(14) P.P. McGuinness, "The Way to End Unemployment", The National Times, week ending April 14, 1979.

(15) P.P. McGuinness, "The Way Labour Would do it - by the man who would", Australian Financial Review, 25th November 1977.

(16) R.R. Neild, "Pricing and Employment in the Trade Cycle. A Study of British Manufacturing Industry, 1950 to 1961", National Institute of Economic and Social Research, Occasional Papers XXL (1963).

(17) W.D. Nordhaus, "Recent Developments in Price Dynamics", in O. Eckstein (ed.), The Econometrics of Price Determination Conference, October 30-31, 1970, Washington, D.C., proceedings published in June 1972 by the Board of Governors of the Federal Reserve System.

(18) W.D. Nordