with substitution elasticity σ_i.

In this miniature version we take commodity disaggregation one step further, by introducing into each domestic industry N_i individual firms. Each firm produces a (slightly) differentiated product, but all are presumed to behave identically in other respects. Each firm's 'variant' of domestic commodity i is a close but imperfect substitute for the other N_i-1 variants of the same commodity. There is a common, constant, elasticity of substitution between the group - σ_{id}. Thus a further nest is introduced: domestic commodity i is itself a CES aggregate of the N_i variants, and the additional demand equation is added:

$$x_{ijdn} = x_{ijd} - \sigma_{id}(p_{idn} - p_{id}), \qquad n = 1,N_i \quad i=1,g \quad j=1,h \qquad (3)$$

where x_{ijdn} is the demand by industry j for the n^{th} domestic variant of commodity i; p_{idn} is the price of the n^{th} domestic variant; and σ_{id} is the elasticity of substitution between any two domestic variants within 'domestically sourced' commodity i. Note the absence of any asterisk on (3), showing that it is not actually a model equation: since each firm is **representative**, $p_{idn} = p_{id}$ and $x_{ijdn} = x_{ijd}$. This and similar equations below are only used in the derivation of a monopolistic (Negishi-Lerner) domestic pricing rule. Foreign prices of importables are assumed exogenous so no similar equation need be introduced for foreign sourced commodity i.

It should be noted that this specification departs from Harris in at least one important way – Harris' model imposes symmetric substitution between all domestic and foreign variants, i.e., there is only one substitution elasticity which holds for pairwise substitutions between any two variants, be they domestic or foreign. For reasons which will be explained in part (c) of Section One below, we have preferred to use the 'double-nesting' approach above.

(ii) Consumer Demands

Consumer demands differ from intermediate demands in that they are modelled as Cobb-Douglas (rather than Leontief) between commodities, whilst still using CES 'nesting' between domestic and imported substitutes, and between variants of the domestically sourced commodity. Since demands are modelled as Cobb-Douglas, nominal expenditure on good i increases at the same rate as total consumption expenditure. Hence, in p.c. form:

$$c_i + p_i = c, \qquad i=1,g$$

or

$$c_i = c - p_i, \qquad i=1,g \qquad (4)$$

where c is aggregate consumption expenditure, c_i is consumer demand for commodity i (in quantity terms), and p_i is an index of the price of commodity i (from domestic and foreign sources). This index is just

$$p_i = S_d\, p_{id} + S_m\, p_{im}\,, \qquad (5)$$

where the variables on the right side are defined as in (i) above (although in this case the expenditure shares S_d, S_m relate to shares in consumption demand). Consumer demand for domestic and imported sources of good i is derived (also as in (i)) via a CES nesting, so that:

$$c_{id} = c_i - \sigma_i\, S_m\, (p_{id} - p_{im}), \qquad (6)$$

$$c_{im} = c_i + \sigma_i\, S_d\, (p_{id} - p_{im}). \qquad (7)$$

Combining (4), (5) and (6) and (7) gives us, respectively,

$$* \quad c_{id} = c - p_{id}(S_d + \sigma_i S_m) - p_{im}(S_m - \sigma_i S_m), \quad i=1,g \qquad (8)$$

$$* \quad c_{im} = c - p_{id}(S_d - \sigma_i S_d) - p_{im}(S_m + \sigma_i S_d). \quad i=1,g \qquad (9)$$

CES 'nesting' between the domestic variants of i gives:

$$c_{idn} = c_{id} - \sigma_{id}(p_{idn} - p_{id}), \qquad n_i = 1,N_i \quad i=1,g \qquad (10)$$

where c_{idn} is consumer demand for the n^{th} domestic variant of i, p_{idn} is its price, and σ_{id} is the substitution elasticity between any pair of domestic variants in consumer demands. Note that at this point we are assuming that the substitution elasticities σ_i, σ_{id} are invariant over all categories of demand for good i.

(iii) Demands for Inputs to Capital Creation

A single capital creator combines commodities to create units of capital, which are uniform between industries. Like the intermediate inputs, demands for capital creation are modelled as Leontief between commodities and CES between domestic and imported substitutes:

$$* \quad y_{id} = y_r - \sigma_i S_m (p_{id} - p_{im}), \qquad i=1,g \qquad (11)$$

$$* \quad y_{im} = y_r + \sigma_i S_d (p_{id} - p_{im}), \qquad i=1,g \qquad (12)$$

where y_{id}, y_{in} are, respectively, demands for domestic and foreign sourced commodity i for capital creation purposes, y_r is aggregate capital creation ~~in real terms, and all other variables are as above (although, once again~~ the share terms S_m,S_d refer to shares for this demand category separately).

Analogously with equation (3) above, which models intermediate demands for the N_i domestic variants of good i, equation (11) is supplemented by the further nest:

$$y_{idn} = y_{id} - \sigma_{id}(p_{idn} - p_{id}). \qquad n = 1,N_i \ \ i=1,g \qquad (13)$$

Again, the parameter σ_{id} is the same as that appearing in equations (3) and (10).

(iv) Export Demands

The world demand for Australian exports is modelled in a manner similar to that in both the Harris and ORANI models. Each domestic commodity faces a constant elasticity demand curve in world markets, of the form (in levels):

$$E_i = F^q_{ie}(P_{ie}/F^p_{ie})^{E_{ix}}, \qquad i=1,g \qquad (14)$$

where P_{ie} is the foreign currency export price of Australian commodity i, E_{ix} is the export demand elasticity, F^p_{ie},F^q_{ie} are exogenous shifter variables (e.g., F^p_{ie} could be a world market price) and E_i is export demand. In p.c. form, (14) becomes:

* $$e_i = E_{ix}(p_{ie} - f^p_{ie}) + f^q_{ie}. \qquad i=1,g \qquad (15)$$

We assume zero pure profits in exporting, so that the export price of commodity i is related to the domestic price, p_{id}, by:

* $$p_{ie} + \phi = p_{id} + s_i \qquad i=1,g \qquad (15a)$$

Here ϕ is the percentage change in the exchange rate, and s_i the percentage change in the power of the export tax on good i.

Like the Australian domestic markets, the rest of the world's demand for commodity i is assumed to be a CES nesting between Australian variants of i. The export demand equation for the n^{th} domestic variant of commodity i thus becomes:

$$e_{in} = e_i - \sigma_{id}(p_{ien} - p_{ie}), \qquad i=1,g \qquad (16)$$

where p_{ien}, the export price of the n^{th} domestic variant of commodity i, is the only variable not previously defined. Note that we are assuming, at this point, that the elasticity of substitution between any pair of domestic variants of i in export demand is identical to that in home demand in Australia. Combining (15) and (16) gives:

$$e_{in} = E_{ix}(P_{ie} - f^p_{ie}) + f^q_{ie} - \sigma_{id}(p_{ien} - p_{ie}). \qquad i=1,g \qquad (17)$$

(b) Industry Factor Demands

As the introduction foreshadowed, the treatment of factors of production in this Harris-style miniature departs from conventional ORANI. This reflects the manner in which economies of scale are incorporated into the miniature model. In conventional ORANI, the factors land, labour and capital are CES-aggregated to an effective input of primary factors which is, in turn, combined with material inputs via Leontief technology. In longrun simulations, both capital and labour are mobile between industries, and are available at economy-wide prices. For the majority of industries which do not use land (which remains dedicated to particular industries) this means that the output price depends only on the prices of two mobile factors, and material inputs, and not on the level of output.

As described in the introduction, in the Harris-style miniature there is a fixed real cost incurred annually by each firm, which is the same for all firms in an industry. Note that the fixed cost is recurrent, rather than 'sunk'. Total industry fixed costs are thus directly related to the number of firms in the industry. Total industry variable costs, on the other hand, are proportional to output, as in conventional ORANI. Hence, the total industry unit cost, incorporating both fixed and variable components, is a decreasing function of output, and an increasing function of the number of firms. The number of firms is an endogenous variable, adjusting to satisfy the Zero Pure Profits (ZPP) condition. This is a significant departure from the standard ORANI model, in which constant returns makes the number of firms irrelevant.

Following Harris, we allow for the firm's fixed costs to be a mix of labour and capital; substitution between these factors is also allowed. Empirical specification of the levels of firm's fixed costs is a crucial issue, since it is the basic determinant of the level or significance of scale economies in an industry. This aspect of the modelling in Harris (1984) is discussed extensively in Cory (1985) and will not be pursued at this juncture. The levels of fixed costs used in the initial database in the current exercise will be discussed in section 2 of this paper.

Demands for fixed labour and capital (in p.c. form) can be written as follows, assuming that inter-factor substitution is characterized by a CES relation (and omitting industry subscripts):

$$l^f = n - \sigma^f (K^f/F)(p_l - p_k), \tag{18}$$

$$(K^f + L^f = F = \text{Fixed costs})$$

$$k^f = n + \sigma^f (L^f/F)(p_l - p_k), \tag{19}$$

where l^f, k^f are, respectively, demands for fixed labour and capital; n is the number of firms; σ^f is the substitution elasticity between fixed labour and capital; p_l, p_k are, respectively, the prices of labour and capital; and L^f/F and K^f/F are, respectively, the shares of fixed labour and fixed capital in total fixed costs. (Price terms are omitted as they are assumed to be unity in the base equilibrium). This specification essentially interprets the fixed factor requirement as a 'fixture' which can, however, vary with respect to its input proportions. If the relative factor prices are unchanged, both factors are required, for 'fixed' purposes, in proportion to the number of firms.

The variable components of factor demand are modelled as proportional to output, as in ORANI, so that for given factor prices unit variable factor costs are constant:

$$l^v = z - \sigma^v (K^v/V)(p_l - p_k), \tag{20}$$

$$(K^v + L^v = V = \text{Variable Factor Costs})$$

$$k^v = z + \sigma^v (L^v/V)(p_l - p_k), \tag{21}$$

where z is, as above, the industry activity level; all other variables are defined similarly to those in (18) and (19) above, except that they relate to variable rather than fixed factor use. The total factor demands are found by adding fixed and variable components, so that in p.c. form:

$$l = (L^v/L)l_v + (L^f/L)l_f \tag{22}$$

and

$$k = (K^v/K)k_v + (K^f/K)k_f. \tag{23}$$

Here $K = K^v + K^f$ = total capital costs and $L = L^v + L^f$ = total labour costs. Again, these flows are measured at the base level equilibrium, where prices are assumed to be unity.

Thus the full form of the factor demand equations is:

$$* \quad l_j = n_j(L^f/L)_j + z_j(L^v/L)_j - (p_l - p_k^f)(\sigma^f(L^f.K^f)_j/[L.F]_j + \sigma^v(L^v.K^v)_j/[L.V]_j), \quad j=1,h \qquad (24)$$

$$* \quad k_j = n_j(K^f/K)_j + z_j(K^v/K)_j - (p_k - p_l)(\sigma^f(K^f.L^f)_j/[K.F]_j + \sigma^v(K^v.L^v)_j/[K.V]_j). \quad j=1,h \qquad (25)$$

For each industry, a measure of efficiency, b_j, is defined:

$$* \quad b_j = z_j - n_j. \qquad j=1,h \qquad (26)$$

Note that if the b_j (output per firm) are held exogenously at zero, a conventional constant returns to scale (CRTS) environment is modelled. The factor demand equations become (again, omitting industry subscripts):

$$l = z - \sigma^t(K/(K+L))(p_l - p_k), \qquad (27)$$

$$k = z + \sigma^t(L/(K+L))(p_l - p_k), \qquad (28)$$

where σ^t is now an overall elasticity of substitution given by:

$$\sigma^t = \frac{K+L}{K.L}\left(\sigma^f \frac{L^f.K^f}{F} + \sigma^v \frac{L^v.K^v}{V}\right). \qquad (29)$$

A third possibility encompassed by equations (24) and (25) is to hold the number of firms in an industry constant, so that $n_j = 0$. In that case a unit percentage increase in output requires that inputs increase by only V/(F+V) per cent.

(c) Industry Costs and Pricing

One of the important features of the Harris (1984) study, which is carried over into our miniature version of ORANI, is the modelling of imperfectly competitive pricing behaviour. As did Harris, we have specified two pricing rules which are plausible descriptions of pricing in imperfectly competitive environments. One is the monopolistic-competitive pricing hypothesis which is a markup rule akin to the Lerner formula. This pricing rule presumes non-cooperative behaviour and is based on the approach introduced by Negishi in his general equilibrium analysis of imperfect competition. The size of the markup is inversely related to the elasticity of demand that each firm in the industry perceives for its product. This perceived elasticity takes account of both foreign competition - through import substitution effects - and domestic competition - since different firms' products are imperfect substitutes for each other. The derivation of the perceived elasticities is discussed below. The other rule is Eastman-Stykolt or import-parity pricing, which is broadly consistent with a collusive environment.

In order to provide maximum flexibility to the model, we in fact specify a mixed pricing equation. The actual price is set as a geometric mean of the price of the imported substitute, p_{im}, and the price dictated by the markup pricing rule, p_{i1}. Thus, in p.c. form:

$$* \qquad p_{id} = \alpha_i p_{im} + (1-\alpha_i)p_{i1} + f^p_{id}, \tag{30}$$

where α_i is a parameter, and f^p_{id} is a shifter variable held exogenously at zero, in a noncompetitive environment. The parameter α_i can be varied between zero and unity as necessary, to accord with the apparent structure and firm behaviour within any industry i.

Our mixed pricing specification is obviously <u>ad hoc</u>; it is not derived from a single consistent model of optimizing behaviour in an imperfectly competitive environment. Nevertheless, it is a useful and flexible device to model industry behaviour which may lie between the bounds of import-parity, and Negishi pricing.

The zero-pure profits condition (ZPP) is satisfied by free entry or exit of firms from the industry. Output per firm changes until each firm's recurrent fixed cost is just balanced by the excess of sales revenue over variable costs. A competitive environment may still be simulated by allowing the f^p_{id} in equation (30) to be endogenous - deactivating the equation - and instead exogenizing the industry efficiencies, b_j $(=z_j-n_j)$. This enforces CTRS and so the ZPP determines output prices as in other versions of ORANI.

It remains to specify P_{il}. According to the markup pricing rule:

$$\frac{P_{il}-V_i}{P_{il}} = 1/\ E^t_i, \tag{31}$$

where P_{il}, V_i, and E^t_i are, respectively, the Lerner price, unit variable (or marginal) cost, and the perceived elasticity of demand for each (identical) firm in industry i in terms of <u>levels</u>. (Here, 'perceived' refers to the firm's perception of the demand conditions which it faces.) Equation (31) transforms into:

$$P_{il} = V_i E^t_i/(E^t_i-1), \qquad \text{and so in p.c. form:}$$

$$* \qquad p_{il} = v_i + \varepsilon_i/(1 - E^t_i). \tag{32}$$

or: change in markup $= p_{il} - v_i = \varepsilon_i \mu_i$, where $\mu_i = 1/(1 - E^t_i)$.

In other words, under the Negishi hypothesis, changes in markup over variable cost are proportional to changes in the perceived demand elasticity. The formula presumes that this elasticity is greater than one, so the markup change will be less in absolute terms than any change in elasticity.

We need to explain the variables V_i and E^t_i, and their percentage change equivalents, v_i and ε_i, in more detail. We briefly consider V_i and v_i first. V_i, being unit variable cost, is just the sum of unit material costs and unit variable primary factor costs. Given the specification of these cost items above, in p.c. form we simply have:

$$* \qquad v_j = \sum_i (S^j_{id}p_{id} + S^j_{im}p_{im}) + S^j_{lv}p_l + S^j_{kv}p_k, \qquad j=1,h \tag{33}$$

where the shares S^j represent the database shares in total variable costs of each component of variable costs.

Some of the variables in equation (33) above require further explanation. The purchasers' prices of imports (which appear also in equation (30)) are defined by applying ZPP to the activities of importing and exporting, so that in p.c. form:

$$* \qquad p_{im} = t_i + \phi + p_i^*, \qquad i=1,g \qquad (33a)$$

where t_i is the percentage change in the power of the trade tax, ϕ is the percentage change in the exchange rate, and p_i^* the percentage change in the foreign currency price of imported good i.

Using the CPI as a deflator, a real wage, F_1, corresponds to the money wage, P_1. In p.c. form:

$$* \qquad p_1 = f_1 + cpi. \qquad (33b)$$

In the longrun environment, both p_1 and f_1 adjust so that an exogenous labour supply L is employed.

Rates of return are held constant in the longrun environment. It follows that, in p.c. form:

$$* \qquad p_k = \pi. \qquad (33c)$$

In other words, rental prices of capital in each industry move in line with the investment price index. This simple form follows from the assumed uniform commodity composition of capital between industries. It is not assumed, necessarily, that the database rates of return are all equal.

The discussion of E_i^t and ε_i^t is necessarily more lengthy and more complex. Each of the (identical) firms in industry i sells to a number of markets – to each of the h industries, and to final demands (which in this miniature ORANI are consumption, investment and exports). Each firm faces a downward sloping demand curve in each market, as described in section (a) above, and thus has a perceived elasticity of demand in each market.

The total perceived elasticity of demand for a variant of the domestically produced commodity i is merely the shareweighted sum of the perceived elasticities in the various markets for that commodity.

$$E_i^t = \sum_k S_i^k E_i^k, \qquad k = 1,h+3$$

where the S_i^k is the (volume) share accounted for by market k in the total sale of commodity i. In p.c. form:

$$\varepsilon_i^t E_i^t = \sum_k S_i^k E_i^k (s_i^k + \varepsilon_i^k).$$

Notice the need to take account of the changes in the shares S_k. Noting that $S_i^k = X_{ik}/Z_i$, where X_{ik} is the sales of i to market k, we can manipulate the last equation to obtain:

$$* \qquad \varepsilon_i^t + z_i = \sum_k Q_i^k(\varepsilon_i^k + x_{ik}), \qquad i=1,g \qquad (34)$$

where z_i is the percentage change in the total output of commodity i, x_{ik} is the change in the part going to market k, and $Q_i^k = S_i^k E_i^k / E_i^t$. The first h values of k represent the h industries; the last three denote the consumption, investment, and export markets, respectively.

We consider briefly the derivation of the perceived elasticities for the individual markets, beginning with intermediate demands. Combining equations (1) and (3) from above, we have:

$$x_{ijdn} = z_j - \sigma_i \; S_m(p_{id} - p_{im}) - \sigma_{id}(p_{idn} - p_{id}), \qquad (35)$$

where all variables are as previously defined. Notice that

$$p_{id} = \sum_{q=1}^{N_i} S_{ijdq} \; p_{idq},$$

where S_{ijdq} is the share of the q^{th} domestic variant (firm) in the demand for domestic i by industry j. Since all firms are identical, $S_{ijdq} = 1/N_i$. Hence (35) above could be written:

$$x_{ijdn} = z_j + \sigma_i S_m(p_{im} - \sum_{q=1}^{N_i} p_{idq} \; /N_i) - \sigma_{id}(p_{idn} - \sum_{q=1}^{N_i} p_{idq}/N_i). \qquad (36)$$

To find the perceived elasticity, we have each firm conduct the following conceptual experiment. It considers the effect of changing the price charged to industry j for its variant of i, assuming that all other firms in i keep their prices constant, and that there is no downstream impact of the change in the price of its variant of i on z_j – the output level of industry j. Thus the firm takes into account only the effects of substitution between its variant and those of other firms, and between domestic and imported equivalents. Then its perceived elasticity (conceived as a <u>positive</u> number) is merely the coefficient on p_{idn} in equation (36) above, namely:

$$E_{ij} = -(x_{ijdn}/p_{ijdn}) = S_m\sigma_i/N_i + \sigma_{id}(1-1/N_i), \qquad (37)$$

(where the 'n' subscript has been omitted because, in fact, all firms producing a domestic variant of i are identical). Notice that if the number of firms is very large, then $E_{ij} \simeq \sigma_{id}$; whereas if the number of firms equals just one, then $E_{ij} = S_m \sigma_i$. The reason for distinguishing between σ_{id} and σ_i is based on their relation to these limits on the value of E_{ij}. In general, values of the Armington elasticity (σ_i) in the ORANI database are, in our view, too low to assume symmetric substitution, as Harris (1984) does. This would impose an upper bound on E_{ij} equal to these low Armington elasticities. Under the specification we have chosen, industries with very low import shares or low Armington elasticities but large number of domestic competitors can have high perceived elasticities, provided the σ_{id} is high. Industries with few domestic firms will have high perceived elasticities only if σ_i is high.

In p.c. form, equation (37) can be written:

$$(n_i + \varepsilon_{ij})N_i E_{ij} = S_m \sigma_i s_m + N_i \sigma_{id} n_i,$$

or

$$\varepsilon_{ij} = s_m S_m \sigma_i / N_i E_{ij} + n_i(\sigma_{id} - S_m \sigma_i)/N_i E_{ij}, \qquad (38)$$

or

$$\varepsilon_{ij} = s_m(A/B) + n_j(1-A)/B,$$

where $A = S_m(\sigma_i/\sigma_{id})$

and $B = A + N_i - 1.$

These equations provide a relationship between changes in the elasticity of demand in intermediate market j perceived by the producers of variants of i, and changes in the number of firms in i and in the share of imports of i in the market for j. Exit and entry on the one hand, and changes in import shares on the other, influence each firm's perception of the elasticity of demand for its product, and thus influence its markup. Conceptually, this is obviously an important equation within the model.

It is interesting to note that the coefficient on n_i, which we might expect to be always positive, is in fact of ambiguous sign. It would be negative if a high imported share were combined with an Armington elasticity greater than the corresponding elasticity of substitution between domestic variants. This reflects the restrictions imposed by our nested demand equations, whereby substitution is divided into two stages — first, between imported and domestic goods, and second, between the variants of the domestic good. The required conjunction of parameters is highly unlikely, however, and could be excluded by the restriction that $\sigma_{id} \geq \sigma_i$. The Harris assumption of symmetric substitution appears then as the limiting case, where the two are equal.

The likely magnitude of this coefficient is more interesting than any logically possible aberration in sign. Note from equation (38) that the partial of ε_i with respect to N_i, (1-A)/B, approaches $1/N_i$ as N_i becomes large. Thus, there is very little impact of entry-exit of firms on perceived elasticities once the number of firms is larger than, say, 10.

Note also that the coefficients in (38) are dependent only on the ratio of σ_i and σ_{id}. If these two are equal, as Harris assumed, then their value has no effect on the coefficients, which are then merely $S_m/(S_m+N_i-1)$ and $S_d/(S_m+N_i-1)$, respectively.

For computational purposes, however, we wish to express equation (38) in yet another format, eliminating the variable s_m.
Note that, in terms of expenditure levels:

$$S_d/S_m = (X_{ijd}P_{id})/(X_{ijm}P_{im}),$$

so:

$$s_d - s_m = (x_{ijd} - x_{ijm}) + (p_{id} - p_{im}).$$

But the definition of σ_i implies that:

$$(x_{ijd} - x_{ijm}) = - \sigma_i(p_{id} - p_{im}).$$

Also:

$$S_m + S_d = 1, \quad \text{so in p.c. form:}$$

$$s_m = - s_d \, S_d/S_m.$$

Combining the above three equations:

$$s_d = S_m(1 - \sigma_i)(p_{id} - p_{im}),$$

and

$$s_m = S_d(1 - \sigma_i)(p_{im} - p_{id}).$$

Hence:

$$\varepsilon_{ij}N_iE_{ij} = S_mS_d\sigma_i(\sigma_i-1)(p_{id} - p_{im}) + N_i(\sigma_{id} - E_{ij})n_i, \tag{39}$$

or:

* $$\varepsilon_{ij}N_iE_{ij} = S_mS_d\sigma_i(\sigma_i-1)(p_{id} - p_{im}) + (\sigma_{id} - S_m\sigma_i)n_i. \quad i=1,g, \; j=1,h \tag{40}$$

This is the format that appears in the model.

Notice that in equations (37) through (40), there are no j subscripts on the right hand side. This reflects the existence of two simplifications in these equations, one being purely notational, the other substantive. The S_m and S_d share parameters should be written more precisely as S_m^j , S_d^j , since these shares are allowed to vary according to user industry. For convenience, however, the j superscripts are omitted. More substantive is the assumption, previously mentioned, that good i has common σ_i and σ_{id} in <u>all</u> user markets. Finally, there is also the assumption made that all firms share equally in all markets.

We turn now to consumer demands, and the perceived elasticity of demand for the n^{th} variant of good i. In combining the demand equations (8) and (10) above, we have:

$$c_{idn} = c - p_{id}(S_d+\sigma_i S_m) - p_{im}(S_m-\sigma_i S_m) - \sigma_{id}(p_{idn}-p_{id}). \qquad (41)$$

Following similar reasoning to that for intermediate demands (given in equations (35) to (37) above) we derive the perceived elasticity for product i, sold to consumers, as:

$$E_i^c = (S_d+ S_m\sigma_i)/N_i + (1 - 1/N_i)\sigma_{id}. \qquad (42)$$

~~Following the pattern set for intermediate demand elasticities,~~ we may derive the percentage change in the elasticity as:

$$* \qquad \varepsilon_i^c E_i^c N_i = (\sigma_i - 1)^2 S_d S_m(p_{id} - p_{im}) + N_i(\sigma_{id} - E_i^c)n_i. \quad i=1,g \qquad (43)$$

The change in the perceived elasticity of investment demand for commodity i is derived just as for the intermediate demands. Hence:

$$* \qquad \varepsilon_i^y N_i E_i^y = S_m S_d \sigma_i(\sigma_i-1)(p_{id} - p_{im}) + N_i(\sigma_{id} - E_i^y)n_i. \qquad i=1,g \qquad (44)$$

Finally, we have the export demand equation (15), from which we can derive an equation for the perceived elasticity as follows:

$$E_i^e = E_{ix}/N_i + (1 - 1/N_i)\sigma_{id}. \qquad (45)$$

The firm assumes that any export tax is imposed at an exogenous <u>ad valorem</u> rate; consequently the elasticity of foreign demand seems the same whether with respect to the basic price of good i, or its export (tax-inclusive) price. E_{ix} is deemed constant so ε_i^e, the percentage change in E_i^e is:

$$* \qquad \varepsilon_i^e E_i^e = n_i(\sigma_{id} - E_i^e). \qquad i=1,g \qquad (46)$$

For some export commodities, in which Australia has a relatively large share of the world market, aggregate foreign demand may be reasonably inelastic. Nevertheless, there may be a large number of Australian producers or exporters competing within this market, none of whom are able to reap monopoly profits. By setting σ_{id} larger than the export elasticity we may allow competition between domestic firms to increase the perceived demand elasticity and reduce their price below the collusive optimum. We do not cater for the possibility that a marketing organization, such as the Wool Corporation or Wheat Board, could act as price setter, allowing the domestic industry to maximise profits by restricting supply, or minimize the terms-of-trade loss from export expansion.

This then completes the description of the perceived elasticities in the Lerner pricing hypothesis. The model assumes that prices in all markets are the same, so that the total perceived elasticity, a volume weighted average of the individual market elasticities, is used in the determination of markup levels. It is intended in later versions of the model to allow for price discrimination in domestic versus export markets.

The industry ZPP conditions have been introduced already, but for completeness we should specify the associated equations. To ensure proper accounting, each industry's sales must equal its material costs, plus any payments made to factors. In terms of levels of expenditure, we have:

$$Z_j P_{jd} = \sum_i X_{ijd} P_{id} + L_j P_l + K_j P_k + \sum_i X_{ijm} P_{im}, \qquad j = 1,h$$

or in p.c. form:

$$* \quad z_j + p_{jd} = \sum_i [S_{ijd}(p_{id} + x_{ijd}) + S_{ijm}(p_{im} + x_{ijm})] + S_j^l(l_j + p_l) + S_j^k(k_j + p_k), \qquad (47)$$

where the coefficients S are shares in total sales revenue, or total costs.

We could also decompose industry costs into variable and fixed components:

$$z_j + p_{jd} = S_v^j(z_j + v_j) + S_f^j(n_j + p_j^f),$$

where S_v^j and S_f^j are the shares of variable and fixed costs in total costs. v_j is the index of variable costs described above, while p_j^f is a price index of fixed costs defined by:

$$* \quad p_j^f = S_{lf}^j p_l + S_{kf}^j p_k, \qquad j = 1,h \qquad (48)$$

where S^j_{lf} is the share of labour in fixed costs, and S^j_{kf} the share of capital.

Recall that an important feature of the model is that this condition is enforced primarily via entry or exit of firms. In the standard version of ORANI, output price is determined by the CRTS production technology. The ZPP condition then determines output price as a suitable mean of input prices. In our miniature the direction of causality is reversed, whenever the price-setting equation (30) above is operational. The adjustment in the number of of firms necessary to eliminate pure profits implies a shift in industry-wide production technology, as the amount of fixed costs per unit of output responds. Thus price setting determines the technology employed, rather than the reverse.

Where markup pricing influences price setting, a secondary feedback mechanism comes into play. The change in the number of firms alters the perceived elasticity of demand, and this in turns reacts back on each firm's markup over marginal cost. In Section II we explain why this effect may be of rather little importance.

At this point, we should emphasise that the present model eliminates one step in the Harris' solution algorithm. In the present exercise, the initial database is a longrun zero-profit equilibrium. In Harris (1984), the initial database incorporates non-normal or pure profits; a solution algorithm generates the longrun zero profit equilibrium which would result under free entry/exit, in the absence of a policy shock. We have not, at this stage, introduced this feature into the current version of our miniature ORANI model.

(d) Other Equations

(i) Market Clearing Equations

Market clearing equations are implemented for locally-produced goods:

$$* \quad z_i = S_i^c c_{id} + S_i^y y_{id} + S_i^e e_i + \sum_j S_i^j x_{ijd}, \qquad i=1,g \qquad (49)$$

and for imports:

$$* \quad m_i = S_i^c c_{im} + S_i^y y_{im} + \sum_j S_i^j x_{ijm}. \qquad i=1,g \qquad (50)$$

For labour:

$$* \quad l = \sum_j S_j^l l_j, \qquad (51)$$

and for capital:

$$* \quad k = \sum_j S_j^k k_j. \qquad (52)$$

In all these equations the shares S are database value shares in total sales of the good or factor.

(ii) Miscellaneous Macro Equations

Various macro variables are defined by the next equations. An aggregate imports volume index is given by:

$$* \quad m = \sum_i S_i^m m_i, \qquad (53)$$

where m_i is the change in imports of commodity i, and the S_i are database value shares of each commodity in total import expenditure (tax-exclusive). Similarly, a quantity index for aggregate exports is given by:

$$* \quad e = \sum_i S_i^e e_i, \qquad (54)$$

where e_i represents the percentage change in change in exports of commodity i, and the S_i are database value shares of each commodity in total exports at tax-inclusive prices.

Price indices are defined for consumer goods, and for investment goods.

$$* \quad cpi = \sum_i S_{id}^c p_{id} + \sum_i S_{im}^c p_{im}, \text{ and} \qquad (55)$$

$$* \quad \pi = \sum_i S_{id}^y p_{id} + \sum_i S_{im}^y p_{im}, \qquad (56)$$

where the shares S are expenditure shares in the original bundles. These nominal aggregates are related to their real equivalents by:

$$* \quad c = c_r - cpi, \tag{57}$$

and

$$* \quad i = y_r - \pi. \tag{58}$$

Aggregate revenue to capital, R, is computed as:

$$* \quad r = p_k + \sum_j S_j^k k_j, \tag{59}$$

where the S_j^k are industry database shares in total revenue to capital.

In the same way, the change in the economy-wide wage bill,(RL), is:

$$* \quad (rl) = p_l + \Sigma S_j^l l_j, \tag{60}$$

where the S_j^l are industry database shares in total payments to labour.

Z_t is a measure of aggregate output. In p.c. form:

$$* \quad z_t = \sum_j S_j z_j, \tag{61}$$

where the S_j are industry database shares in total value of output.

The percentage change, (re), in revenue from export taxes, (RE), is computed as:

$$* \quad (re)(RE) = \sum_i B_i(p_{id} + e_i) + C_i s_i, \qquad i=1,g \tag{62}$$

where the B_i are the original export tax yields by commodity, and the C_i are the original values of exports, tax-inclusive. Note that S_i is defined as the power of the export tax.

Similarly, (rm), the change in revenue from tariffs, is:

$$* \quad (rm)(RM) = \sum_i B_i(p_i^* + m_i + \phi) + C_i t_i, \qquad i=1,g \tag{63}$$

where the B_i are the original import tax yields by commodity, and the C_i are the original values of imports, tax-inclusive. Again, note that T_i is defined as the power of a tax.

GDP is calculated from the expenditure side as a shareweighted sum of the changes in consumption, investment and (exports - imports):

$$* \quad gdp = S_1 c + S_2 i + S_3 e + S_4 m . \tag{64}$$

GDI (= gross domestic income) is necessarily identical to the above GDP:

$$GDI = R + (RL) + (RE) + (RM),$$

but it is computed separately as a checking feature. In p.c. form:

* $$gdi = S_1 r + S_2(rl) + S_3(re) + S_4(rm). \quad (65)$$

(iii) Investment Equations

Investment in each industry moves in line with the industry capital stock:

* $$y_j = k_j. \quad (66)$$

This equation reflects the assumption that the growth rates of the capital stock in each industry are unchanged by any shock. It is part of the longrun environment described in Horridge (1985). Aggregate real investment is merely the sum of the industry components. In p.c. form:

* $$y_r = \sum_j S_j^y y_j. \quad (67)$$

(iv) Longrun Closure Equations

The following group of equations assist in the implementation of a longrun macro environment. They are borrowed from a special version of ORANI described in Horridge (1985), which should be consulted for a fuller explanation. One key feature is that some of the capital stock is foreign-owned so that rentals from this part accrue to foreigners. Thus GDP may be divided again into GNP - the income accruing to Australians, and (RX), the capital rentals accruing to foreigners. In p.c. form :

* $$gdp = S_1 gnp + S_2(rx), \quad (68)$$

where S_1 and S_2 are the database shares of GNP and (RX) in GDP.

Q is defined as the Australian-owned share of the capital stock, so that (1-Q) is the foreign share. Then (RX) = (1-Q)R, where R is aggregate capital revenue, as defined above. In p.c. form:

* $$(rx) = r - qQ/(1-Q). \quad (69)$$

Australian wealth is equated to the Australian-owned part of the aggregate capital stock, or in p.c. form:

* $$w = q + k. \qquad (70)$$

The accretion of this wealth depends on the stream of saving made by Australians. In p.c. form:

* $$w = \lambda(s - \pi), \qquad (71)$$

where λ is a parameter between 0 and 1 which reflects the assumed mechanism of conversion of flow (saving) into stock (wealth), and other database features (see Horridge (1985)).

A simple proportional consumption function models the division of national income into consumption and saving. In p.c. form:

* $$c = s + f_c, \qquad (72)$$

where f_c is the (normally exogenous) average propensity to consume. The national budget constraint may be represented as:

* $$gnp = S_1 c + S_2 s, \qquad (73)$$

where S_1 and S_2 are database shares of consumption and saving in GNP.

Finally net foreign investment, (NFI) is merely the difference between total investment I and Australian saving S, so that I = S + (NFI). In p.c. form:

* $$S_1 s + S_2 (nfi) = i, \qquad (74)$$

where S_1 and S_2 are the database shares of saving and foreign investment in total investment.

III EMPIRICAL SPECIFICATION AND MODEL SIMULATION

(a) The Database

In Section I, we outlined the equations comprising the longrun Harris-style miniature ORANI. To illustrate the working of the model we now document four trial simulations, and interpret their results. One aim is to evaluate the numerical significance of the equations added to ORANI, by comparing results using the new specifications with those from a conventional constant-returns-to-scale (CRTS) version. Thus the simulations share the same database, differing only in their specification of pricing behaviour and production technology.

This database may be divided into two parts. The first is based on the 1977-8 'typicalized' ORANI database drawn primarily from the ABS input-output (I-O) tables (see Bruce (1985) and Higgs (1985)). That database was ~~aggregated from its original size of 112 industries and 114 commodities,~~ down to 8 industries each producing a single product, using the aggregation facility described in Bruce et al. (1984). The eight industry groupings comprise:

(1) Resource industries: agriculture, forestry, fishing, mining, metal processing, petroleum and coal products.
(2) Food processing: food, beverages and tobacco.
(3) Textiles: textiles, clothing, footwear and leather.
(4) Wood and Paper Products: furniture, wood products, paper products, printing and publishing.
(5) Chemicals: chemicals, rubber and plastic products.
(6) Non-metallic minerals: glass, clay, ceramics and concrete.
(7) Metal products: fabricated metal products, machinery, transport equipment, miscellaneous manufatures.
(8) Services: construction, trade, transport, finance, utilities, and government.

The aggregated ORANI database forms the basis of the miniature database set out in Table 1, although various adjustments had to be made to accommodate the simplifications of the smaller version. Government demands, as found in the ABS I-O tables, were allocated to the consumption vectors, reflecting their similar treatment in the standard ORANI model. Margins were reallocated to primary flows, whilst taxes (other than trade

Table 1:

MINIATURE ORANI DATABASE - INPUT/OUTPUT FLOWS

		Industries								Other Users					
		1	2	3	4	5	6	7	8	Consumption	Investment	Exports	Totals	Trade Taxes	
	1	42.63	38.10	2.46	2.49	12.09	4.17	21.57	13.03	14.54	2.65	78.89	232.61	2.04	Resource
	2	4.72	19.56	.43	.14	.99	.04	.29	2.81	110.92	.00	25.99	165.89	-.20	Food
	3	.55	.30	15.30	.75	1.14	.07	.96	4.07	39.76	.87	2.67	66.45	.00	Textiles
Domestic	4	1.40	2.57	.27	16.06	1.02	.30	2.12	30.21	18.47	1.79	1.57	75.78	-.00	Wood
Demands	5	12.75	3.99	1.41	3.10	18.10	1.37	6.66	30.09	26.89	.27	5.77	110.40	.17	Chemicals
	6	1.20	1.05	.00	.22	.31	2.41	.83	18.16	1.74	.17	.16	26.25	.00	Non-metal
	7	5.13	3.49	.10	.71	.53	.14	27.39	47.19	42.48	51.75	6.71	185.63	-.01	Metal
	8	54.91	60.36	28.52	23.94	36.91	8.07	57.41	170.70	385.65	133.86	15.56	975.89	.02	Services
	1	2.96	2.65	.17	.17	.84	.29	1.50	.90	1.01	.18		10.67	.22	
	2	.16	.64	.01	.00	.03	.00	.01	.09	3.65	.00		4.60	.14	
	3	.12	.06	3.29	.16	.25	.01	.21	.88	8.55	.19		13.71	1.76	
Imported	4	.19	.34	.04	2.11	.13	.04	.28	3.98	2.43	.24		9.78	.45	
Demands	5	2.39	.75	.26	.58	3.40	.26	1.25	5.65	5.05	.05		19.66	.86	
	6	.13	.11	.00	.02	.03	.26	.09	1.95	.19	.02		2.81	.21	
	7	1.76	1.20	.04	.24	.18	.05	9.40	16.19	14.58	17.75		61.38	5.48	
	8	1.48	1.63	.77	.64	.99	.22	1.55	4.60	10.39	3.61		25.87	.00	
Fixed Capital		13.16	7.58	1.31	5.11	11.29	2.81	9.89	26.11				77.26		
Var'ble Capital		29.89	2.64	1.82	2.42	1.79	.43	2.80	210.34				252.13		
Fixed Labour		10.30	11.12	2.71	8.66	15.46	4.07	26.45	22.73				101.50		
Var'ble Labour		46.79	7.76	7.54	8.21	4.90	1.25	14.98	366.21				457.64		
Column Total		232.6	165.9	66.4	75.8	110.4	26.3	185.6	975.9	686.3	213.4	137.3	2875.9	11.2	

Total Revenue to Capital:	329.390
Total Revenue to Labour:	559.141
Total Revenue to Fixed Labour and Capital:	178.756
Total Revenue to Variable Labour and Capital:	709.775
Gross National Product:	817.338
Gross Domestic Product:	899.685

Total Imports at Foreign Prices:	139.350
Total Exports at Foreign Prices:	139.350
Balance of Trade:	-.000
National Saving:	131.041
Foreign Investment:	82.348
Rentals to Foreigners:	82.347

Table 1:(continued)

MINIATURE ORANI DATABASE - INPUT/OUTPUT FLOWS:

Table of Cost (Column) Shares

		Industries 1	2	3	4	5	6	7	8	Other Users Consumption	Investment	Exports	Totals	Trade Taxes	
Domestic Demands	1	.183	.230	.037	.033	.109	.159	.116	.013	.021	.012	.574	.081	.183	Resource
	2	.020	.118	.006	.002	.009	.001	.002	.003	.162	.000	.189	.058	-.018	Food
	3	.002	.002	.230	.010	.010	.002	.005	.004	.058	.004	.019	.023	.000	Textiles
	4	.006	.015	.004	.212	.009	.012	.011	.031	.027	.008	.011	.026	-.000	Wood
	5	.055	.024	.021	.041	.164	.052	.036	.031	.039	.001	.042	.038	.015	Chemicals
	6	.005	.006	.000	.003	.003	.092	.004	.019	.003	.001	.001	.009	.000	Non-metal
	7	.022	.021	.002	.009	.005	.005	.148	.048	.062	.243	.049	.065	-.001	Metal
	8	.236	.364	.429	.316	.334	.307	.309	.175	.562	.627	.113	.339	.001	Services
Imported Demands	1	.013	.016	.003	.002	.008	.011	.008	.001	.001	.001		.004	.020	
	2	.001	.004	.000	.000	.000	.000	.000	.000	.005	.000		.002	.012	
	3	.001	.000	.050	.002	.002	.001	.001	.001	.012	.001		.005	.158	
	4	.001	.002	.001	.028	.001	.002	.002	.004	.004	.001		.003	.041	
	5	.010	.005	.004	.008	.031	.010	.007	.006	.007	.000		.007	.077	
	6	.001	.001	.000	.000	.000	.010	.000	.002	.000	.000		.001	.019	
	7	.008	.007	.001	.003	.002	.002	.051	.017	.021	.083		.021	.492	
	8	.006	.010	.012	.009	.009	.008	.008	.005	.015	.017		.009	.000	
Fixed Capital		.057	.046	.020	.067	.102	.107	.053	.027				.027		
Var'ble Capital		.128	.016	.027	.032	.016	.016	.015	.216				.088		
Fixed Labour		.044	.067	.041	.114	.140	.155	.142	.023				.035		
Var'ble Labour		.201	.047	.114	.108	.044	.048	.081	.375				.159		
Original Column Totals		232.6	165.9	66.4	75.8	110.4	26.3	185.6	975.9	686.3	213.4	137.3	2875.9	11.2	

taxes) were ignored. The category 'capital' includes returns to land, capital, and the ORANI category 'Other Cost Tickets'. The share of imports in usage of good i was set to be the same for all users, at a level equal to the overall share of imports in usage of that good. Finally, a RAS process (Bacharach (1970)) imposed equality of costs and sales for each industry.

In spite of these adjustments, the miniature database is empirically sourced in the following important respects:

(i) commodity flows, domestic and imported, between industries and between industries and final demand categories,
(ii) factor payments to labour and capital,
(iii) Armington elasticities for each commodity,
(iv) the levels of trade taxes.

The second part of the miniature database reflects the extensions to conventional ORANI incorporated in our miniature. Additional information is needed, which cannot be drawn from the existing ORANI database. In fact, the following extra data were required:

(a) the number of firms in each industry,
(b) the elasticity of substitution between domestic variants of each good (the σ_{id}),
(c) the allocation of labour and capital costs between fixed and variable components.
(d) two capital-labour substitution elasticities for each industry. One, σ^{v}, corresponds to the normal combination of (variable) factors in production; the other, σ^{f}, determines the factor mix of the recurrent fixed input for each firm.

The values we adopted for the experiments reported below are largely hypothetical, although they do reflect experience gained during a continuing process of genuine data gathering. They are listed in the latter part of Table 2. An attempt has been made to match the 8 industry groupings to distinct industry 'types'. Thus, industry 3,(textiles), is assigned a low proportion of fixed costs, and so has a scale elasticity

Table 2: Parameter Values in this Miniature Simulation

Other Data Based on that Used in Large ORANI Model

Armington Elasticities: σ_i	2.000	1.646	3.039	1.545	1.191	.993	2.156	.444
Export Demand Elasticities: E_{ix}	6.300	7.000	9.000	8.000	4.000	2.000	5.000	2.000
Investment by Industry: $y_{j\pi}$	27.890	6.620	2.023	4.880	8.477	2.098	8.224	153.177
Ratio of Changes of Wealth and Saving: λ	.500							
Australian Share of Capital Stock: Q	.750							

Additional Data Required for Extension to Harris-style Version

Number of Firms in Each Industry: N_i	100.000	30.000	50.000	7.000	6.000	10.000	10.000	100.000
Substitution Elast. between Domestic Variant: σ_{id}	20.000	10.000	20.000	10.000	5.000	5.000	6.000	38.000
Share of Fixed Costs in Total Costs: S_f^i	.101	.113	.060	.182	.242	.262	.196	.050
Ratio (K/L)Fixed to (K/L)Variable:	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000
Variable Costs KL Substitution Elasticity: σ^v	1.280	1.280	1.280	1.280	1.280	1.280	1.280	1.280
Fixed Costs KL Substitution Elasticity: σ^f	1.280	1.280	1.280	1.280	1.280	1.280	1.280	1.280

Other Derived Parameters of Interest

Output per Firm by Industry:	2.326	5.530	1.329	10.825	18.401	2.625	18.563	9.759
Fixed Cost per Firm by Industry: p_j^f	.235	.623	.080	1.968	4.459	.687	3.634	.488
Actual Markup: $1/S_v$	1.112	1.127	1.064	1.222	1.320	1.355	1.243	1.053
~~Unit Marginal Cost: S_v~~	~~.899~~	~~.887~~	~~.940~~	~~.818~~	~~.758~~	~~.738~~	~~.804~~	~~.950~~
Implied Scale Elasticity: S_v	.899	.887	.940	.818	.758	.738	.804	.950
Perceived Elasticity by Commodity: E_i^t	19.823	9.726	19.627	8.651	4.265	4.517	5.488	37.624
Implied Lerner Markup: $E_i^t/(E_i^t-1)$	1.053	1.115	1.054	1.131	1.306	1.284	1.223	1.027
Implied Lerner Price: $1 - 1/E_i^t$	.947	.989	.990	.925	.990	.948	.983	.976
Share of Factor Costs in Total Costs:	.431	.175	.201	.322	.303	.326	.292	.641
Share of Capital in All Factor Costs:	.430	.351	.233	.309	.391	.378	.235	.378
Share of Labour in All Factor Costs:	.570	.649	.767	.691	.609	.622	.765	.622
Share of Capital in All Costs:	.185	.062	.047	.099	.119	.123	.068	.242
Share of Labour in All Costs:	.245	.114	.154	.223	.184	.203	.223	.399
Share of Capital in Variable Costs:	.143	.018	.029	.039	.021	.022	.019	.227
Share of Labour in Variable Costs:	.224	.053	.121	.132	.059	.065	.100	.395
Share of Capital in Fixed Costs:	.561	.405	.325	.371	.422	.408	.272	.535
Share of Labour in Fixed Costs:	.439	.595	.675	.629	.578	.592	.728	.465
Overall Imported Share in Usage: S_m (overall)	.065	.032	.177	.116	.158	.097	.255	.026
Product, Armington Elasticity and Import Share: $\sigma_i S_m$	.130	.052	.538	.180	.188	.096	.551	.01
Share of Exports in Sales:	.339	.157	.040	.021	.052	.006	.036	.016
BOTE[1] Elasticity of Output w.r.t. Import Price:	.105	.019	.514	.187	.169	.098	.556	.001
BOTE[1] Elasticity of Output w.r.t. Domestic Price:	-2.723	-2.230	-1.869	-.712	-.701	-.188	-1.029	-.529
Apparent Overall CRTS KL Substitution Elasticity σ^t	1.253	1.251	1.254	1.250	1.259	1.260	1.259	1.269
Powers of Tariffs: T_i	1.021	1.030	1.147	1.049	1.046	1.083	1.098	1.000

1 BOTE = Back-of-the-envelope.

near to unity. (Recall that this elasticity - of required inputs with respect to additional output - is equal to the share of variable cost in total costs.) Appropriately, it seems to be a highly competitive industry, with a fairly large number of firms, and a high degree of substitutability between their products. Thus, output per firm, and fixed cost per firm are low. Industries 4 (Wood products), 5 (Chemicals), and 7 (Metal products) are at the opposite end of the spectrum with high fixed cost shares and relatively larger output per firm. The degree of substitutability between domestic variants is rather less. Industry 6 (Non-metallic minerals) is a hybrid with high fixed costs but low output per firm. This might reflect significant unexploited scale economies associated with geographically dispersed demand and high internal transport costs - rather than indicating the entry of 'too many' firms behind high tariff barriers. Thus the effective degree of substitutability between domestic variants is low. Industry 1 (Resources) typifies the competitive export-oriented industries, whilst 8 (Services) is competitive, yet largely non-traded. Finally, Industry 2 (Food processing) is an intermediate case, with moderate scale economies and a relatively large number of firms, whose products are fairly substitutable. It is the second largest exporter.

The elasticity of substitution between capital and labour has been assigned the same value for all industries, whether for the fixed or variable component of production technology. This value, 1.28, is the same as that adopted in current longrun versions of ORANI, and recommended by Caddy (1977). The relation between the capital intensity of the fixed and variable components in each industry is arbitrarily set so that the 'fixed' part of the production process is twice as capital intensive as the variable part. The overall capital intensity of each industry is drawn from the ORANI database.

Although small enough to be manageable, this minature version of ORANI could be expected to capture far more of the flavour of its fullsize counterpart than other miniature ORANIs, most of which have had but two sectors. Specifying only an importer and an exporter, the two-sector model lacks a non-traded sector, and so may seem over-responsive to trade policy experiments. By contrast, Table 1 shows that industry 8 (Services), which is virtually non-traded, accounts for about half of all industry output. The additional sectors allow for linkages within the import-competing group, precluded in the two-sector models. In many ways, such a miniature could be better described as a small fullsize model.

In summary, this miniature database combines stylised features of industrial organization, chosen to illustrate the potential implications of equations added to the existing ORANI framework, with genuine data deriving ultimately from the ABS input-output tables. Since the aim of the experiments is only to gain an insight into the workings of this type of model, little importance may be attached to this database. At the same time we have tried to make it as plausible as possible. Data is currently being gathered to satisfy requirements (a) to (d) above, in the context of a fullsize model. This will enable revision of our miniature parameter file.

Discussion of one important set of parameters has been avoided so far. These are the α_i - representing the relative weight of import-parity pricing (as opposed to Lerner markup pricing) in price-setting. The omission is deliberate, as our experiments consist partially in altering these values, and observing the effects. Thus, as treated below, the α_i are chosen, rather than given. Normally, we would like to choose values which most realistically characterize observed pricing behaviour, in accord with a theory of firm behaviour. There are obvious empirical and conceptual difficulties involved. Data on firm numbers, industry concentration, actual markups (or observed profitability using some other measure) might serve as a proxy basis for determining the degree of collusion within an industry, although this is bound to be imprecise, and highly subjective. The paper of Dixon and Gunther (1983) is a possible guide along these lines.

(b) The Experiments

Four experiments are reported here, each modelling the effects of a 25 per cent across-the-board (ATB) cut in <u>ad valorem</u> tariff rates. Thus the change in the price of duty-paid imports of each commodity was proportional to the initial rate of protection. These changes, equivalent to the change in the powers of the tariff, are shown in Table 3. The

Table 3: Details of the Experiments

Same Shocks for All Experiments

Percentage Changes in Powers of Tariffs:

-.514 -.728 -3.20 -1.17 -1.10 -1.92 -2.23 0.000

Variables Exogenous in All Four Cases:

No.	Symbol	Mnemonic	Range	Name
51.	f_c	fc	1	Consumption Shifter - Ratio Consumption to Saving
53.	f^p_{ie}	fie	g	Export Demand Price Shifter, Good i
54.	f^q_{ie}	fie	g	Export Demand Quantity Shifter, Good i
55.	l	ltot	1	Aggregate Employment
56.	p^*_i	piw	g	World Price of Imported Good i
57.	s_i	si	g	Power of Export Tax, Good i
58.	t_i	ti	g	Power of Import Tax, good i
59.	ϕ	ex	1	Exchange Rate (dollars/yen)

Also Exogenous in Experiment 1

16.	b_j	bj	h	Efficiency by Industry j	j = 1,....,8

Also Exogenous in Experiment 2

52.	f^p_{id}	fid	g	Domestic Price Shifter, Good i	i = 1,....,8

Also Exogenous in Experiments 3 and 4

16.	b_j	bj	h	Efficiency by Industry j	j = 1,3,8
52.	f^p_{id}	fid	g	Domestic Price Shifter, Good i	i = 2,4,5,6,7

Setting of α - Same for All Industries

Experiment 1: Irrelevant - Average Cost Pricing

Experiment 2: Zero - Lerner Pricing

Experiments 3 and 4: 1/2 - Mixed Pricing Hypothesis for Industries 2,4,5,6, and 7
Irrelevant - Average Cost Pricing for Industries 1,3, and 8

initial rates, shown in Table 2, reflect only direct tariffs. Were quotas and indirect barriers included as tariff-equivalents, the rates of protection would be approximately doubled. Our results, then, could be roughly interpreted as a 12.5 per cent ATB cut in all forms of protection. The experiments are distinguished by the specification of pricing behaviour:

(1) Average Cost Pricing with Constant Returns to Scale. This forms a benchmark simulation with which to contrast other results. It is brought about by constraining the number of firms to move in line with industry output, just as do variable costs. To achieve this, the b_j in equation (26) above are held at zero. Thus the ZPP is sufficient to determine output price, and so, to avoid overdetermination, the mixed pricing equation (30) is deactivated through the device of allowing the variables f_{id} to float endogenously. Notice that these f_{id} appear in no other equation. The chosen values of α_i are irrelevant in this environment.

(2) Lerner Markup Pricing based on endogenous perceived demand elasticities. Both f_{id} and α_i are set at nought to enforce this rule. The ZPP is satisfied by free entry or exit of firms, the numbers of which are endogenous. As the number of competitors, the shares of imports, and the relative importance of each customer category changes, so too do the perceived demand elasticities, and hence the markup over variable cost.

(3) Mixed Pricing Behaviour. This environment is more realistic and resembles that of Harris' model. Industries 1, 3, and 8 are deemed competitive and modelled just as in Simulation 1. The remaining industries combine monopolistic with import-parity pricing. In terms of equation (30), their pricing rule is:

$$p_{id} = (p_{im} + p_{il})/2.0$$

(4) Mixed Pricing Behaviour with Stronger Scale Effects. This simulation tests the sensitivity of (3) to the database industry scale elasticities. The share of fixed in total costs was increased by 20 per cent from the values used in Simulation 3, whilst all other details of the experiment and database remained unchanged.

Thus the differences consist not only in the different values for α_i, but also in the closure - that is, the allocation of exogenous/endogenous status between the variables. A summary appears in Table 3, which also shows the variables which were held exogenous in all simulations. Apart from the tariffs, all exogenous variables had zero values. Thus, most of them reflect constant world prices and demand conditions. The fixed exchange rate may be regarded merely as a convenient numeraire. The macro features common to all three closures are fully explained in Horridge (1985). Principal among these are the fixed total labour supply with endogenous real wage, endogenous capital stocks adjusting to maintain given rates of return, and constant ratios of nominal saving and consumption to nominal national income. Investment is linked to the growth in the capital stock, and foreign investment adjusts endogenously to make up any shortfall in the amount of funds provided by domestic saving. The change in foreign equity affects the amount of capital revenue remitted overseas and the two together serve to determine the balance of trade endogenously.

The experimental results are presented through short digests - Tables 4 to 7 - and in more detailed summaries relegated to Appendix III.

(i) Results in Constant Returns to Scale Environment

Table 4 shows the results of the 25 per cent tariff cuts in the CRTS environment for a small selection of endogenous variables. Fuller results appear in Appendix III. Columns 1 to 8 correspond to the individual tariff increases whilst column 9 is merely a rowsum - the combined ATB effect. Figure 1 shows how the vector of industry outputs is represented in tabular form. Each row corresponds to one variable. Thus there are eight rows for the z_j - showing the output changes of each industry. The leading diagonal of this matrix shows the effect on domestic output of each commodity of the reduction in the tariff on that commodity. The bottom row is a mean of the first eight, weighted by industry factor costs; it shows the effect of each tariff on aggregate output.

The output matrix tells a story familiar to users of ORANI and similar models. It is schematized in Figure 2. Each individual tariff cut reduces output in the associated industry, through an economy-wide substitution towards the imported equivalent. The extent of the damage depends positively on the existing degree of import penetration, the Armington elasticity, and, naturally, on the existing degree of protection: hence the poorer performance of Industries 3 (Textiles) and 7 (Metal products).

Following each tariff cut, all industries other than the one losing protection reap the benefit of reduced input costs. Average cost pricing implies that a reduction in the price of one import feeds through the whole economy. Labour released from the contracting, exposed industry is available for reallocation elsewhere. Thus the off-diagonal elements of the industry output matrix tend to be positive. Down any column, they outweigh the negative diagonal elements; the net effect on aggregate output, z_t, is positive. The reduced input costs of the exporting industries 1 and 2 translate particularly strongly into greater sales. The rowsums, in contrast, are of ambiguous sign. Economy-wide cost reductions due to the reduction in tariffs elsewhere do not outweigh the loss of tariff protection for industries 3 and 7.

Some features of the results are specific to longrun versions of

Table 4: Results in Constant-Returns-to-Scale Environment

Tariff Induced Change in Import Price No : (Diagonal of p_{im} matrix)	1	2	3	4	5	6	7	8
	-.514	-.728	-3.20	-1.17	-1.10	-1.92	-2.23	0.000

			1	2	3	4	5	6	7	8	ATB
	Resource	1	-.009	0.012	0.278	0.052	0.079	0.016	0.820	0.000	1.247
	Food	2	0.025	-.010	0.093	0.023	0.028	0.009	0.353	0.000	0.520
Industry	Textiles	3	0.004	0.001	-1.29	0.009	0.010	0.004	0.188	0.000	-1.07
	Wood, Paper	4	0.003	-.001	0.024	-.182	0.010	0.003	0.150	0.000	0.007
Outputs	Chemicals	5	0.005	0.001	0.051	0.009	-.139	0.003	0.207	0.000	0.138
	Non-Metal	6	0.003	-.001	0.007	0.006	0.008	-.181	0.138	0.000	-.020
z_j	Metal	7	0.010	0.001	0.066	0.017	0.025	0.007	-.753	0.000	-.626
	Services	8	0.001	-.002	-.029	0.002	0.001	0.002	0.100	0.000	0.075
Aggregate Output z_t			0.001	0.000	0.001	0.004	0.007	0.003	0.144	0.000	0.161

			1	2	3	4	5	6	7	8	ATB
	Resource	1	-.013	-.005	-.100	-.017	-.029	-.006	-.297	0.000	-.468
	Food	2	-.016	-.008	-.098	-.021	-.025	-.007	-.295	0.000	-.471
Domestic	Textiles	3	-.007	-.005	-.300	-.017	-.021	-.005	-.254	0.000	-.608
	Wood, Paper	4	-.006	-.005	-.107	-.057	-.026	-.006	-.265	0.000	-.472
Prices	Chemicals	5	-.010	-.005	-.106	-.018	-.056	-.006	-.275	0.000	-.476
	Non-Metal	6	-.012	-.005	-.100	-.019	-.030	-.026	-.277	0.000	-.468
p_{id}	Metal	7	-.010	-.005	-.099	-.018	-.024	-.006	-.375	0.000	-.537
	Services	8	-.005	-.005	-.102	-.021	-.019	-.008	-.305	0.000	-.465

		1	2	3	4	5	6	7	8	ATB
Nominal Wage to Labour	p_l	-.002	-.005	-.107	-.010	0.000	0.000	-.134	0.000	-.258
Nominal Capital Rental	p_k	-.006	-.004	-.095	-.020	-.019	-.007	-.475	0.000	-.626
Aggregate Capital Stock	k	0.004	-.001	0.004	0.012	0.019	0.007	0.389	0.000	0.434
Consumer Price Index	cpi	-.008	-.009	-.146	-.024	-.029	-.008	-.329	0.000	-.553
Investment Price Index	π	-.006	-.004	-.095	-.020	-.019	-.007	-.475	0.000	-.626
Absorption Price Deflator		-.007	-.007	-.133	-.023	-.026	-.028	-.008	0.000	-.570
Real Consumption	c_r	-.002	-.001	-.001	-.003	-.004	-.001	-.034	0.000	-.046
Total Real Investment	y_r	0.004	-.001	0.004	0.012	0.019	0.007	0.389	0.000	0.434
Nominal Capital Income	r	-.003	-.005	-.091	-.008	0.001	0.000	-.086	0.000	-.191
Nominal Labour Income	rl	-.002	-.005	-.107	-.010	0.000	0.000	-.134	0.000	-.258
Nominal Tariff Revenue	rm	-.592	-.360	-3.51	-1.20	-2.30	-.556	-13.3	0.000	-21.8
Nominal GDP	gdp	-.008	-.009	-.134	-.021	-.023	-.005	-.246	0.000	-.446
Real GDP		0.001	-.001	-.000	-.001	0.003	0.002	0.117	0.000	0.124
All Imports, World Prices	m	0.061	0.029	0.514	0.082	0.121	0.025	1.114	0.000	1.947
All Exports, World Prices	e	0.064	0.028	0.514	0.091	0.136	0.031	1.444	0.000	2.310

Figure 1: Schematic Representation of Output Solution Matrices

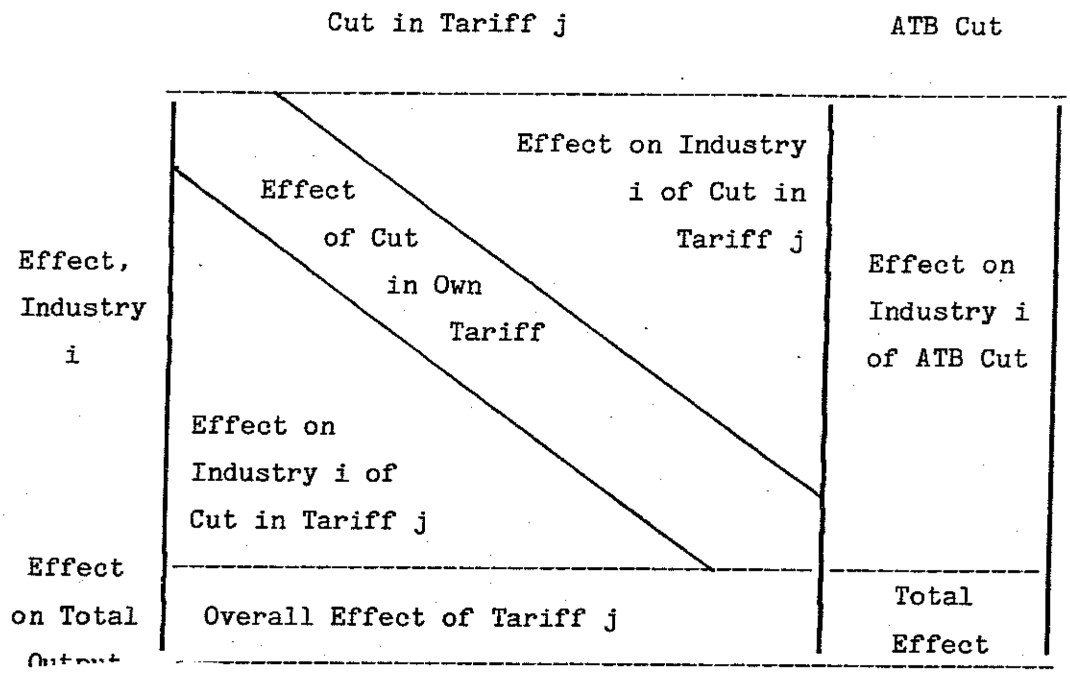
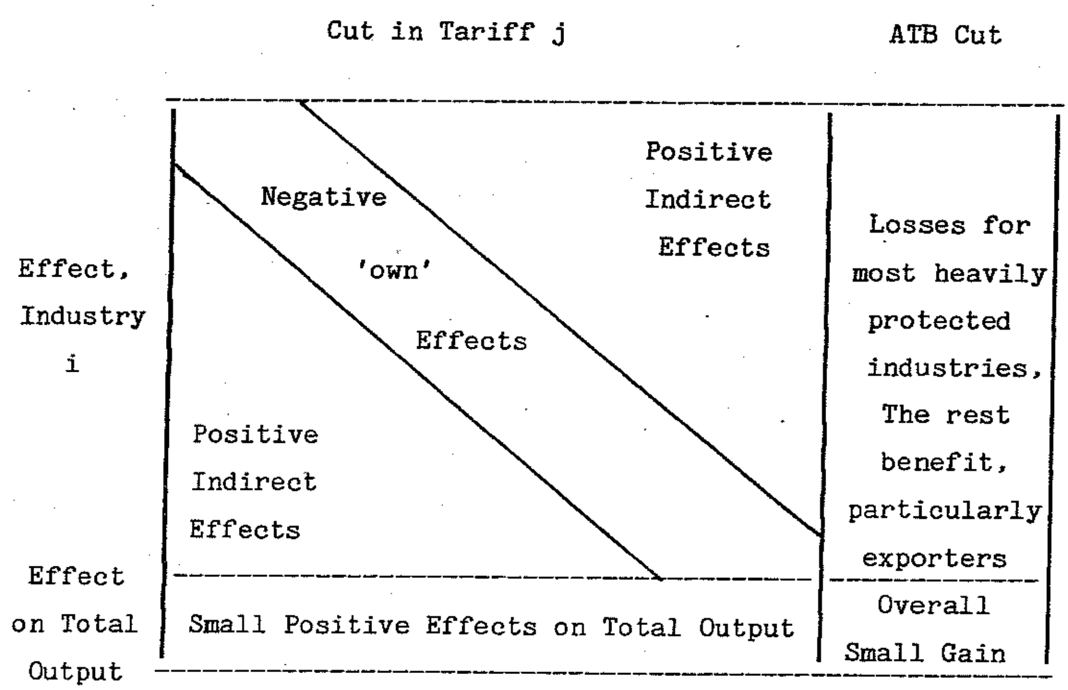


Figure 2: Output Matrix - Competitive Environment



ORANI. Since both factors are mobile between industries, and available at an economy-wide price, supply curves may be conceived of as flat. Thus industries do not reduce output price in response to falling demand, as in shortrun ORANI, in which each industry's capital stock is fixed. This exacerbates the fall in output suffered by each newly exposed industry, and enables the other industries to expand more readily. Thus the longrun versions of ORANI (both this miniature in CRTS mode and the full model) allow greater intersectoral transfers of resources than the shortrun version.

In this miniature version of ORANI all exports are endogenously determined, with export elasticities averaging about 6.00. The standard fullsize version of ORANI, by contrast, allows only 2/3 of export prices to change - endogenous export subsidies adjust to maintain fixed export prices and volumes for the remainder. Our smaller version of ORANI therefore shows greater terms of trade losses than does the fullsize version. Thus although aggregate output, z_t, increases following each tariff reduction, real GDP increases less or even decreases.

A second feature of the longrun environment minimizes any welfare gain to be achieved from tariff reform. Labour is in fixed total supply, whilst capital is in elastic supply at a fixed real rental. The elasticity of substitution between the two is greater than one. In these circumstances, capital tends to account for the greater part of any increase in factor income (see Horridge (1985), p. 62). Given fixed real capital rental rates, any increase in real capital income derives from an increase in the stocks employed. Given a constant average propensity to consume, domestic saving is proportional to national income and does not increase enough to purchase this new capital, and so it is paid for by foreign investment. Thus most of the increase in factor incomes actually accrues to foreigners. Real consumption, c_r, which is also proportional to national income, can be used as a welfare measure to demonstrate this point. The results show that each tariff cut brings about a small welfare loss. Any increase in labour income is more than offset by the lost tariff revenue.

The results in Table 4 are in broad agreement with those derived from a comparable experiment using fullsize ORANI (Horridge (1985)). This increases our confidence that qualitative conclusions drawn from our miniature version will be confirmed by subsequent fullscale implementation. The main differences are brought about by the averaging of various parameters during the condensation down to eight sectors. Tariff rates, in particular, display a high variance within each of our eight sectors, and are higher in the fullsize model, which makes allowance for quotas and other indirect barriers to imports. Fullsize results show more 'outliers' among the industries, principally those which are heavily protected or export-oriented.

(ii) Results: Monopolistic Pricing Environment

Table 5 shows the results of the tariff cuts in an environment where monopolistic, or Negishi-Lerner pricing is enforced for each industry. The figures are strikingly similar to those for the previous CRTS environment. In particular, the number of firms, n_j, seems to move in line with the industry output levels, z_j. Thus only small departures are made from CRTS in practice. This reflects certain features of our database.

Both CRTS and monopolistic pricing environments may be thought of as examples of markup pricing rules. CRTS implies that price bears a **constant** (unitary) ratio to **average** cost, whilst the Lerner approach implies that price bears a **changing** ratio to **marginal** cost. Thus the differences between the two environments may be partitioned into two effects: changes in the Lerner markup, and any induced disparities between marginal and average cost.

The mechanisms governing any change in the Lerner markup are treated in Section I above. Three fundamental equations are reproduced for convenience:

* $$p_{i1} = v_i + \varepsilon_i/(1 - E_i^t), \qquad (32)$$

* $$\varepsilon_i^t + z_i = \Sigma_k Q_i^k(\varepsilon_i^k + x_{ik}), \qquad i=1,g \qquad (34)$$

* $$\varepsilon_{ij} N_i E_{ij} = S_m S_d \sigma_i(\sigma_i - 1)(p_{id} - p_{im}) + (\sigma_{id} - S_m \sigma_i) n_i . \qquad i=1,g,\ j=1,h \qquad (40)$$

The first relates the change in the markup to a change in the total perceived elasticity of demand for a good. The second defines the total perceived elasticity in terms of changes in component elasticities, and changes in the weighting of these components. The third shows the derivation of one representative component perceived elasticity — corresponding to intermediate demands by industry j for a variant produced in industry i.

Table 6 presents numbers to flesh out this material. The top half

Table 5: Results in Monopolistic (Lerner) Pricing Environment

Tariff Induced Change in Import Price No : (Diagonal of p_{im} matrix)	1	2	3	4	5	6	7	8
	-.514	-.728	-3.20	-1.17	-1.10	-1.92	-2.23	0.000

Industry Outputs z_j		1	2	3	4	5	6	7	8	ATB
Resource	1	-.006	0.012	0.278	0.054	0.087	0.017	0.826	0.000	1.269
Food	2	0.030	-.009	0.094	0.027	0.037	0.012	0.369	0.000	0.560
Textiles	3	0.005	0.001	-1.26	0.011	0.015	0.005	0.196	0.000	-1.02
Wood, Paper	4	0.005	-.001	0.027	-.174	0.020	0.005	0.165	0.000	0.046
Chemicals	5	0.009	0.001	0.057	0.014	-.126	0.006	0.226	0.000	0.186
Non-Metal	6	0.006	-.001	0.009	0.009	0.016	-.179	0.151	0.000	0.011
Metal	7	0.013	0.001	0.068	0.022	0.037	0.010	-.712	0.000	-.562
Services	8	0.003	-.002	-.026	0.004	0.007	0.004	0.111	0.000	0.100
Aggregate Output z_t		0.004	0.000	0.004	0.007	0.014	0.004	0.157	0.000	0.191

Domestic Prices p_{id}		1	2	3	4	5	6	7	8	ATB
Resource	1	-.014	-.005	-.099	-.017	-.030	-.006	-.295	0.000	-.467
Food	2	-.018	-.008	-.098	-.022	-.028	-.008	-.301	0.000	-.483
Textiles	3	-.006	-.005	-.314	-.018	-.020	-.006	-.255	0.000	-.622
Wood, Paper	4	-.006	-.004	-.109	-.065	-.030	-.006	-.272	0.000	-.492
Chemicals	5	-.012	-.005	-.111	-.021	-.065	-.007	-.287	0.000	-.508
Non-Metal	6	-.015	-.005	-.099	-.021	-.038	-.029	-.283	0.000	-.490
Metal	7	-.012	-.004	-.099	-.020	-.029	-.007	-.404	0.000	-.575
Services	8	-.004	-.005	-.101	-.021	-.017	-.008	-.305	0.000	-.462

Total Perceived Elasticity by Industry ε_j		1	2	3	4	5	6	7	8	ATB
Resource	1	0.000	0.000	0.003	0.001	0.001	0.000	0.009	0.000	0.013
Food	2	0.001	0.000	0.004	0.001	0.001	0.000	0.015	0.000	0.022
Textiles	3	0.000	0.000	-.024	0.000	0.000	0.000	0.004	0.000	-.020
Wood, Paper	4	0.000	0.000	0.004	-.029	-.001	0.000	0.026	0.000	0.001
Chemicals	5	0.000	0.000	0.009	0.001	-.023	0.000	0.036	0.000	0.023
Non-Metal	6	-.001	0.000	0.001	0.000	-.002	-.020	0.014	0.000	-.008
Metal	7	0.000	0.000	0.006	0.001	0.001	0.000	-.056	0.000	-.047
Services	8	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.001

No of firms per Industry n_j		1	2	3	4	5	6	7	8	ATB
Resource	1	-.016	0.012	0.276	0.051	0.064	0.014	0.853	0.000	1.254
Food	2	0.014	-.012	0.092	0.017	0.012	0.005	0.325	0.000	0.453
Textiles	3	0.001	0.001	-1.45	0.005	-.004	0.001	0.180	0.000	-1.27
Wood, Paper	4	0.001	-.001	0.016	-.210	-.007	0.000	0.137	0.000	-.064
Chemicals	5	-.001	0.001	0.038	0.004	-.165	0.000	0.181	0.000	0.059
Non-Metal	6	-.006	-.001	0.009	0.000	-.017	-.190	0.129	0.000	-.075
Metal	7	0.003	0.002	0.065	0.011	0.007	0.003	-.842	0.000	-.751
Services	8	0.002	-.002	-.029	-.002	-.003	-.001	0.122	0.000	0.086

		1	2	3	4	5	6	7	8	ATB
Nominal Wage to Labour	p_l	0.001	-.005	-.104	-.007	0.007	0.002	-.127	0.000	-.234
Nominal Capital Rental	p_k	-.006	-.004	-.094	-.020	-.019	-.007	-.483	0.000	-.633
Aggregate Capital Stock	k	0.006	-.001	0.006	0.015	0.026	0.009	0.405	0.000	0.465
Consumer Price Index	cpi	-.008	-.009	-.147	-.025	-.029	-.008	-.333	0.000	-.558
Investment Price Index	π	-.006	-.004	-.094	-.020	-.019	-.007	-.483	0.000	-.633
Absorption Price Deflator		-.007	-.007	-.134	-.023	-.026	-.007	-.368	0.000	-.575
Real Consumption	c_r	0.000	-.001	0.001	0.000	0.002	0.001	-.026	0.000	-.024
Total Real Investment	y_r	0.006	-.001	0.006	0.015	0.026	0.009	0.405	0.000	0.465
Nominal Capital Income	r	0.000	-.005	-.089	-.005	0.007	0.001	-.077	0.000	-.169
Nominal Labour Income	rl	0.001	-.005	-.104	-.007	0.007	0.002	-.127	0.000	-.234
Nominal Tariff Revenue	rm	-.591	-.359	-3.51	-1.20	-2.30	-.556	-13.3	0.000	-21.8
Nominal GDP	gdp	-.006	-.009	-.132	-.018	-.016	-.004	-.239	0.000	-.424
Real GDP		0.001	-.001	0.002	0.005	0.010	0.003	0.129	0.000	0.151
All Imports, World Prices	m	0.062	0.029	0.514	0.083	0.124	0.026	1.109	0.000	1.947
All Exports, World Prices	e	0.067	0.028	0.515	0.094	0.145	0.033	1.453	0.000	2.336

Table 6:

Table of Market Shares and Perceived Elasticities

MARKET SHARES

Commodity	Customer: Industries 1	2	3	4	5	6	7	8	Other Users Consumption	Investment	Exports	No. of Firms	Imported Share in Usage	
1	.183	.164	.011	.011	.052	.018	.093	.056	.063	.011	.339	100.0	.065	Resource
2	.028	.118	.003	.001	.006	.000	.002	.017	.669	.000	.157	30.0	.032	Food
3	.008	.005	.230	.011	.017	.001	.014	.061	.598	.013	.040	50.0	.177	Textiles
4	.019	.034	.004	.212	.013	.004	.028	.399	.244	.024	.021	7.0	.116	Wood
5	.115	.036	.013	.028	.164	.012	.060	.273	.244	.002	.052	6.0	.158	Chemicals
6	.046	.040	.000	.009	.012	.092	.032	.692	.066	.006	.006	10.0	.097	Non-metal
7	.028	.019	.001	.004	.003	.001	.148	.254	.229	.279	.036	10.0	.255	Metal
8	.056	.062	.029	.025	.038	.008	.059	.175	.395	.137	.016	100.0	.026	Services

PERCEIVED ELASTICITIES

Commodity	Customer: Industries 1	2	3	4	5	6	7	8	Other Users Consumption	Investment	Exports	Total	
1	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.8	19.81	19.80	19.86	19.82	Resource
2	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.7	9.70	9.67	9.90	9.73	Food
3	19.6	19.6	19.6	19.6	19.6	19.6	19.6	19.6	19.63	19.61	19.78	19.63	Textiles
4	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.6	8.72	8.60	9.71	8.65	Wood
5	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.34	4.20	4.83	4.27	Chemicals
6	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.60	4.51	4.70	4.52	Non-metal
7	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.53	5.46	5.90	5.49	Metal
8	37.6	37.6	37.6	37.6	37.6	37.6	37.6	37.6	37.63	37.62	37.64	37.62	Services

KEY EQUATION COEFFICIENTS

The second coefficient in equation (38) gives the approximate partial elasticity with respect to number of firms:

$$\varepsilon_{ij} = s_m S_m \sigma_i / N_i E_{ij} + n_i(\sigma_{id} - s_m \sigma_i)/N_i E_{ij} \qquad (38)$$

$(\sigma_{id} - s_m\sigma_i)/N_i E_{ij}$: .010 .034 .020 .162 .188 .109 .099 .010

Equation (32) gives the change in the Lerner markup due to a change in the perceived elasticity of demand:

$$\text{Change in markup} = p_{i1} - v_i = \varepsilon_i \mu_i \quad \text{where } \mu_i = 1/(1 - E_i^t).$$

μ_i: -.053 -.114 -.053 -.130 -.306 -.284 -.222 -.027

of the table shows the shares of each good going to various markets, and the number of firms in each market. This information is combined with other database flows and with the Armington, domestic substitution, and export elasticities to produce the lower half of Table 6, which shows the component perceived elasticities of demand, corresponding to flows of each good to each market. The total elasticity for each good is also shown. At the bottom of Table 6 is shown the effect on the representative intermediate demand elasticity of a one per cent change in the number of firms, again for each good. As described in Section II, this is computed as $(\sigma_{id} - S_m\sigma_i)/N_iE_{ij}$. This corresponds to the second term in equation (40) above. We list too the coefficients from equation (32) relating changes in the total perceived elasticity to changes in markups over variable costs.

This collation of material enables us to compare the CRTS and monopolistic pricing environments, and in particular to explain the very small changes in markups observed in the latter. Notice that, in our experiments, the two terms of equation (40) are likely to be opposite in sign. On the off-diagonal elements of Table 5, we see that domestic prices fall as input costs decline, while the imported price remains constant. Thus the variable part of the first right hand term of (40) is negative. Since σ_i exceeds unity, and the share terms are positive, the first right hand member of (40) as a whole therefore is unambiguously negative, corresponding to the fall in the share of imports (which is explicit in (38)). In these industries which benefit from declining input costs, output and the number of firms increases; hence the second term in equation (40) is negative. For diagonal elements (own tariff effects) the reverse is true. Since the solution matrix of changes in perceived elasticities is mainly negative on the diagonal and positive elsewhere (see third block of Table 5), we may conclude that the main influence on these elasticities is the change in the number of firms. Paradoxically, exposed (by reduction of their tariff) and contracting industries increase their markups over marginal cost. However, a change in the number of firms has a rather small effect on a component perceived elasticity. As mentioned above, the ratio of these two variables is well approximated by the reciprocal of the number of firms, as soon as this exceeds ten.

Even though the component elasticities hardly change, reformulation of the total perceived elasticity for a good, using different weights, might still cause a change in the total elasticity, as equation (34) shows. Such a change would be brought about by an endogenous redistribution of the market shares pictured in the upper part of Table 6. Although these shares do change, the component elasticities in the base period equilibrium, shown in the bottom section, are so close to each other, that the total elasticity can hardly alter - see Table 5. Again, as the number of firms exceeds ten, all component elasticities converge to the value adopted for the elasticity of substitution between domestic variants. Thus the redistribution of market share does not cause much change in the total elasticity. Lastly, as equation (32) shows, the change in the markup over variable cost is only a fraction of any change in the total elasticity. This fraction is roughly the reciprocal of the total perceived elasticity in the base equilibrium - again a small number.

For all these reasons, only tiny changes in markups occurred and the CTRS fixed markup environment was approximated. This highlights one difference between our specification and that of Harris. He specified that the elasticity of substitution between domestic variants was equal to the Armington elasticity. Thus, rather smaller perceived elasticities were implemented. Retracing the arguments of the preceding paragraphs, we can see from equation (32) that this would allow a change in the number of firms to have a greater effect on markups over marginal cost. Again, in Harris' model firms do not take account of domestic competition in evaluating the elasticity of export demand. Since the export elasticity for a good is typically higher than the product of the Armington elasticity and the share of imports in usage, the perceived elasticity of demand for exports generally far exceeds that for domestic sales. As a consequence, in the Harris model, greater gains in exports can be reaped from a fall in input costs to an industry. Holding the markup constant, exports naturally increase in response to a drop in output price. Then, since the export market is generally relatively elastic, the share of exports in total sales rises. Thus, greater weight is attached to the (higher) export elasticity. The total perceived elasticity rises, markups fall, and so the output price falls again. Export sales, in short, are subject to a multiplier effect, and more conspicuous increases in intra-industry trade occur in the Harris' results.

In this respect, we feel that we have improved on the Harris specification. Our distinction between inter– and intranational substitution, although including the Harris case, can additionally take account of the different bundles corresponding to domestic and imported versions of the same good. For example, we should expect Australian fruit and vegetables from different producers to be far more intersubstitutable than substitutable with exotic imports in the same statistical classification. Again, in contrast to Harris', our specification can allow domestic competition to influence the perceived elasticity of exporters.

ORANI may lack another element, vital to the replication of the export multiplier process described above. For markups to fall appreciably in response to an increase in exports, requires that many noncompetitive industries do already export a significant share of output. Harris' Canadian context obviously includes a far greater diversity of such exporting industries. ORANI's database, on the other hand, will reflect the fact that Australia exports a smaller variety of exports, mainly from primary, competitive industries.

Even bearing in mind these differences between Harris' implementation and the current miniature version, it seems doubtful whether Lerner pricing contributes crucially to Harris' results.

So much for the similarities between the CRTS and monopolistic environments. It turns out that the differences are due less to a change in Lerner markups, than to disparities in the two price indices upon which the markups are based. In either CRTS or monopolistic environments, the fixed component of costs tends, in change terms, to fall less than the variable component. This is because fixed costs are far more closely linked to wages than variable costs, and wages tend to fall little, or even to rise. Now, if fixed costs fall proportionally less than average costs, variable costs must fall more. Since, as was explained above, the Lerner markup is practically constant, output price follows variable costs. Hence the monopolistic pricer relates output price to a price index which falls less than does the CTRS average cost pricer. Output in the 'own' protected industry decreases more, and the 'off' industries gain less. (The 'own' results are the effect on each industry of the change in the associated tariff – they appear on the diagonal of the solution matrices. The 'off'-diagonal results show the effects of each tariff change on other industries.) In fact, such discrepancies as exist, between output results in the CTRS and monopolistic environments, are more pronounced in columns and rows 4 to 7 of the z_j matrix. As Table 2 shows these correspond to industries with a higher fixed share of total costs. The higher this share, the more the variable and average cost indices may diverge.

Table 7: Results in Mixed Pricing Environment

Tariff Induced Change in Import Price No : (Diagonal of p_{im} matrix)	1	2	3	4	5	6	7	8
	−.514	−.728	−3.20	−1.17	−1.10	−1.92	−2.23	0.000

			1	2	3	4	5	6	7	8	ATB
	Resource	1	−.012	0.033	0.247	0.069	0.145	0.055	1.100	0.000	1.638
	Food	2	0.007	0.781	−.035	0.038	0.061	0.032	0.165	0.000	1.050
Industry	Textiles	3	0.003	−.025	−1.30	0.045	0.057	0.031	0.328	0.000	−.860
	Wood, Paper	4	−.003	0.089	−.059	0.289	0.072	0.031	0.274	0.000	0.694
Outputs	Chemicals	5	−.002	0.081	−.027	0.054	0.301	0.034	0.368	0.000	0.809
	Non-Metal	6	−.002	0.105	−.050	0.051	0.075	0.027	0.376	0.000	0.582
z_j	Metal	7	0.002	0.053	−.026	0.051	0.078	0.037	0.548	0.000	0.742
	Services	8	−.003	0.084	−.072	0.049	0.064	0.034	0.358	0.000	0.514
Aggregate Output z_t			−.003	0.098	−.048	0.057	0.083	0.036	0.445	0.000	0.668

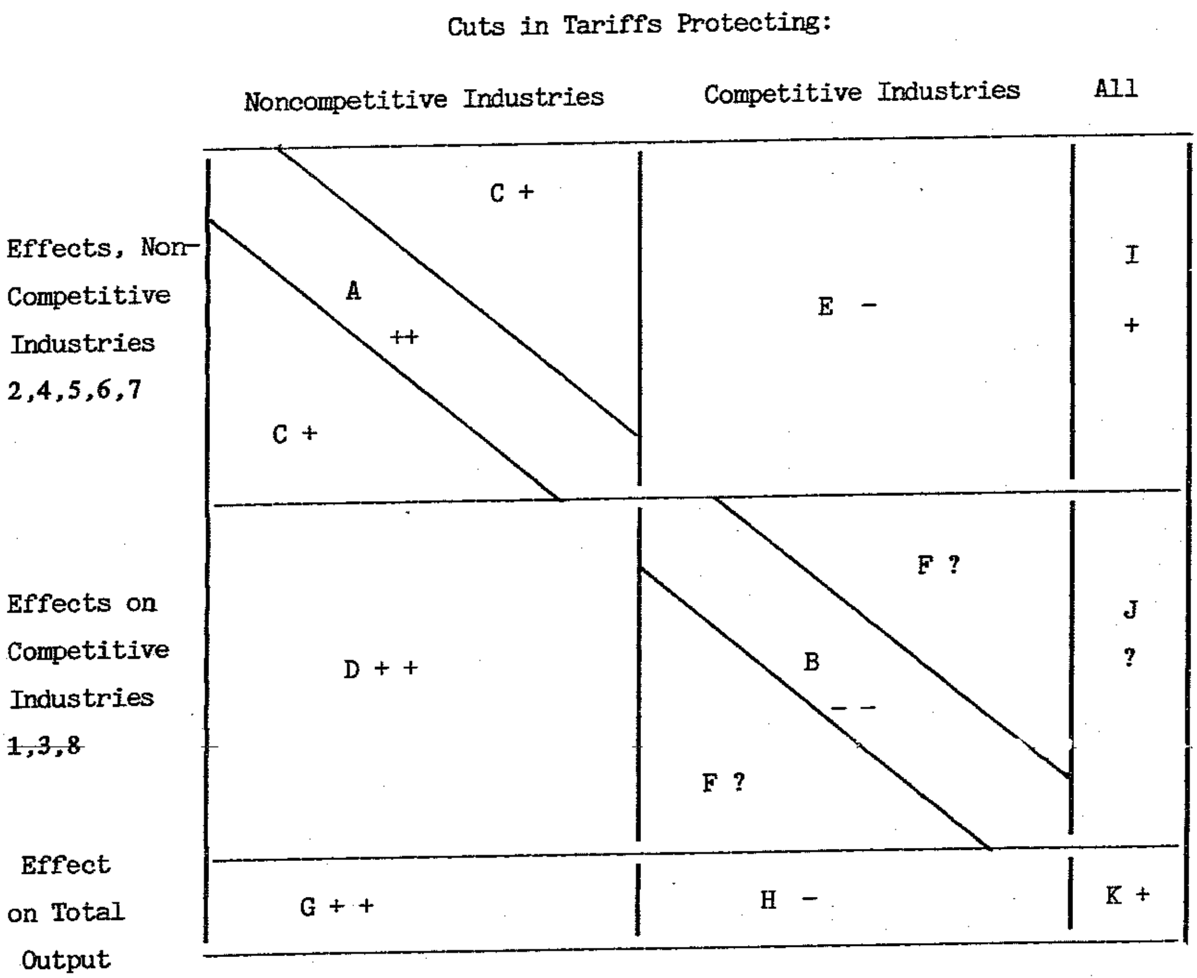
			1	2	3	4	5	6	7	8	ATB
	Resource	1	−.014	0.054	−.106	−.015	−.034	−.013	−.340	0.000	−.469
	Food	2	−.009	−.361	−.048	−.017	−.015	−.012	−.166	0.000	−.628
Domestic	Textiles	3	−.008	0.061	−.311	−.019	−.009	−.011	−.266	0.000	−.562
	Wood, Paper	4	−.004	0.027	−.052	−.673	−.019	−.008	−.133	0.000	−.863
Prices	Chemicals	5	−.007	0.025	−.056	−.016	−.596	−.011	−.161	0.000	−.822
	Non-Metal	6	−.008	0.026	−.050	−.016	−.033	−.989	−.156	0.000	−1.23
p_{id}	Metal	7	−.006	0.027	−.049	−.014	−.019	−.010	−1.38	0.000	−1.45
	Services	8	−.007	0.067	−.112	−.029	0.001	−.024	−.355	0.000	−.458

			1	2	3	4	5	6	7	8	ATB
	Resource	1	−.015	0.052	−.105	−.017	−.041	−.015	−.333	0.000	−.473
Industry	Food	2	−.018	−.001	−.095	−.033	−.029	−.023	−.327	0.000	−.526
	Textiles	3	−.008	0.059	−.322	−.020	−.012	−.012	−.269	0.000	−.585
Variable	Wood, Paper	4	−.007	0.052	−.100	−.225	−.037	−.015	−.248	0.000	−.580
	Chemicals	5	−.012	0.047	−.103	−.028	−.175	−.019	−.277	0.000	−.567
Costs	Non-Metal	6	−.016	0.052	−.096	−.031	−.063	−.161	−.286	0.000	−.601
	Metal	7	−.012	0.051	−.094	−.027	−.037	−.018	−.603	0.000	−.740
v_j	Services	8	−.007	0.067	−.112	−.031	0.000	−.025	−.354	0.000	−.461

			1	2	3	4	5	6	7	8	ATB
	Resource	1	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Output	Food	2	−.066	3.272	−.443	−.106	−.056	−.073	−1.39	0.000	1.138
	Textiles	3	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
per Firm	Wood, Paper	4	−.018	0.167	−.286	2.694	−.015	−.017	−.645	0.000	1.882
	Chemicals	5	−.018	0.123	−.211	−.020	1.956	−.011	−.502	0.000	1.318
b_j	Non-Metal	6	−.020	0.126	−.201	−.020	−.011	3.327	−.501	0.000	2.701
	Metal	7	−.024	0.160	−.264	−.026	0.000	−.015	4.388	0.000	4.217
	Services	8	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

		1	2	3	4	5	6	7	8	ATB
Nominal Wage to Labour	p_l	−.006	0.100	−.147	0.026	0.075	0.021	0.026	0.000	0.096
Nominal Capital Rental	p_k	−.006	0.050	−.088	−.029	−.006	−.018	−.750	0.000	−.848
Aggregate Capital Stock	k	0.000	0.041	−.042	0.053	0.070	0.036	0.872	0.000	1.030
Consumer Price Index	cp	−.008	−.017	−.138	−.044	−.036	−.020	−.392	0.000	−.655
Investment Price Index	π	−.006	0.050	−.088	−.029	−.006	−.018	−.750	0.000	−.848
Absorption Price Deflator		−.007	−.001	−.126	−.040	−.028	−.019	−.476	0.000	−.700
Nominal Capital Income	r	−.007	0.090	−.130	0.024	0.064	0.018	0.122	0.000	0.182
Nominal Labour Income	rl	−.006	0.100	−.147	0.026	0.075	0.021	0.026	0.000	0.096
Nominal Tariff Revenue	rm	−.593	−.216	−3.51	−1.19	−2.26	−.555	−13.8	0.000	−22.1
Nominal GDP	gd	−.012	0.092	−.173	0.013	0.048	0.014	−.075	0.000	−.093
Real GDP		−.004	0.093	−.046	0.053	0.076	0.033	0.401	0.000	0.607
Real Consumption	c_r	−.006	0.102	−.041	0.045	0.067	0.027	0.103	0.000	0.296
Total Real Investment	y_r	0.000	0.041	−.042	0.053	0.070	0.036	0.872	0.000	1.030
All Imports, World Prices	m	0.059	0.171	0.501	0.083	0.143	0.033	0.859	0.000	1.849
All Exports, World Prices	e	0.058	0.207	0.462	0.129	0.203	0.064	1.610	0.000	2.733

Figure 3: Output Matrix - Mixed-Pricing Environment



A++ Increased sales through own price fall outweigh import penetration.

B-- Increased import penetration without any compensating gains at all.

C+ Output gains from reduced input costs - only partly squandered by firm entry.

D++ Full passing on of reduced input costs leads to large sales gains.

E- Small cost reductions partly wasted in climate of falling aggregate demand.

F? Competitive industries gain at imports expense yet aggregate demand declines.

G++ Output gain from rationalisation and price cutting in exposed industry far outweighs efficiency loss from firm entry in other noncompetitive industries.

H- Domestic income and aggregate demand fall; resources released by acute contraction of exposed competitive industry partly wasted by entry into noncompetitive industries.

I+ Noncompetitive industries gain from reduction of input and output costs outweighing reduced intermediate demands from shrinking competitive sector.

J? Competitive industries suffer if initially heavily protected - gain if able to greatly expand export sales.

K+ Effects of rationalisation in the non-competitive sector reduce costs economywide, minimize import penetration and maximise export increases.

(iii) Results in Mixed Pricing Environment

Table 7 presents a summary of the effects of the ATB tariff cut in the mixed pricing environment described above. Whilst industries 1,3 and 8 are modelled as competitive CRTS industries, the noncompetitive remainder combine Lerner and import-parity pricing in equal weight. As the previous section showed, with our database, Lerner pricing yields similar results to CRTS average cost pricing. Thus industries 2, 4, 5, 6 and 7 could also be thought of as combining average cost with import parity pricing.

The interaction of the two types of industry complicates the analysis of the overall effect on output of the tariff reform. Figure 3 schematizes the matrix of industry outputs, dividing the interactions involved into six types A - F, with subtotal effects G - J, and grand total K. The six primary zones represent:

(A) the effects on a noncompetitive industry of a reduction in its own tariff,

(B) the effects on a competitive industry of a reduction in its own tariff,

(C) the effects on other noncompetitive industries of a reduction in the tariff protecting a noncompetitive industry,

(D) the effects on competitive industries of a reduction in the tariff protecting a noncompetitive industry,

(E) the effects on noncompetitive industries of a reduction in the tariff protecting a competitive industry,

(F) the effects on other competitive industries of a reduction in the tariff protecting a competitive industry.

The subtotals are:

(G) the effects on aggregate output of cuts in tariffs sheltering noncompetitive industries.

(H) the effects on aggregate output of cuts in tariffs sheltering competitive industries.

(I) the effects on noncompetitive industries of the ATB tariff cut.

(J) the effects on competitive industries of the ATB tariff cut.

The grand total is:

(K) the effect on aggregate output of the ATB tariff cut.

Our discussion follows the above schema:

(A) Consider first the effect of a tariff cut on demand for the associated locally produced commodity of one of the noncompetitive industries. The imported price will fall; assuming little change in either variable costs or Lerner markups, the domestic price will fall by only half as much, although by far more than it fell in the CRTS or Lerner pricing environments. The relative reduction of the imported price increases import penetration at the expense of the local industry. Against this, the reduced domestic price makes possible an expansion into exports, if these initially form a significant part of sales. These export expansions tend to be more pronounced than in the CRTS environment, leading to greater increases in intra-industry trade. Finally, both domestic and imported sales are boosted by the transfer of consumer purchasing power towards the cheaper commodity. To estimate the relative strength of these effects we can use the Back-Of-The-Envelope, or BOTE, elasticities presented in Table 2. They are partial demand elasticities of industry output with respect to prices of either domestic or imported product. We derive them from model equations, by ignoring price and quantity changes outside the industry in question. They show that the effect on output of a unit decrease in the domestic price is always more than double that of a unit decrease in the imported price. Thus the loss of domestic sales to increased imports is more than outweighed by the gain in sales following the smaller domestic price reduction. For industry 6, the BOTE estimates suggest that the two effects nearly cancel each other out (one BOTE is nearly twice the other), and indeed the results show that the net effect of this tariff on its own industry was comparatively small. For industry 2, in contrast, the domestic price reduction enables a large expansion into exports. We may question the plausibility of this result. In the real world, price discrimination often exists, causing exports - in elastic demand - to be sold at near marginal cost. Only the domestic market pays the (duty-paid) import-parity price. In such a case, were the tariff reduced, export prices would fall by much less than simulated here, and volumes would rise less. We plan to incorporate such price discrimination in future versions of our model.

For each good in these noncompetitive industries, the domestic price reduction exceeds any fall in input costs generated indirectly through reduction of its own tariff. Thus the cost saving necessary to preserve industry ZPP must be made by reducing expenditure on fixed costs. It is important to realize that the necessary cost reduction is independent of the ability of the industry to rationalize in this way. Imagine an industry output of 100 units. Following removal of the protective tariff, import prices fall by, say, 20 per cent, whilst all input prices fall by 10 per cent. The domestic price, following the mixed pricing rule, must fall by 15 per cent. Immediately a deficit, of value 5 percent of output, faces the industry. To offset this, an equal reduction must be made in the fixed component of expenditure. The smaller the share of fixed costs in output, the larger the proportional change in fixed expenditure necessary, and the larger the proportional change in the number of firms. The absolute size of the cut in fixed expenditure is independent of the original amount of fixed expenditure. The possibility arises, therefore, that the pricing rule could dictate a cost reduction impossible to achieve even by total elimination of all fixed costs. This would be more likely if the original share of fixed in total costs were very low. Our model solution algorithm would register such a situation by predicting a fall of more than 100 per cent in the number of firms in an industry. Luckily, we found much smaller rationalisation effects, as the fuller table of results in Appendix III shows. The theoretical possibility of total exit from an industry, however, does exist.

(B) As in the CRTS environment, reduction of its own tariff always harms a competitive industry. In fact the results are worse than in the CRTS environment because of indirect effects explored below.

In summary, a tariff cut tends to increase output in the associated mixed pricing industry, in contrast to the CRTS industry. At the same time other industries stand to gain more than in the CRTS environment. The fall in the price of the domestic equivalent, although only about half as big as the fall in the imported price, tends to have a greater impact on economy-wide cost levels, since usage of each domestic good is always much more than twice that of the imported version. Again, rationalisation in the newly exposed industry releases labour for deployment elsewhere. Thus the fall in input costs shown in the off-diagonal elements of the V_j matrix greatly exceed those observed in the CRTS environment.

(C) The mechanism which produces this greater fall in costs, however, also acts to hinder either its propagation or its transformation into a welfare gain. Other noncompetitive industries reduce their output price by only half the decrease in their variable costs. Once again the difference is absorbed by an increase in fixed, unproductive, expenditure. Thus rationalisation in the exposed industry is accompanied by efficiency losses in other noncompetitive industries. Nevertheless, since half any decrease in input costs <u>is</u> realized in lower output prices, output of other noncompetitive industries does tend to increase.

(D) Competitive industries, on the other hand, pass on the full <u>decrease in input</u> costs. Thus they gain the most, in output terms, from the reduction of protection in noncompetitive industries.

The final cases to consider are the effects on other industries of a cut in protection on a competitive industry. The reduction in the tariff on good 3 (Textiles) provides the main example. The domestic price of good 3, determined by average input cost, changes little, since most of the imports flow to consumers, so that production costs in no industry decrease much. The acute contraction of industry 3 itself reduces demands for material inputs, depresses the wage, and reduces aggregate consumption. Thus the effects of the tariff cut on other industries tend to be negative:

(E) Half of the meagre reduction in input costs is wasted by the noncompetitive industries in reducing outputs per firm. Their failure to take full advantage of the cost reduction, coupled with falling aggregate demand, leads to output decreases.

(F) Competitive industry 1 (Resource) gains through the cut in the tariff sheltering industry 3, through a happy conjunction of characteristics. It is able to pass on the full decrease in input costs to an elastic export market - its main customer. Declining aggregate consumption does not affect it as this represents only a small share of its market. Industry 8 (Services) on the other hand, gains neither through increased exports nor through import replacement, as it is largely non-traded. Its output declines in line with aggregate consumption.

In considering (G) and (H), the effects on aggregate output of individual tariffs, it is useful to recall the results in the CRTS environment. There, contraction in the exposed industry was only just outweighed by expansion of the other industries.

(G) A noncompetitive industry always responds positively to reduction in its own tariff. Thus the diagonal element in the column sum is much greater than in the CRTS case. The cost savings passed to other industries, in the form of lower product prices, are more than twice those passed on in the CRTS case, since although the domestic price only falls by half as much as the imported, the volume of domestic output sold to ~~intermediate usage is over twice that coming from imports. Of these doubled~~ cost savings, half those passing to noncompetitive industries disappear into increased expenditure on fixed costs. Cost savings passed to competitive industries, on the other hand, are fully passed on as output increases and price decreases. Thus the total contribution to (G) of the off-diagonal column elements is positive, and greater than in the CRTS case. Combining all the column elements we obtain much greater values of (G) than in the CRTS case.

(H) Comparing the effect on total output of a cut in protection of a competitive industry with the CRTS case, we recall from above that the effect on the exposed industry and on noncompetitive industries is worse than in CRTS. The effect on competitive industries is comparable. Since the net effect under CRTS is close to zero, (H), the column total under mixed pricing, must be negative.

The signs of the row totals denoted by (I), (J) and (K) in Figure 3 depend on the relative magnitudes of the tariff reductions in competitive and noncompetitive industries. Assuming, as seems very likely, that the noncompetitive industries are initially at least as heavily protected as the competitive, and so suffer from as great a reduction in tariffs, we could expect (I) - the effects of the ATB cut on the noncompetitive industries - to be positive. Although the shrinkage of competitive industries contributes towards a contraction in aggregate demand, including demand for noncompetitive commodities, this is outweighed, for the noncompetitive sector, by the increases in sales due to reduced output prices.

The signs of elements of (J) are not uniform. Industry 1 (Resource) takes advantage of reduced input costs to expand into exports, whilst industry 8 (Services) has no initial protection to lose and gains from the overall increases in demand, stemming from increased output in the noncompetitive sector. But these indirect stimuli are not enough to counteract increased penetration of imports into the market of the heavily-protected industry 3 (Textiles). On balance, its output contracts.

The grand total (K) - the effect on national output of the ATB cut - is 0.668 per cent. Doubling, to take account of indirect protection, and quadrupling to represent the complete removal of tariffs, our miniature version of ORANI estimates the output gain from dismantling of trade barriers to be about 5.5 per cent. The majority of the gain comes from the cut in the tariff on good 7 (Metal products). This good accounted for almost half of all imports, which were subject to the second highest tariff rate. Domestic prices fell considerably as well, since the industry was modelled as noncompetitive. The great bulk of sales were to intermediate usage and investment so that any price decreases were fully passed on as reductions in producer costs.

Although output expands by much more than in the CRTS case, exports increase by only a little more. Thus in the mixed pricing environment, a smaller fraction of the output gain disappears into terms of trade losses, and more is translated into increases in real GDP and consumption.

(iv) Mixed Pricing Environment with Decreased Scale Elasticities

One feature of Harris' model that we have been unable to understand is his finding that results in a mixed pricing environment are sensitive to the initial estimates of industry scale elasticities.

Adopting one method of investigating this proposition, we reran simulation 3 after making an adjustment to our database; for each industry we increased the fixed share of total costs by 20 per cent. Since the scale elasticity is merely the complementary share of variable in total costs, this amounts to an increase in the potential gains from industry rationalization. The effect on the database shown in Table 1 is merely to reallocate factors between fixed and variable rows: industry total endowments of labour and capital are unaffected.

A short summary of the results appears in Table 8; they are extremely similar to those of Table 7. This accords with the interpretation of industry rationalisation offered above. Absolute changes in fixed costs are dictated merely by any discrepancy between average production costs and the output price dictated by the particular pricing rule in force. Thus entry and exit of firms is a passive adjustment of fixed expenditure to eliminate economic profits.

Given a certain **absolute** reduction in fixed costs, the **percentage** change therein is inversely related to the initial amount of it. The percentage change in the number of firms, n_j, is merely the percentage change in fixed expenditure, deflated by an appropriate price index. Thus the change in the number of firms is indeed sensitive to the decreased scale elasticities, as the fuller results in Appendix III show. So too is the efficiency variable b_j ($=z_j-n_j$, or output per firm). However, the only other role of n_j in the model equation system is its influence on perceived elasticities, and hence on markups. We have argued above that such influences are rather small.

The chief effect of decreasing the scale elasticities seems to be rather indirect. Assuming the Lerner markup to be constant, we can write the pricing rules as:

Table 8: Mixed Pricing Environment - Increased Fixed Costs Database

Tariff Induced Change in Import Price No : (Diagonal of p_{im} matrix)	1	2	3	4	5	6	7	8
	-.514	-.728	-3.20	-1.17	-1.10	-1.92	-2.23	0.000

			1	2	3	4	5	6	7	8	ATB
	Resource	1	-.012	0.037	0.246	0.071	0.150	0.057	1.089	0.000	1.637
	Food	2	0.008	0.786	-.037	0.040	0.066	0.034	0.172	0.000	1.069
Industry	Textiles	3	0.003	-.024	-1.30	0.047	0.059	0.032	0.326	0.000	-.857
	Wood, Paper	4	-.003	0.092	-.061	0.299	0.078	0.032	0.277	0.000	0.715
Outputs	Chemicals	5	-.001	0.085	-.030	0.056	0.318	0.036	0.370	0.000	0.834
	Non-Metal	6	-.002	0.108	-.051	0.053	0.081	0.031	0.378	0.000	0.598
z_j	Metal	7	0.002	0.058	-.029	0.054	0.085	0.039	0.567	0.000	0.775
	Services	8	-.003	0.086	-.073	0.050	0.069	0.035	0.359	0.000	0.524
Aggregate Output zt			-.003	0.101	-.049	0.060	0.088	0.038	0.446	0.000	0.679

			1	2	3	4	5	6	7	8	ATB
	Resource	1	-.014	0.054	-.106	-.015	-.034	-.014	-.335	0.000	-.465
	Food	2	-.009	-.364	-.048	-.017	-.016	-.012	-.166	0.000	-.632
Domestic	Textiles	3	-.008	0.060	-.311	-.018	-.008	-.011	-.260	0.000	-.556
	Wood, Paper	4	-.004	0.025	-.051	-.684	-.022	-.009	-.132	0.000	-.876
Prices	Chemicals	5	-.007	0.022	-.054	-.018	-.614	-.012	-.160	0.000	-.842
	Non-Metal	6	-.008	0.024	-.048	-.018	-.038	-1.00	-.157	0.000	-1.25
p_{id}	Metal	7	-.006	0.025	-.048	-.015	-.022	-.011	-1.40	0.000	-1.48
	Services	8	-.007	0.066	-.112	-.029	0.001	-.024	-.349	0.000	-.453

		1	2	3	4	5	6	7	8	ATB
Nominal Wage to Labour	p_l	-.006	0.100	-.148	0.027	0.078	0.022	0.041	0.000	0.115
Nominal Capital Rental	p_k	-.006	0.049	-.088	-.029	-.006	-.019	-.751	0.000	-.851
Aggregate Capital Stock	k	0.000	0.046	-.043	0.055	0.076	0.038	0.858	0.000	1.030
Consumer Price Index	cpi	-.007	-.018	-.137	-.045	-.037	-.021	-.389	0.000	-.655
Investment Price Index	π	-.006	0.049	-.088	-.029	-.006	-.019	-.751	0.000	-.851
Absorption Price Index		-.007	-.002	-.125	-.041	-.029	-.020	-.482	0.000	-.701
Nominal Consumption	c	-.014	0.085	-.179	0.001	0.033	0.007	-.278	0.000	-.344
Nominal GDP	gdp	-.012	0.094	-.174	0.015	0.052	0.015	-.072	0.000	-.083
Real GDP		-.005	0.096	-.048	0.046	0.081	0.035	0.410	0.000	0.618
Total Real Investment	y_r	0.000	0.046	-.043	0.055	0.076	0.038	0.858	0.000	1.030
Real Consumption	c_r	-.006	0.103	-.042	0.046	0.070	0.028	0.112	0.000	0.311
All Imports, World Prices	m	0.059	0.172	0.501	0.084	0.144	0.033	0.854	0.000	1.846
All Exports, World Prices	e	0.058	0.213	0.461	0.131	0.209	0.066	1.594	0.000	2.730

$$p_{id} = .5v_i + .5p_{im}, \qquad i = 1,8$$

where v_i is the index of variable costs. In increasing the share of fixed in total costs, we necessarily reduce the share of factor payments in variable costs. This alteration to the basis of the price index, v_i, will affect our pricing rule inasmuch as factor costs differ from the overall price level. Possibly this may explain our divergence from Harris' results, since we assumed that capital is available in elastic supply at a fixed real rental rate (of return), whereas Harris held the nominal rental rate fixed. In the deflationary climate of a tariff reform this would cause the relative price of capital to rise. Thus the capital intensity of the variable cost bundle, altering with changing scale elasticities, could exert a more definite influence on simulation results.

A second possible explanation of this difference between our results and those of Harris is related to his procedure for constructing a base level equilibrium. His adjustment of scale elasticities was accompanied by a corresponding change in the number of firms in each industry. This allowed the fixed cost per firm to remain unchanged - so that the technical characteristics of production were also unaltered. In effect, the changed number of firms meant that the firms occupied a new position on their original cost curves. By contrast, our adjustment of the share of fixed in total costs (leaving the numbers of firms unchanged) implies a shift in the firms' cost curves, and a change in the technical characteristics of production.

How changes in the numbers of firms could effect the simulation results is, however, rather unclear. We have argued above that such changes can have little effect, if the number of firms is over 10. Harris' database postulated much higher numbers of firms per industry than this. The discrepancy between his results and ours remains a puzzle at this stage.

IV CONCLUSION

We have described a miniature version of ORANI, implemented with Australian data, which incorporates several of the most important features of Harris' model of the Canadian economy.

We should stress, however, that the Harris model boasted a range of features and options not included in its imitator. Some of these features were:

(a) the incorporation of multiproduct firms, allowing economies of scope as well as economies of scale.

(b) alternative specifications of the behaviour of foreigners in their contribution to product variety.

(c) The generation of a longrun equilibrium database from a shortrun equilibrium database displaying economic profits.

The specification of our miniature model corresponds to the choice of options which Harris chose most frequently, or by default. The majority of his reported results are generated in an environment similar to our experiments 3 and 4 – the mixed pricing environment.

Harris also reports a far wider range of experiments than are described here, including simulations of a number of different industrial policies. We have concentrated solely on the effects of tariff reductions – this experiment has been performed most often with ORANI and the results are well understood. Consequently, tariff experiments are a good starting point in analysing the effects of any alteration to ORANI.

Further, we have restricted ourselves to studying the effects of a unilateral tariff reform, whilst Harris allotted equal importance to the analysis of multilateral tariff reduction. This reflects his Canadian conception of what is politically possible; and in particular may be linked to the special trading relationship between Canada and the U.S.A.

Although our miniature model is capable of performing all of the experiments that Harris reports, with minor adaptation, its performance will probably await a full-scale ORANI implementation, and the gathering of more data.

Our benchmark simulation, under CRTS conditions, gave results comparable with those obtained from fullsize ORANI. The key features of the results were that each individual tariff cut caused a contraction in the associated industry, but that in most cases this was offset by an economy-wide expansion effect, due to reductions in the price of imports. In concert, the tariff cuts gave rise to small increases in aggregate output, yet most of this increase was offset by terms-of-trade effects, and the need to renumerate foreign owners of freshly employed capital. The welfare gains were negligible.

Our second simulation replaced average cost pricing (CRTS) with the Lerner-Negishi pricing hypothesis, that markups over marginal cost are determined by firms' perception of the elasticity of demand for their product. The results were very similar to the CRTS case; most of the small differences were attributable to divergence between indices of marginal and average cost - rather than to changes in perceived elasticities, and hence in markups. The (small) difference between these price indices reflects our assumption that fixed costs were influenced only by primary factor, and not by materials prices. This assumption was not supported by any data in either Harris' model or in our own version. In no useful sense, therefore, did our version of Lerner pricing give rise to results different from those obtained in the CRTS case.

A number of variations on our implementation of the Lerner pricing rule are possible and we plan to experiment further with these. In particular, our manner of nesting the demand for domestic and foreign variants of the same commodity may be too restrictive. However, our current guess is that these variations would yield the same qualitative results - similar to the CRTS environment . It took considerable effort to apply the perceived elasticities approach even to our miniature model. At this stage, we question the value of making the even greater effort necessary to incorporate it into ORANI proper. At the same time, our provisional dismissal of Lerner pricing is based on experimental results incorporating a specific range of values for the N_i and σ_{id}. It remains possible that Lerner pricing might have quite different implications, if our N_i and σ_{id} were of different orders of magnitude from their chosen values. This is an area for further study.

The results from our mixed pricing hypothesis were markedly different from both CRTS and Lerner pricing environments. They seemed broadly comparable to Harris' results. Significant welfare gains resulted from the move towards free trade, in contrast to the CRTS environment. These gains derived from industry rationalization effects. Where the assumed pricing rule dictated a price decrease greater than the fall in input costs, firms were forced to leave the industry until costs fell enough for industry profits to return to normal.

Since the import-parity pricing hypothesis is virtually wholly responsible for these welfare gains it seems relevant to focus close attention on the key parameters values involved. An implication of discussions in the text is that results in the mixed pricing environment were not closely dependent on the setting of most of the data which was required to supplement the ORANI database:

(a) The σ_{id} - elasticities of substitution between domestic variants - were required only for the Lerner pricing equations.

(b) The N_i - numbers of firms - have relevance only for pricing behaviour only in the Lerner pricing hypothesis; with the proviso that, if small, the N_i bear on the problem of integer constraints on firm numbers.

(c) Initial industry shares of variable in total costs - equivalent to scale elasticities - seem to have little relevance in either the Lerner pricing or in the mixed pricing environment.

In fact the key parameter in determining welfare gains under the mixed pricing hypothesis seems to be α_i - the amount by which a noncompetitive firm reduces the price of its product in response to a unit decrease in the price of the imported equivalent. This largely determines the amount of fixed costs which must be shed through exit of firms. Indeed Harris reports that the welfare gain from unilateral tariff reform is roughly linear in the overall level of α_i. Thus, if all were set to 0.25, instead of to 0.5, only half the welfare gain would be simulated. This accords with our interpretation of our own results, and underlines the importance of these parameter values.

Our choice of 0.5 for all values of α_i, although the same as Harris', was quite arbitrary. In principle, it is possible to estimate these values from our database, together with other data. However, a very high degree of uncertainty would surround such estimates. An alternative course, apparently followed by Harris, is to choose the α_i and adjust the database to match. This process of adjustment could form part of his transformation of contemporary data, reflecting a shortrun equilibrium with pure profits, into a longrun equilibrium where these profits had been dissipated through entry or exit of firms.

Neither approach seems satisfactory and this represents one of the main problems of the Harris approach - or at least of our version of it. The other cause for unease must be the apparent insensitivity of our results to the initial database scale elasticities. **Actual** industry rationalization effects seemed independent of the **potential** scale economies.

In further work we plan to experiment with other pricing hypotheses, as well as with different versions of Lerner pricing. We hope to develop a model whereby pricesetting behaviour is more explicitly related to market structure than in our present model.

REFERENCES

Bacharach, M.O.L (1970) Biproportional Matrices and Input/Output Changes, Cambridge University Press.

Bruce, I. (1985) "The ORANI 78 Input-Output and Parameter File for 1977-78", IMPACT Preliminary Working Paper No. OP-51, pp.70.

Bruce, I, J. Sutton and M. Da Cruz (1984) "ORANI 78 Large Change Aggregation Facility: Computing Manual", IMPACT Research Memorandum No. CA-72.

Caddy, V. (1977) "The Application of a Random Coefficient Model to the Problem of Estimating Aggregate Production Parameters", IMPACT Preliminary Working Paper No. OP-10, pp. 29.

Cory (1985) "A Review of the Theoretical and Empirical Specification of Scale Economies and Imperfect Competition in R.G. Harris: 'Trade, Industrial Policy and Canadian Manufacturing'", mimeo, available from IMPACT.

Dixon, R. and A. Gunther (1983) "The Cowling-Waterson Model: Extensions and Applications to Australian Data", University of Melbourne, Department of Economics, Research Paper No. 101, Dec. 1983.

Dixon, P.B., B.R. Parmenter, J. Sutton and D.P. Vincent (1982) ORANI : A Multisectoral Model of the Australian Economy, North-Holland Publishing Company, Amsterdam.

Harris, R.G. (1984) Trade, Industrial Policy and Canadian Manufacturing, Ontario Economic Council, Toronto, 1984.

Higgs, P.J. (1985) "Implementation of Adams' Typical Year for the Agricultural Sector in the ORANI 1977-8 Database", IMPACT Preliminary Working Paper No. OP-49, pp.180.

Horridge, M. (1985) "The Longrun Closure of ORANI: First Implementation", IMPACT Preliminary Working Paper No. OP-50, pp.142.

Appendix I: **Summary Of Equations**

Although the equations below form a simultaneous system, in which all variables are mutually determined, the equation ordering corresponds to the numbering of the variables in Appendix II, according to an intuitive mapping between variables and the equations which chiefly determine them. The equation numbers used in the main text appear in brackets.

1.	(1)	$x_{ijd} = z_j - \sigma_i S_m (p_{id} - p_{im})$	gh	Intermediate Demands, Domestic
2.	(2)	$x_{ijm} = z_j + \sigma_i S_d (p_{id} - p_{im})$	gh	Intermediate Demands, Imported
3.	(40)	$\varepsilon_{ij} N_i E_{ij} = S_m S_d \sigma_i (\sigma_i - 1)(p_{id} - p_{im}) + (\sigma_{id} - S_m \sigma_i) n_i$	gh	Perceived Elasticities - Intermediate
4.	(8)	$c_{id} = c - p_{id}(S_d + \sigma_i S_m) - p_{im}(S_m - \sigma_i S_m)$	g	Consumption Demands, Domestic
5.	(9)	$c_{im} = c - p_{id}(S_d - \sigma_i S_d) - p_{im}(S_m + \sigma_i S_d)$	g	Consumption Demands, Imported
6.	(43)	$\varepsilon_i^c E_i^c N_i = (\sigma_i - 1)^2 S_d S_m (p_{id} - p_{im}) + N_i(\sigma_{id} - E_i^c) n_i$	g	Perceived Elasticities - Consumption
7.	(11)	$y_{id} = y_r - \sigma_i S_m (p_{id} - p_{im})$	g	Investment Demands, Domestic
8.	(12)	$y_{im} = y_r + \sigma_i S_d (p_{id} - p_{im})$	g	Investment Demands, Imported
9.	(44)	$\varepsilon_i^y N_i E_i^y = S_m S_d \sigma_i (\sigma_i - 1)(p_{id} - p_{im}) + N_i(\sigma_{id} - E_i^y) n_i$	g	Perceived Elasticities - Investment
10.	(15)	$e_i = E_{ix}(p_{ie} - f_{ie}^p) + f_{ie}^q$	g	Export Demands
11.	(46)	$\varepsilon_i^e E_i^e = n_i(\sigma_{id} - E_i^e)$	g	Perceived Elasticities - Exports
12.	(34)	$\varepsilon_i^t + z_i = \sum_k Q_i^k (\varepsilon_i^k + x_{ik})$	g	Total Perceived Elasticities
13.	(47)	$z_j + p_{jd} = \sum_i [S_{ijd}(p_{id} + x_{ijd}) + S_{ijm}(p_{im} + x_{ijm})] + S_j^l (l_j + p_l) + S_j^k (k_j + p_k)$	h	Zero Pure Profits
14.	(24)	$l_j = n_j (L^f/L)_j + z_j (L^v/L)_j - (p_l - p_k^f)(\sigma^f (L^f.K^f)_j/[L.F]_j + \sigma^v (L^v.K^v)_j/[L.V]_j)$	h	Labour Demands
15.	(25)	$k_j = n_j (K^f/K)_j + z_j (K^v/K)_j - (p_k - p_l)(\sigma^f (K^f.L^f)_j/[K.F]_j + \sigma^v (K^v.L^v)_j/[K.V]_j)$	h	Capital Demands
16.	(26)	$b_j = z_j - n_j$	h	Industry Efficiencies
17.	(33)	$v_j = \sum_i (S_{id}^j p_{id} + S_{im}^j p_{im}) + S_{lv}^j p_l + S_{kv}^j p_k$	h	Variable Costs
18.	(48)	$p_j^f = S_{lf}^j p_l + S_{kf}^j p_k$	h	Price of a 'Fixture', Industry j
19.	(30)	$p_{id} = \alpha_i p_{im} + (1 - \alpha_i) p_{il} + f_{id}^p$	g	Price Setting Rule
20.	(32)	$p_{il} = v_i + \varepsilon_i / (1 - E_i^t)$	g	Lerner Price
21.	(33a)	$p_{im} = t_i + \phi + p_i^*$	g	Zero Pure Profits in Importing
22.	(15a)	$p_{ie} + \phi = p_{id} + s_i$	g	Export Prices
23.	(33b)	$p_l = f_l + cpi$	l	Wage Indexation
24.	(33c)	$p_k = \pi$	l	Rental Price of Capital

25.	(49)	$z_i = S_i^c c_{id} + S_i^y y_{id} + S_i^e e_i + \sum_j S_i^j x_{ijd}$	g	Goods Clearing, Domestic
26.	(50)	$m_i = S_i^c c_{im} + S_i^y y_{im} + \sum_j S_i^j x_{ijm}$	g	Goods Clearing, Imported
27.	(51)	$l = \sum_j S_j^l l_j$	1	Labour Market Clearing
28.	(52)	$k = \sum_j S_j^k k_j$	1	Capital Market Clearing
29.	(53)	$m = \sum_i S_i^m m_i$	1	Aggregate Imports at Foreign Prices
30.	(54)	$e = \sum_i S_i^e e_i$	1	Aggregate Exports at Foreign Prices
31.	(55)	$cpi = \sum_i S_{id}^c p_{id} + \sum_i S_{im}^c p_{im}$	1	Consumer Price Index
32.	(56)	$\pi = \sum_i S_{id}^y p_{id} + \sum_i S_{im}^y p_{im}$	1	Investment Price Index
33.	(57)	$c = c_r - cpi$	1	Aggregate Nominal Consumption
34.	(58)	$i = y_r - \pi$	1	Aggregate Nominal Investment
35.	(59)	$r = p_k + \sum_j S_j^k k_j$	1	Revenue to Capital
36.	(60)	$(rl) = p_l + \sum S_j^l l_j$	1	National Wage Bill
37.	(61)	$z_t = \sum_j S_j^z z_j$	1	Aggregate Output
38.	(62)	$(re)(RE) = \sum_i B_i(p_{id} + e_i) + C_i s_i$	1	Export Tax Revenue
39.	(63)	$(rm)(RM) = \sum_i B_i(p_i^* + m_i + \phi) + C_i t_i$	1	Tariff Revenue
40.	(64)	$gdp = S_1 c + S_2 i + S_3 e + S_4 m$	1	Gross Domestic Product from Expenditure
41.	(65)	$gdi = S_1 r + S_2(rl) + S_3(re) + S_4(rm)$	1	Gross Domestic Product from Income Sid
42.	(66)	$y_j = k_j$	h	Investment by Industry
43.	(67)	$y_r = \sum_j S_j^y y_j$	1	Uses, Aggregate Real Investment
44.	(68)	$gdp = S_1 gnp + S_2(rx)$	1	National Income
45.	(69)	$(rx) = r - qQ/(1-Q)$	1	Rentals to Foreigners
46.	(70)	$w = q + k$	1	National Wealth
47.	(71)	$w = \lambda(s - \pi)$	1	Wealth Accretion Function
48.	(72)	$c = s + f_c$	1	Consumption Function
49.	(73)	$gnp = S_1 c + S_2 s$	1	National Budget Constraint
50.	(74)	$S_1 s + S_2(nfi) = i$	1	Nominal Foreign Investment

Total Number of Equations = $3gh + 15g + 7h + 25$

Appendix II: Variables in Harris-type Miniature

No	Symbol	Mnemonic	Range	Description
1.	x_{ijd}	xijd	gh	Intermediate Demand for domestic good i by industry j
2.	x_{ijm}	xijm	gh	Intermediate Demand for imported good i by industry j
3.	ε_{ij}	elsij	gh	Perceived Elasticity, industry j, good i
4.	c_{id}	cid	g	Household Demand for domestic good i
5.	c_{im}	cim	g	Household Demand for imported good i
6.	ε_i^c	elsci	g	Perceived Elasticity, households, good i
7.	y_{id}	yid	g	Investment Demand for domestic good i
8.	y_{im}	yim	g	Investment Demand for imported good i
9.	ε_i^y	elsyi	g	Perceived Elasticity, Investment, good i
10.	e_i	ei	g	Exports, good i
11.	ε_i^e	elsei	g	Perceived Elasticity, Exports, good i
12.	ε_i	elsti	g	Total Perceived Elasticity, good i
13.	n_j	nj	h	Number of Firms in Industry j
14.	l_j	lj	h	Labour Demand by industry j
15.	k_j	kj	h	Capital Demand by industry j
16.	b_j	bj	h	Efficiency by industry j
17.	v_j	vj	g	Variable Cost in industry j
18.	p_j^f	pfj	h	Fixture Rental Price in industry j
19.	p_{id}	pid	g	Basic Price of domestic good i
20.	p_{il}	pil	g	Lerner Markup Rule Price, domestic good i
21.	p_{im}	pim	g	Basic Price of imported good i
22.	p_{ie}	pie	g	Export Price of good i
23.	p_l	pl	1	Nominal Economy-Wide Wage
24.	p_k	pk	1	Nominal Economy-Wide Capital Rental
25.	z_j	zj	h	Real Output, industry j
26.	m_i	mi	g	Total imports of good i
27.	f_l	fl	1	Real Economy-Wide Wage
28.	k	ktot	1	Aggregate Capital Stock
29.	m	mn	1	Aggregate Nominal imports at Foreign Prices(A$)
30.	e	en	1	Aggregate Nominal exports at Foreign Prices(A$)
31.	cpi	cp	1	Consumer Price index
32.	π	py	1	Investment Price index

33. c	cn	1	Aggregate Nominal Consumption
34. i	yn	1	Aggregate Nominal Investment
35. r	r	1	Aggregate Nominal capital revenue
36. (rl)	rl	1	Aggregate Nominal wages
37. z	zt	1	Aggregate Real output
38. (re)	re	1	Export Tax Revenue
39. (rm)	rm	1	Import Tax Revenue
40. gdp	gdp	1	Nominal GDP from Expenditure Side
41. gdi	gdi	1	GDP from Income Side
42. y_j	yj	h	Real Investment in industry j
43. y^r	yr	1	Aggregate Real Investment
44. gnp	gnp	1	Aggregate Nominal income to Australians
45. (rx)	rx	1	Capital Rentals to Overseas
46. q	q	1	Australian share of national capital stock
47. w	w	1	Australian Wealth
48. c_r	cr	1	Real Aggregate household Consumption
49. s	s	1	Aggregate Nominal Australian saving
50. (nfi)	nfi	1	Nominal Foreign Investment

3gh + 15g + 7h + 25 = Total Number of Endogenous Variables

Default Exogenous Variables

51. f_c	fc	1	Consumption shifter
52. f^p_{id}	fid	g	Domestic Price shifter, good i
53. f^p_{ie}	fie	g	Export Demand Price shifter, good i
54. f^q_{ie}	fie	g	Export Demand Quantity shifter, good i
55. l	ltot	1	Aggregate Employment
56. p^*_i	piw	g	World Price of imported good i
57. s_i	si	g	Power of Export Tax, good i
58. t_i	ti	g	Power of Import Tax, good i
59. ϕ	ex	1	Exchange Rate (dollars/yen)

6g + 3 = Total Number of Exogenous Variables

APPENDIX III

FULLER TABULATIONS OF SIMULATION RESULTS

The following pages are an edited version of the original computer printouts. Columns 1 to 8 show the effects of individual tariff cuts whilst column 9 shows the total, or ATB effect. Variables are referred to by their mnemonics. Appendix II describes each variable, giving the symbol, which appears in the text, together with the corresponding mnemonics.

RESULTS - CRTS ENVIRONMENT

VARIABLE NO. 25 zj

		1	2	3	4	5	6	7	8	9
zj	1	-.009	0.012	0.278	0.052	0.079	0.016	0.820	0.000	1.247
zj	2	0.025	-.010	0.093	0.023	0.028	0.009	0.353	0.000	0.520
zj	3	0.004	0.001	-1.29	0.009	0.010	0.004	0.188	0.000	-1.07
zj	4	0.003	-.001	0.024	-.182	0.010	0.003	0.150	0.000	0.007
zj	5	0.005	0.001	0.051	0.009	-.139	0.003	0.207	0.000	0.138
zj	6	0.003	-.001	0.007	0.006	0.008	-.181	0.138	0.000	-.020
zj	7	0.010	0.001	0.066	0.017	0.025	0.007	-.753	0.000	-.626
zj	8	0.001	-.002	-.029	0.002	0.001	0.002	0.100	0.000	0.075

VARIABLE NO. 4 cid

		1	2	3	4	5	6	7	8	9
cid	1	-.030	-.004	-.042	-.008	-.002	-.002	-.047	0.000	-.135
cid	2	0.006	-.017	-.047	-.006	-.007	-.001	-.062	0.000	-.133
cid	3	-.001	-.003	-.896	-.003	-.005	-.001	-.018	0.000	-.927
cid	4	-.004	-.005	-.034	-.040	-.006	-.002	-.081	0.000	-.172
cid	5	0.000	-.005	-.038	-.008	-.009	-.002	-.080	0.000	-.142
cid	6	0.002	-.005	-.048	-.008	-.003	0.019	-.087	0.000	-.130
cid	7	0.003	-.004	-.020	-.004	-.002	-.001	-.536	0.000	-.563
cid	8	-.005	-.005	-.047	-.006	-.014	0.000	-.063	0.000	-.141

VARIABLE NO. 5 cim

		1	2	3	4	5	6	7	8	9
cim	1	0.972	-.015	-.241	-.043	-.060	-.014	-.641	0.000	-.041
cim	2	-.021	1.169	-.209	-.040	-.049	-.013	-.548	0.000	0.290
cim	3	-.021	-.018	7.931	-.056	-.068	-.018	-.789	0.000	6.961
cim	4	-.013	-.012	-.199	1.676	-.045	-.011	-.491	0.000	0.904
cim	5	-.012	-.011	-.165	-.030	1.234	-.009	-.407	0.000	0.600
cim	6	-.010	-.010	-.147	-.027	-.033	1.895	-.361	0.000	1.307
cim	7	-.019	-.014	-.233	-.042	-.054	-.013	3.466	0.000	3.091
cim	8	-.008	-.007	-.092	-.015	-.023	-.004	-.198	0.000	-.347

VARIABLE NO. 7 yid

		1	2	3	4	5	6	7	8	9
yid	1	-.061	0.000	0.017	0.014	0.023	0.008	0.428	0.000	0.428
yid	2	0.004	-.001	0.004	0.012	0.019	0.007	0.389	0.000	0.434
yid	3	0.007	0.002	-1.56	0.021	0.031	0.010	0.526	0.000	-.961
yid	4	0.005	0.000	0.023	-.188	0.024	0.008	0.437	0.000	0.309
yid	5	0.006	0.000	0.024	0.015	-.177	0.008	0.441	0.000	0.317
yid	6	0.005	0.000	0.014	0.014	0.022	-.175	0.416	0.000	0.295
yid	7	0.009	0.002	0.058	0.022	0.033	0.010	-.633	0.000	-.499
yid	8	0.004	-.001	0.005	0.012	0.020	0.007	0.393	0.000	0.440

VARIABLE NO. 10 ei

		1	2	3	4	5	6	7	8	9
ei	1	0.083	0.033	0.627	0.109	0.183	0.038	1.872	0.000	2.946
ei	2	0.114	0.056	0.689	0.144	0.176	0.052	2.068	0.000	3.299
ei	3	0.059	0.042	2.696	0.157	0.187	0.049	2.285	0.000	5.476
ei	4	0.051	0.037	0.856	0.457	0.204	0.045	2.122	0.000	3.773
ei	5	0.041	0.020	0.425	0.074	0.222	0.024	1.098	0.000	1.904
ei	6	0.025	0.010	0.199	0.038	0.059	0.052	0.553	0.000	0.936
ei	7	0.051	0.023	0.494	0.089	0.120	0.029	1.877	0.000	2.685
ei	8	0.011	0.010	0.205	0.042	0.038	0.016	0.610	0.000	0.930

VARIABLE NO. 12 elsti

		1	2	3	4	5	6	7	8	9
elsti	1	0.000	0.000	0.003	0.001	0.001	0.000	0.008	0.000	0.013
elsti	2	0.001	0.000	0.005	0.001	0.001	0.000	0.015	0.000	0.024
elsti	3	0.000	0.000	-.021	0.000	0.000	0.000	0.004	0.000	-.016
elsti	4	0.001	0.000	0.006	-.025	0.002	0.001	0.028	0.000	0.011
elsti	5	0.001	0.000	0.011	0.002	-.019	0.001	0.040	0.000	0.036
elsti	6	0.000	0.000	0.001	0.001	0.001	-.019	0.015	0.000	-.002
elsti	7	0.001	0.000	0.006	0.002	0.002	0.001	-.048	0.000	-.036
elsti	8	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.001

VARIABLE NO. 13 nj

		1	2	3	4	5	6	7	8	9
nj	1	-.009	0.012	0.278	0.052	0.079	0.016	0.820	0.000	1.247
nj	2	0.025	-.010	0.093	0.023	0.028	0.009	0.353	0.000	0.520
nj	3	0.004	0.001	-1.29	0.009	0.010	0.004	0.188	0.000	-1.07
nj	4	0.003	-.001	0.024	-.182	0.010	0.003	0.150	0.000	0.007
nj	5	0.005	0.001	0.051	0.009	-.139	0.003	0.207	0.000	0.138
nj	6	0.003	-.001	0.007	0.006	0.008	-.181	0.138	0.000	-.020
nj	7	0.010	0.001	0.066	0.017	0.025	0.007	-.753	0.000	-.626
nj	8	0.001	-.002	-.029	0.002	0.001	0.002	0.100	0.000	0.075

VARIABLE NO. 14 lj

		1	2	3	4	5	6	7	8	9
lj	1	-.011	0.013	0.283	0.048	0.071	0.013	0.680	0.000	1.097
lj	2	0.024	-.010	0.094	0.022	0.025	0.008	0.307	0.000	0.471
lj	3	0.003	0.001	-1.28	0.007	0.007	0.003	0.126	0.000	-1.14
lj	4	0.003	-.001	0.025	-.184	0.008	0.002	0.102	0.000	-.046
lj	5	0.005	0.001	0.052	0.009	-.141	0.003	0.178	0.000	0.107
lj	6	0.003	-.001	0.008	0.005	0.007	-.182	0.112	0.000	-.049
lj	7	0.009	0.002	0.067	0.016	0.024	0.007	-.778	0.000	-.653
lj	8	-.001	-.002	-.023	-.003	-.007	-.001	-.051	0.000	-.087

VARIABLE NO. 15 kj

		1	2	3	4	5	6	7	8	9
kj	1	-.006	0.012	0.271	0.057	0.089	0.019	1.005	0.000	1.447
kj	2	0.026	-.010	0.090	0.025	0.032	0.011	0.437	0.000	0.611
kj	3	0.007	0.000	-1.29	0.015	0.021	0.008	0.393	0.000	-.848
kj	4	0.005	-.001	0.020	-.179	0.016	0.005	0.258	0.000	0.124
kj	5	0.006	0.001	0.050	0.011	-.137	0.004	0.250	0.000	0.185
kj	6	0.004	-.001	0.005	0.007	0.011	-.180	0.181	0.000	0.027
kj	7	0.011	0.001	0.063	0.020	0.030	0.009	-.672	0.000	-.538
kj	8	0.004	-.003	-.038	0.009	0.014	0.007	0.346	0.000	0.341

VARIABLE NO. 17 vj

		1	2	3	4	5	6	7	8	9
vj	1	-.014	-.005	-.100	-.018	-.031	-.006	-.294	0.000	-.468
vj	2	-.018	-.008	-.098	-.021	-.027	-.008	-.298	0.000	-.479
vj	3	-.007	-.005	-.312	-.018	-.022	-.006	-.255	0.000	-.623
vj	4	-.007	-.005	-.108	-.067	-.030	-.006	-.266	0.000	-.489
vj	5	-.012	-.005	-.108	-.020	-.071	-.007	-.273	0.000	-.496
vj	6	-.015	-.005	-.099	-.021	-.037	-.034	-.278	0.000	-.489
vj	7	-.012	-.004	-.098	-.019	-.029	-.007	-.412	0.000	-.581
vj	8	-.005	-.005	-.102	-.021	-.019	-.008	-.304	0.000	-.466

VARIABLE NO. 19 pid

		1	2	3	4	5	6	7	8	9
pid	1	-.013	-.005	-.100	-.017	-.029	-.006	-.297	0.000	-.468
pid	2	-.016	-.008	-.098	-.021	-.025	-.007	-.295	0.000	-.471
pid	3	-.007	-.005	-.300	-.017	-.021	-.005	-.254	0.000	-.608
pid	4	-.006	-.005	-.107	-.057	-.026	-.006	-.265	0.000	-.472
pid	5	-.010	-.005	-.106	-.018	-.056	-.006	-.275	0.000	-.476
pid	6	-.012	-.005	-.100	-.019	-.030	-.026	-.277	0.000	-.468
pid	7	-.010	-.005	-.099	-.018	-.024	-.006	-.375	0.000	-.537
pid	8	-.005	-.005	-.102	-.021	-.019	-.008	-.305	0.000	-.465

VARIABLE NO. 20 pil

		1	2	3	4	5	6	7	8	9
pil	1	-.014	-.005	-.100	-.018	-.031	-.006	-.294	0.000	-.469
pil	2	-.018	-.008	-.098	-.022	-.028	-.008	-.300	0.000	-.482
pil	3	-.007	-.005	-.311	-.018	-.022	-.006	-.255	0.000	-.622
pil	4	-.007	-.005	-.109	-.064	-.030	-.006	-.270	0.000	-.490
pil	5	-.013	-.005	-.111	-.021	-.065	-.007	-.286	0.000	-.507
pil	6	-.016	-.005	-.099	-.021	-.038	-.029	-.282	0.000	-.489
pil	7	-.012	-.005	-.099	-.020	-.029	-.007	-.401	0.000	-.573
pil	8	-.005	-.005	-.102	-.021	-.019	-.008	-.304	0.000	-.466

RESULTS - CRTS ENVIROMENT

VARIABLE NO. 26 mi

		1	2	3	4	5	6	7	8	9
mi	1	0.946	-.009	-.100	-.013	-.033	-.008	-.314	0.000	0.469
mi	2	-.018	1.164	-.180	-.033	-.041	-.011	-.452	0.000	0.427
mi	3	-.018	-.015	7.375	-.050	-.060	-.015	-.672	0.000	6.545
mi	4	-.008	-.009	-.159	1.520	-.033	-.007	-.302	0.000	1.003
mi	5	-.009	-.006	-.096	-.016	1.084	-.005	-.170	0.000	0.783
mi	6	-.009	-.006	-.093	-.013	-.022	1.693	-.139	0.000	1.411
mi	7	-.014	-.009	-.163	-.024	-.030	-.006	3.151	0.000	2.904
mi	8	-.002	-.004	-.078	-.008	-.008	-.002	-.044	0.000	-.146

SCALAR VARIABLES

fl	1	0.006	0.003	0.039	0.014	0.029	0.008	0.195	0.000	0.296
ktot	1	0.004	-.001	0.004	0.012	0.019	0.007	0.389	0.000	0.434
mn	1	0.061	0.029	0.514	0.082	0.121	0.025	1.114	0.000	1.947
en	1	0.064	0.028	0.514	0.091	0.136	0.031	1.444	0.000	2.310
cp	1	-.008	-.009	-.146	-.024	-.029	-.008	-.329	0.000	-.553
py	1	-.006	-.004	-.095	-.020	-.019	-.007	-.475	0.000	-.626
cn	1	-.010	-.010	-.148	-.027	-.033	-.008	-.363	0.000	-.599
r	1	-.003	-.005	-.091	-.008	0.001	0.000	-.086	0.000	-.191
~~rl~~	~~1~~	~~-.002~~	~~-.005~~	~~-.107~~	~~-.010~~	~~0.000~~	~~0.000~~	~~-.134~~	~~0.000~~	~~-.258~~
pl	1	-.002	-.005	-.107	-.010	0.000	0.000	-.134	0.000	-.258
pk	1	-.006	-.004	-.095	-.020	-.019	-.007	-.475	0.000	-.626
zt	1	0.001	0.000	0.001	0.004	0.007	0.003	0.144	0.000	0.161
re	1	0.063	0.025	0.501	0.085	0.154	0.030	1.482	0.000	2.340
rm	1	-.592	-.360	-3.51	-1.20	-2.30	-.556	-13.3	0.000	-21.8
gdp	1	-.008	-.009	-.134	-.021	-.023	-.005	-.246	0.000	-.446
yr	1	0.004	-.001	0.004	0.012	0.019	0.007	0.389	0.000	0.434
rx	1	0.014	0.001	0.001	0.039	0.080	0.024	0.913	0.000	1.072
q	1	-.006	-.002	-.030	-.016	-.027	-.008	-.333	0.000	-.421
cr	1	-.002	-.001	-.001	-.003	-.004	-.001	-.034	0.000	-.046

VARIABLE NO. 25 zj

		1	2	3	4	5	6	7	8	9
zj	1	-.006	0.012	0.278	0.054	0.087	0.017	0.826	0.000	1.269
zj	2	0.030	-.009	0.094	0.027	0.037	0.012	0.369	0.000	0.560
zj	3	0.005	0.001	-1.26	0.011	0.015	0.005	0.196	0.000	-1.02
zj	4	0.005	-.001	0.027	-.174	0.020	0.005	0.165	0.000	0.046
zj	5	0.009	0.001	0.057	0.014	-.126	0.006	0.226	0.000	0.186
zj	6	0.006	-.001	0.009	0.009	0.016	-.179	0.151	0.000	0.011
zj	7	0.013	0.001	0.068	0.022	0.037	0.010	-.712	0.000	-.562
zj	8	0.003	-.002	-.026	0.004	0.007	0.004	0.111	0.000	0.100

VARIABLE NO. 10 ei

		1	2	3	4	5	6	7	8	9
ei	1	0.085	0.033	0.625	0.110	0.190	0.039	1.860	0.000	2.942
ei	2	0.125	0.058	0.686	0.153	0.193	0.058	2.110	0.000	3.382
ei	3	0.053	0.041	2.825	0.158	0.182	0.050	2.293	0.000	5.602
ei	4	0.051	0.036	0.871	0.519	0.237	0.052	2.173	0.000	3.940
ei	5	0.049	0.020	0.444	0.083	0.259	0.029	1.148	0.000	2.033
ei	6	0.031	0.009	0.198	0.042	0.076	0.058	0.566	0.000	0.980
ei	7	0.059	0.022	0.494	0.099	0.145	0.036	2.022	0.000	2.877
ei	8	0.009	0.009	0.203	0.042	0.035	0.016	0.611	0.000	0.924

VARIABLE NO. 11 elsei

		1	2	3	4	5	6	7	8	9
elsei	1	0.000	0.000	0.002	0.000	0.000	0.000	0.006	0.000	0.009
elsei	2	0.000	0.000	0.001	0.000	0.000	0.000	0.003	0.000	0.005
elsei	3	0.000	0.000	-.016	0.000	0.000	0.000	0.002	0.000	-.014
elsei	4	0.000	0.000	0.000	-.006	0.000	0.000	0.004	0.000	-.002
elsei	5	0.000	0.000	0.001	0.000	-.006	0.000	0.006	0.000	0.002
~~elsei~~	~~6~~	~~0.000~~	~~0.000~~	~~0.001~~	~~0.000~~	~~-.001~~	~~-.012~~	~~0.008~~	~~0.000~~	~~-.005~~
elsei	7	0.000	0.000	0.001	0.000	0.000	0.000	-.014	0.000	-.013
elsei	8	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.001

VARIABLE NO. 12 elsti

		1	2	3	4	5	6	7	8	9
elsti	1	0.000	0.000	0.003	0.001	0.001	0.000	0.009	0.000	0.013
elsti	2	0.001	0.000	0.004	0.001	0.001	0.000	0.015	0.000	0.022
elsti	3	0.000	0.000	-.024	0.000	0.000	0.000	0.004	0.000	-.020
elsti	4	0.000	0.000	0.004	-.029	-.001	0.000	0.026	0.000	0.001
elsti	5	0.000	0.000	0.009	0.001	-.023	0.000	0.036	0.000	0.023
elsti	6	-.001	0.000	0.001	0.000	-.002	-.020	0.014	0.000	-.008
elsti	7	0.000	0.000	0.006	0.001	0.001	0.000	-.056	0.000	-.047
elsti	8	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.001

VARIABLE NO. 13 nj

		1	2	3	4	5	6	7	8	9
nj	1	-.016	0.012	0.276	0.051	0.064	0.014	0.853	0.000	1.254
nj	2	0.014	-.012	0.092	0.017	0.012	0.005	0.325	0.000	0.453
nj	3	0.001	0.001	-1.45	0.005	-.004	0.001	0.180	0.000	-1.27
nj	4	0.001	-.001	0.016	-.210	-.007	0.000	0.137	0.000	-.064
nj	5	-.001	0.001	0.038	0.004	-.165	0.000	0.181	0.000	0.059
nj	6	-.006	-.001	0.009	0.000	-.017	-.190	0.129	0.000	-.075
nj	7	0.003	0.002	0.065	0.011	0.007	0.003	-.842	0.000	-.751
nj	8	0.002	-.002	-.029	-.002	-.003	-.001	0.122	0.000	0.086

VARIABLE NO. 16 bj

		1	2	3	4	5	6	7	8	9
bj	1	0.010	0.001	0.002	0.003	0.023	0.003	-.027	0.000	0.015
bj	2	0.016	0.003	0.002	0.010	0.025	0.007	0.044	0.000	0.107
bj	3	0.004	0.000	0.193	0.006	0.019	0.004	0.016	0.000	0.242
bj	4	0.005	0.000	0.011	0.036	0.027	0.005	0.028	0.000	0.110
bj	5	0.010	0.000	0.019	0.009	0.039	0.005	0.044	0.000	0.127
bj	6	0.013	0.000	-.001	0.009	0.033	0.011	0.022	0.000	0.086
bj	7	0.011	0.000	0.003	0.010	0.030	0.007	0.129	0.000	0.189
bj	8	0.001	0.000	0.002	0.007	0.010	0.005	-.011	0.000	0.015

PAGE 2 OF 2: RESULTS - MONOPOLISTIC(NEGISHI-LERNER) PRICING ENVIRONMENT

VARIABLE NO. 17 vj

		1	2	3	4	5	6	7	8	9
vj	1	-.014	-.005	-.099	-.017	-.030	-.006	-.295	0.000	-.466
vj	2	-.018	-.008	-.098	-.022	-.027	-.008	-.300	0.000	-.481
vj	3	-.006	-.005	-.315	-.018	-.020	-.006	-.255	0.000	-.624
vj	4	-.006	-.004	-.108	-.069	-.030	-.006	-.268	0.000	-.492
vj	5	-.012	-.005	-.108	-.020	-.072	-.007	-.276	0.000	-.501
vj	6	-.015	-.005	-.099	-.021	-.038	-.035	-.279	0.000	-.492
vj	7	-.012	-.004	-.097	-.020	-.029	-.007	-.417	0.000	-.586
vj	8	-.004	-.005	-.102	-.021	-.017	-.008	-.305	0.000	-.462

VARIABLE NO. 18 pfj

		1	2	3	4	5	6	7	8	9
pfj	1	-.003	-.005	-.099	-.014	-.008	-.003	-.326	0.000	-.458
pfj	2	-.002	-.005	-.100	-.012	-.003	-.002	-.271	0.000	-.396
pfj	3	-.002	-.005	-.101	-.011	-.001	-.001	-.242	0.000	-.364
pfj	4	-.002	-.005	-.101	-.012	-.003	-.002	-.259	0.000	-.382
pfj	5	-.002	-.005	-.100	-.013	-.004	-.002	-.277	0.000	-.403
pfj	6	-.002	-.005	-.100	-.012	-.004	-.002	-.272	0.000	-.397
pfj	7	-.001	-.005	-.102	-.011	0.000	-.001	-.224	0.000	-.343
pfj	8	-.003	-.005	-.099	-.014	-.007	-.003	-.317	0.000	-.448

VARIABLE NO. 20 pil

		1	2	3	4	5	6	7	8	9
pil	1	-.014	-.005	-.099	-.017	-.030	-.006	-.295	0.000	-.467
pil	2	-.018	-.008	-.098	-.022	-.028	-.008	-.301	0.000	-.483
pil	3	-.006	-.005	-.314	-.018	-.020	-.006	-.255	0.000	-.622
pil	4	-.006	-.004	-.109	-.065	-.030	-.006	-.272	0.000	-.492
pil	5	-.012	-.005	-.111	-.021	-.065	-.007	-.287	0.000	-.508
~~pil~~	~~6~~	~~-.015~~	~~-.005~~	~~-.099~~	~~-.021~~	~~-.038~~	~~-.029~~	~~-.283~~	~~0.000~~	~~-.490~~
pil	7	-.012	-.004	-.099	-.020	-.029	-.007	-.404	0.000	-.575
pil	8	-.004	-.005	-.101	-.021	-.017	-.008	-.305	0.000	-.462

SCALAR VARIABLES

fl	1	0.009	0.004	0.042	0.017	0.036	0.009	0.206	0.000	0.324
ktot	1	0.006	-.001	0.006	0.015	0.026	0.009	0.405	0.000	0.465
mn	1	0.062	0.029	0.514	0.083	0.124	0.026	1.109	0.000	1.947
en	1	0.067	0.028	0.515	0.094	0.145	0.033	1.453	0.000	2.336
cp	1	-.008	-.009	-.147	-.025	-.029	-.008	-.333	0.000	-.558
py	1	-.006	-.004	-.094	-.020	-.019	-.007	-.483	0.000	-.633
cn	1	-.008	-.010	-.146	-.025	-.027	-.007	-.359	0.000	-.582
r	1	0.000	-.005	-.089	-.005	0.007	0.001	-.077	0.000	-.169
rl	1	0.001	-.005	-.104	-.007	0.007	0.002	-.127	0.000	-.234
pl	1	0.001	-.005	-.104	-.007	0.007	0.002	-.127	0.000	-.234
pk	1	-.006	-.004	-.094	-.020	-.019	-.007	-.483	0.000	-.633
zt	1	0.004	0.000	0.004	0.007	0.014	0.004	0.157	0.000	0.191
re	1	0.065	0.025	0.500	0.085	0.162	0.030	1.471	0.000	2.337
rm	1	-.591	-.359	-3.51	-1.20	-2.30	-.556	-13.3	0.000	-21.8
gdp	1	-.006	-.009	-.132	-.018	-.016	-.004	-.239	0.000	-.424
yr	1	0.006	-.001	0.006	0.015	0.026	0.009	0.405	0.000	0.465
rx	1	0.020	0.001	0.005	0.045	0.097	0.027	0.953	0.000	1.148
q	1	-.007	-.002	-.031	-.017	-.030	-.009	-.343	0.000	-.439
cr	1	0.000	-.001	0.001	0.000	0.002	0.001	-.026	0.000	-.024

RESULTS - MIXED PRICING ENVIRONMENT

VARIABLE NO. 25 zj

		1	2	3	4	5	6	7	8	9
zj	1	-.012	0.033	0.247	0.069	0.145	0.055	1.100	0.000	1.638
zj	2	0.007	0.781	-.035	0.038	0.061	0.032	0.165	0.000	1.050
zj	3	0.003	-.025	-1.30	0.045	0.057	0.031	0.328	0.000	-.860
zj	4	-.003	0.089	-.059	0.289	0.072	0.031	0.274	0.000	0.694
zj	5	-.002	0.081	-.027	0.054	0.301	0.034	0.368	0.000	0.809
zj	6	-.002	0.105	-.050	0.051	0.075	0.027	0.376	0.000	0.582
zj	7	0.002	0.053	-.026	0.051	0.078	0.037	0.548	0.000	0.742
zj	8	-.003	0.084	-.072	0.049	0.064	0.034	0.358	0.000	0.514

VARIABLE NO. 4 cid

		1	2	3	4	5	6	7	8	9
cid	1	-.032	0.028	-.065	0.017	0.066	0.021	0.073	0.000	0.108
cid	2	-.005	0.439	-.129	0.017	0.045	0.019	-.119	0.000	0.267
cid	3	-.003	0.003	-.912	0.026	0.042	0.022	0.073	0.000	-.749
cid	4	-.010	0.057	-.123	0.642	0.051	0.015	-.147	0.000	0.485
cid	5	-.007	0.060	-.120	0.017	0.611	0.018	-.123	0.000	0.456
cid	6	-.006	0.059	-.128	0.017	0.063	0.996	-.133	0.000	0.868
cid	7	-.005	0.051	-.115	0.019	0.055	0.019	0.840	0.000	0.864
cid	8	-.007	0.019	-.068	0.029	0.029	0.030	0.061	0.000	0.093

VARIABLE NO. 5 cim

		1	2	3	4	5	6	7	8	9
cim	1	0.968	0.136	-.278	-.014	-.001	-.006	-.607	0.000	0.198
cim	2	-.019	1.043	-.209	-.010	0.021	-.001	-.393	0.000	0.432
cim	3	-.027	0.188	7.882	-.031	0.016	-.012	-.736	0.000	7.279
cim	4	-.016	0.098	-.204	1.406	0.021	0.003	-.353	0.000	0.956
cim	5	-.015	0.089	-.188	-.002	1.211	0.005	-.315	0.000	0.785
cim	6	-.014	0.085	-.178	0.000	0.031	1.917	-.288	0.000	1.553
cim	7	-.019	0.108	-.221	-.012	0.014	-.002	2.675	0.000	2.543
cim	8	-.010	0.049	-.118	0.016	0.030	0.020	-.097	0.000	-.110

VARIABLE NO. 7 yid

		1	2	3	4	5	6	7	8	9
yid	1	-.065	0.034	-.028	0.055	0.074	0.038	0.916	0.000	1.024
yid	2	0.000	0.041	-.042	0.053	0.070	0.036	0.872	0.000	1.030
yid	3	0.004	0.008	-1.60	0.063	0.074	0.042	1.015	0.000	-.390
yid	4	0.000	0.036	-.032	-.036	0.073	0.037	0.896	0.000	0.975
yid	5	0.001	0.036	-.031	0.056	-.025	0.038	0.903	0.000	0.978
yid	6	0.000	0.038	-.037	0.055	0.073	-.053	0.887	0.000	0.964
yid	7	0.003	0.026	-.014	0.061	0.080	0.041	0.403	0.000	0.601
yid	8	0.000	0.040	-.040	0.054	0.070	0.036	0.876	0.000	1.036

VARIABLE NO. 10 ei

		1	2	3	4	5	6	7	8	9
ei	1	0.089	-.341	0.670	0.097	0.212	0.085	2.145	0.000	2.956
ei	2	0.063	2.527	0.338	0.116	0.103	0.082	1.164	0.000	4.394
ei	3	0.072	-.547	2.796	0.167	0.078	0.101	2.394	0.000	5.061
ei	4	0.030	-.214	0.417	5.383	0.155	0.063	1.068	0.000	6.902
ei	5	0.027	-.098	0.225	0.064	2.385	0.042	0.644	0.000	3.289
ei	6	0.016	-.053	0.100	0.033	0.066	1.977	0.313	0.000	2.452
ei	7	0.032	-.133	0.247	0.071	0.096	0.048	6.900	0.000	7.262
ei	8	0.013	-.134	0.224	0.058	-.002	0.047	0.711	0.000	0.917

VARIABLE NO. 11 elsei

		1	2	3	4	5	6	7	8	9
elsei	1	0.000	0.000	0.002	0.000	0.001	0.000	0.008	0.000	0.011
elsei	2	0.001	-.025	0.004	0.001	0.001	0.001	0.016	0.000	-.001
elsei	3	0.000	0.000	-.014	0.001	0.001	0.000	0.004	0.000	-.010
elsei	4	0.000	-.002	0.007	-.071	0.003	0.001	0.027	0.000	-.035
elsei	5	0.001	-.001	0.006	0.003	-.057	0.002	0.030	0.000	-.018
elsei	6	0.001	-.001	0.010	0.005	0.005	-.211	0.056	0.000	-.135
elsei	7	0.000	-.002	0.004	0.001	0.001	0.001	-.065	0.000	-.059
elsei	8	0.000	0.001	-.001	0.000	0.001	0.000	0.003	0.000	0.005

RESULTS - MIXED PRICING ENVIRONMENT

VARIABLE NO. 12	elsti	1	2	3	4	5	6	7	8	9
elsti	1	0.000	0.000	0.003	0.001	0.001	0.001	0.011	0.000	0.016
elsti	2	0.002	-.064	0.013	0.004	0.003	0.003	0.047	0.000	0.008
elsti	3	0.000	-.001	-.021	0.001	0.001	0.001	0.007	0.000	-.012
elsti	4	0.002	-.013	0.036	-.360	0.014	0.007	0.144	0.000	-.169
elsti	5	0.003	-.009	0.033	0.012	-.266	0.008	0.148	0.000	-.071
elsti	6	0.002	-.002	0.016	0.008	0.009	-.351	0.093	0.000	-.226
elsti	7	0.002	-.010	0.022	0.007	0.007	0.005	-.332	0.000	-.299
elsti	8	0.000	0.001	-.001	0.000	0.001	0.000	0.004	0.000	0.005

VARIABLE NO. 13	nj	1	2	3	4	5	6	7	8	9
nj	1	-.012	0.033	0.247	0.069	0.145	0.055	1.100	0.000	1.638
nj	2	0.074	-2.49	0.408	0.144	0.118	0.104	1.554	0.000	-.089
nj	3	0.003	-.025	-1.30	0.045	0.057	0.031	0.328	0.000	-.860
nj	4	0.015	-.078	0.227	-2.40	0.087	0.047	0.919	0.000	-1.19
nj	5	0.016	-.042	0.183	0.073	-1.65	0.045	0.870	0.000	-.509
nj	6	0.017	-.021	0.152	0.071	0.086	-3.30	0.876	0.000	-2.12
nj	7	0.025	-.107	0.238	0.078	0.078	0.052	-3.84	0.000	-3.48
nj	8	-.003	0.084	-.072	0.049	0.064	0.034	0.358	0.000	0.514

VARIABLE NO. 14	lj	1	2	3	4	5	6	7	8	9
lj	1	-.012	0.012	0.271	0.047	0.112	0.039	0.783	0.000	1.252
lj	2	0.046	-1.15	0.234	0.093	0.084	0.069	0.880	0.000	0.253
lj	3	0.003	-.035	-1.29	0.035	0.042	0.024	0.186	0.000	-1.03
lj	4	0.006	-.004	0.096	-1.10	0.068	0.034	0.495	0.000	-.406
lj	5	0.012	-.016	0.137	0.064	-1.19	0.039	0.685	0.000	-.269
lj	6	0.013	0.005	0.109	0.062	0.077	-2.52	0.698	0.000	-1.56
lj	7	0.017	-.053	0.147	0.064	0.072	0.043	-2.31	0.000	-2.02
lj	8	-.003	0.062	-.046	0.024	0.029	0.017	0.017	0.000	0.099

VARIABLE NO. 15	kj	1	2	3	4	5	6	7	8	9
kj	1	-.011	0.060	0.215	0.099	0.189	0.077	1.521	0.000	2.149
kj	2	0.057	-1.63	0.279	0.130	0.123	0.095	1.387	0.000	0.439
kj	3	0.003	0.005	-1.33	0.078	0.105	0.055	0.794	0.000	-.294
kj	4	0.009	-.008	0.117	-1.52	0.108	0.055	0.958	0.000	-.283
kj	5	0.014	-.018	0.147	0.078	-1.38	0.048	0.901	0.000	-.208
kj	6	0.015	0.003	0.117	0.075	0.095	-2.85	0.908	0.000	-1.64
kj	7	0.020	-.059	0.166	0.085	0.097	0.058	-2.69	0.000	-2.32
kj	8	-.003	0.121	-.114	0.088	0.122	0.063	0.919	0.000	1.196

VARIABLE NO. 16	bj	1	2	3	4	5	6	7	8	9
bj	1	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
bj	2	-.066	3.272	-.443	-.106	-.056	-.073	-1.39	0.000	1.138
bj	3	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
bj	4	-.018	0.167	-.286	2.694	-.015	-.017	-.645	0.000	1.882
bj	5	-.018	0.123	-.211	-.020	1.956	-.011	-.502	0.000	1.318
bj	6	-.020	0.126	-.201	-.020	-.011	3.327	-.501	0.000	2.701
bj	7	-.024	0.160	-.264	-.026	0.000	-.015	4.388	0.000	4.217
bj	8	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

VARIABLE NO. 17	vj	1	2	3	4	5	6	7	8	9
vj	1	-.015	0.052	-.105	-.017	-.041	-.015	-.333	0.000	-.473
vj	2	-.018	-.001	-.095	-.033	-.029	-.023	-.327	0.000	-.526
vj	3	-.008	0.059	-.322	-.020	-.012	-.012	-.269	0.000	-.585
vj	4	-.007	0.052	-.100	-.225	-.037	-.015	-.248	0.000	-.580
vj	5	-.012	0.047	-.103	-.028	-.175	-.019	-.277	0.000	-.567
vj	6	-.016	0.052	-.096	-.031	-.063	-.161	-.286	0.000	-.601
vj	7	-.012	0.051	-.094	-.027	-.037	-.018	-.603	0.000	-.740
vj	8	-.007	0.067	-.112	-.031	0.000	-.025	-.354	0.000	-.461

VARIABLE NO. 18 pfj

		1	2	3	4	5	6	7	8	9
pfj	1	-.006	0.072	-.114	-.005	0.030	-.001	-.409	0.000	-.434
pfj	2	-.006	0.080	-.123	0.004	0.042	0.005	-.288	0.000	-.287
pfj	3	-.006	0.084	-.128	0.008	0.049	0.008	-.226	0.000	-.211
pfj	4	-.006	0.082	-.125	0.006	0.045	0.007	-.262	0.000	-.254
pfj	5	-.006	0.079	-.122	0.003	0.041	0.005	-.302	0.000	-.303
pfj	6	-.006	0.080	-.123	0.003	0.042	0.005	-.291	0.000	-.290
pfj	7	-.006	0.087	-.131	0.011	0.053	0.011	-.185	0.000	-.161
pfj	8	-.006	0.073	-.115	-.003	0.032	0.000	-.389	0.000	-.409

VARIABLE NO. 19 pid

		1	2	3	4	5	6	7	8	9
pid	1	-.014	0.054	-.106	-.015	-.034	-.013	-.340	0.000	-.469
pid	2	-.009	-.361	-.048	-.017	-.015	-.012	-.166	0.000	-.628
pid	3	-.008	0.061	-.311	-.019	-.009	-.011	-.266	0.000	-.562
pid	4	-.004	0.027	-.052	-.673	-.019	-.008	-.133	0.000	-.863
pid	5	-.007	0.025	-.056	-.016	-.596	-.011	-.161	0.000	-.822
pid	6	-.008	0.026	-.050	-.016	-.033	-.989	-.156	0.000	-1.23
pid	7	-.006	0.027	-.049	-.014	-.019	-.010	-1.38	0.000	-1.45
pid	8	-.007	0.067	-.112	-.029	0.001	-.024	-.355	0.000	-.458

VARIABLE NO. 20 pil

		1	2	3	4	5	6	7	8	9
pil	1	-.015	0.052	-.106	-.017	-.041	-.015	-.333	0.000	-.474
pil	2	-.018	0.006	-.097	-.033	-.030	-.023	-.333	0.000	-.527
pil	3	-.008	0.059	-.321	-.020	-.012	-.012	-.269	0.000	-.584
pil	4	-.007	0.053	-.104	-.178	-.039	-.016	-.267	0.000	-.558
pil	5	-.013	0.049	-.113	-.032	-.093	-.021	-.322	0.000	-.545
pil	6	-.016	0.053	-.100	-.033	-.066	-.061	-.313	0.000	-.536
pil	7	-.013	0.053	-.099	-.028	-.038	-.019	-.529	0.000	-.674
pil	8	-.007	0.067	-.112	-.031	0.000	-.025	-.354	0.000	-.461

VARIABLE NO. 26 mi

		1	2	3	4	5	6	7	8	9
mi	1	0.937	0.333	-.182	0.024	0.044	0.013	-.117	0.000	1.052
mi	2	-.018	1.061	-.184	-.004	0.029	0.003	-.294	0.000	0.594
mi	3	-.024	0.181	7.323	-.016	0.029	-.006	-.567	0.000	6.921
mi	4	-.010	0.137	-.150	0.946	0.041	0.018	0.051	0.000	1.034
mi	5	-.011	0.120	-.108	0.034	0.786	0.021	0.161	0.000	1.002
mi	6	-.010	0.133	-.100	0.035	0.042	0.935	0.221	0.000	1.255
mi	7	-.013	0.117	-.143	0.020	0.035	0.015	2.145	0.000	2.177
mi	8	-.007	0.117	-.126	0.035	0.066	0.023	0.194	0.000	0.304

SCALAR VARIABLES

fl	1	0.001	0.117	-.009	0.070	0.111	0.042	0.418	0.000	0.750
ktot	1	0.000	0.041	-.042	0.053	0.070	0.036	0.872	0.000	1.030
mn	1	0.059	0.171	0.501	0.083	0.143	0.033	0.859	0.000	1.849
en	1	0.058	0.207	0.462	0.129	0.203	0.064	1.610	0.000	2.733
cp	1	-.008	-.017	-.138	-.044	-.036	-.020	-.392	0.000	-.655
py	1	-.006	0.050	-.088	-.029	-.006	-.018	-.750	0.000	-.848
cn	1	-.014	0.085	-.179	0.000	0.030	0.007	-.289	0.000	-.358
r	1	-.007	0.090	-.130	0.024	0.064	0.018	0.122	0.000	0.182
rl	1	-.006	0.100	-.147	0.026	0.075	0.021	0.026	0.000	0.096
pl	1	-.006	0.100	-.147	0.026	0.075	0.021	0.026	0.000	0.096
pk	1	-.006	0.050	-.088	-.029	-.006	-.018	-.750	0.000	-.848
zt	1	-.003	0.098	-.048	0.057	0.083	0.036	0.445	0.000	0.668
re	1	0.072	-.506	0.555	0.067	0.323	0.068	1.748	0.000	2.327
rm	1	-.593	-.216	-3.51	-1.19	-2.26	-.555	-13.8	0.000	-22.1
gdp	1	-.012	0.092	-.173	0.013	0.048	0.014	-.075	0.000	-.093
yr	1	0.000	0.041	-.042	0.053	0.070	0.036	0.872	0.000	1.030
rx	1	0.003	0.159	-.119	0.141	0.219	0.088	2.047	0.000	2.539
q	1	-.003	-.023	-.004	-.039	-.052	-.023	-.642	0.000	-.785
cr	1	-.006	0.102	-.041	0.045	0.067	0.027	0.103	0.000	0.296

PAGE 1 OF 2: RESULTS - MIXED PRICING (REDUCED SCALE ELASTICITIES)

VARIABLE NO. 25 zj

		1	2	3	4	5	6	7	8	9
zj	1	-.012	0.037	0.246	0.071	0.150	0.057	1.089	0.000	1.637
zj	2	0.008	0.786	-.037	0.040	0.066	0.034	0.172	0.000	1.069
zj	3	0.003	-.024	-1.30	0.047	0.059	0.032	0.326	0.000	-.857
zj	4	-.003	0.092	-.061	0.299	0.078	0.032	0.277	0.000	0.715
zj	5	-.001	0.085	-.030	0.056	0.318	0.036	0.370	0.000	0.834
zj	6	-.002	0.108	-.051	0.053	0.081	0.031	0.378	0.000	0.598
zj	7	0.002	0.058	-.029	0.054	0.085	0.039	0.567	0.000	0.775
zj	8	-.003	0.086	-.073	0.050	0.069	0.035	0.359	0.000	0.524

VARIABLE NO. 10 ei

		1	2	3	4	5	6	7	8	9
ei	1	0.089	-.337	0.670	0.096	0.215	0.086	2.109	0.000	2.928
ei	2	0.064	2.545	0.333	0.121	0.113	0.086	1.159	0.000	4.421
ei	3	0.072	-.543	2.797	0.166	0.076	0.101	2.336	0.000	5.005
ei	4	0.030	-.201	0.407	5.473	0.176	0.069	1.052	0.000	7.005
ei	5	0.027	-.089	0.217	0.070	2.455	0.047	0.638	0.000	3.366
ei	6	0.017	-.049	0.096	0.036	0.077	2.008	0.314	0.000	2.500
ei	7	0.032	-.124	0.239	0.077	0.112	0.054	6.996	0.000	7.385
ei	8	0.013	-.133	0.224	0.059	-.003	0.048	0.699	0.000	0.906

VARIABLE NO. 12 elsti

		1	2	3	4	5	6	7	8	9
elsti	1	0.000	0.000	0.003	0.001	0.001	0.001	0.011	0.000	0.016
elsti	2	0.002	-.049	0.011	0.004	0.003	0.003	0.040	0.000	0.013
elsti	3	0.000	-.001	-.021	0.001	0.001	0.001	0.007	0.000	-.012
elsti	4	0.002	-.009	0.030	-.294	0.013	0.007	0.125	0.000	-.127
elsti	5	0.002	-.005	0.027	0.012	-.215	0.007	0.132	0.000	-.041
elsti	6	0.001	0.000	0.013	0.007	0.008	-.296	0.082	0.000	-.185
elsti	7	0.002	-.008	0.019	0.007	0.007	0.004	-.271	0.000	-.241
elsti	8	0.000	0.001	-.001	0.001	0.001	0.000	0.004	0.000	0.005

VARIABLE NO. 13 nj

		1	2	3	4	5	6	7	8	9
nj	1	-.012	0.037	0.246	0.071	0.150	0.057	1.089	0.000	1.637
nj	2	0.062	-1.95	0.337	0.125	0.106	0.092	1.300	0.000	0.068
nj	3	0.003	-.024	-1.30	0.047	0.059	0.032	0.326	0.000	-.857
nj	4	0.012	-.051	0.183	-1.99	0.081	0.044	0.798	0.000	-.921
nj	5	0.013	-.023	0.152	0.068	-1.36	0.042	0.775	0.000	-.337
nj	6	0.013	-.001	0.122	0.065	0.075	-2.79	0.775	0.000	-1.74
nj	7	0.021	-.080	0.198	0.071	0.074	0.048	-3.18	0.000	-2.85
nj	8	-.003	0.086	-.073	0.050	0.069	0.035	0.359	0.000	0.524

VARIABLE NO. 14 lj

		1	2	3	4	5	6	7	8	9
lj	1	-.012	0.017	0.269	0.049	0.118	0.041	0.787	0.000	1.270
lj	2	0.047	-1.22	0.241	0.098	0.088	0.073	0.932	0.000	0.258
lj	3	0.003	-.032	-1.29	0.037	0.046	0.025	0.197	0.000	-1.01
lj	4	0.006	-.004	0.100	-1.16	0.071	0.036	0.527	0.000	-.419
lj	5	0.012	-.018	0.144	0.067	-1.28	0.041	0.743	0.000	-.294
lj	6	0.012	0.003	0.116	0.063	0.074	-2.66	0.747	0.000	-1.65
lj	7	0.017	-.052	0.151	0.065	0.073	0.044	-2.40	0.000	-2.11
lj	8	-.003	0.064	-.047	0.026	0.032	0.018	0.018	0.000	0.108

VARIABLE NO. 15 kj

		1	2	3	4	5	6	7	8	9
kj	1	-.011	0.063	0.216	0.099	0.193	0.077	1.489	0.000	2.125
kj	2	0.053	-1.52	0.270	0.120	0.113	0.089	1.244	0.000	0.370
kj	3	0.003	0.004	-1.33	0.077	0.104	0.054	0.748	0.000	-.342
kj	4	0.008	-.007	0.115	-1.46	0.099	0.050	0.860	0.000	-.336
kj	5	0.012	-.019	0.146	0.069	-1.32	0.043	0.785	0.000	-.284
kj	6	0.013	0.003	0.117	0.066	0.077	-2.72	0.784	0.000	-1.66
kj	7	0.019	-.056	0.163	0.077	0.087	0.052	-2.62	0.000	-2.28
kj	8	-.003	0.123	-.115	0.091	0.128	0.064	0.920	0.000	1.208

 RESULTS - MIXED PRICING (REDUCED SCALE ELASTICITIES)

VARIABLE NO. 17 vj

		1	2	3	4	5	6	7	8	9
vj	1	-.015	0.051	-.105	-.017	-.043	-.015	-.326	0.000	-.471
vj	2	-.018	-.005	-.094	-.034	-.032	-.024	-.327	0.000	-.534
vj	3	-.008	0.058	-.325	-.021	-.013	-.013	-.263	0.000	-.585
vj	4	-.007	0.049	-.098	-.239	-.042	-.016	-.247	0.000	-.600
vj	5	-.013	0.043	-.100	-.032	-.194	-.021	-.279	0.000	-.596
vj	6	-.016	0.049	-.093	-.035	-.074	-.177	-.290	0.000	-.636
vj	7	-.012	0.048	-.091	-.029	-.043	-.020	-.628	0.000	-.776
vj	8	-.007	0.066	-.112	-.031	-.001	-.025	-.347	0.000	-.457

VARIABLE NO. 18 pfj

		1	2	3	4	5	6	7	8	9
pfj	1	-.006	0.072	-.115	-.004	0.031	-.001	-.397	0.000	-.419
pfj	2	-.006	0.081	-.125	0.005	0.046	0.006	-.264	0.000	-.257
pfj	3	-.006	0.084	-.129	0.009	0.051	0.009	-.209	0.000	-.190
pfj	4	-.006	0.082	-.127	0.007	0.048	0.008	-.239	0.000	-.226
pfj	5	-.006	0.080	-.124	0.005	0.044	0.006	-.274	0.000	-.269
pfj	6	-.006	0.081	-.125	0.006	0.046	0.006	-.263	0.000	-.256
pfj	7	-.006	0.087	-.132	0.013	0.056	0.012	-.162	0.000	-.132
pfj	8	-.006	0.073	-.116	-.003	0.033	0.000	-.380	0.000	-.399

VARIABLE NO. 19 pid

		1	2	3	4	5	6	7	8	9
pid	1	-.014	0.054	-.106	-.015	-.034	-.014	-.335	0.000	-.465
pid	2	-.009	-.364	-.048	-.017	-.016	-.012	-.166	0.000	-.632
pid	3	-.008	0.060	-.311	-.018	-.008	-.011	-.260	0.000	-.556
pid	4	-.004	0.025	-.051	-.684	-.022	-.009	-.132	0.000	-.876
pid	5	-.007	0.022	-.054	-.018	-.614	-.012	-.160	0.000	-.842
pid	6	~~-.008~~	~~0.024~~	~~-.048~~	~~-.018~~	~~-.038~~	~~-1.00~~	~~-.157~~	0.000	~~-1.25~~
pid	7	-.006	0.025	-.048	-.015	-.022	-.011	-1.40	0.000	-1.48
pid	8	-.007	0.066	-.112	-.029	0.001	-.024	-.349	0.000	-.453

VARIABLE NO. 20 pil

		1	2	3	4	5	6	7	8	9
pil	1	-.015	0.051	-.105	-.017	-.043	-.015	-.327	0.000	-.472
pil	2	-.018	0.001	-.095	-.035	-.032	-.025	-.331	0.000	-.535
pil	3	-.008	0.058	-.324	-.021	-.013	-.013	-.264	0.000	-.584
pil	4	-.007	0.050	-.102	-.200	-.044	-.017	-.263	0.000	-.584
pil	5	-.014	0.044	-.109	-.035	-.128	-.023	-.319	0.000	-.584
pil	6	-.017	0.049	-.096	-.036	-.077	-.093	-.314	0.000	-.584
pil	7	-.013	0.050	-.095	-.031	-.045	-.021	-.567	0.000	-.723
pil	8	-.007	0.066	-.112	-.031	-.001	-.025	-.348	0.000	-.457

SCALAR VARIABLES

fl	0.002	0.118	-.010	0.072	0.115	0.043	0.430	0.000	0.769
ktot	0.000	0.046	-.043	0.055	0.076	0.038	0.858	0.000	1.030
mn	0.059	0.172	0.501	0.084	0.144	0.033	0.854	0.000	1.846
en	0.058	0.213	0.461	0.131	0.209	0.066	1.594	0.000	2.730
cp	-.007	-.018	-.137	-.045	-.037	-.021	-.389	0.000	-.655
py	-.006	0.049	-.088	-.029	-.006	-.019	-.751	0.000	-.851
cn	-.014	0.085	-.179	0.001	0.033	0.007	-.278	0.000	-.344
r	-.007	0.095	-.131	0.026	0.069	0.019	0.107	0.000	0.179
rl	-.006	0.100	-.148	0.027	0.078	0.022	0.041	0.000	0.115
pl	-.006	0.100	-.148	0.027	0.078	0.022	0.041	0.000	0.115
pk	-.006	0.049	-.088	-.029	-.006	-.019	-.751	0.000	-.851
zt	-.003	0.101	-.049	0.060	0.088	0.038	0.446	0.000	0.679
re	0.072	-.503	0.555	0.066	0.329	0.069	1.718	0.000	2.305
rm	-.593	-.216	-3.51	-1.19	-2.26	-.555	-13.8	0.000	-22.1
gdp	-.012	0.094	-.174	0.015	0.052	0.015	-.072	0.000	-.083
yr	0.000	0.046	-.043	0.055	0.076	0.038	0.858	0.000	1.030
rx	0.003	0.180	-.122	0.146	0.238	0.093	1.972	0.000	2.509
q	-.003	-.028	-.003	-.040	-.056	-.025	-.622	0.000	-.776
cr	-.006	0.103	-.042	0.046	0.070	0.028	0.112	0.000	0.311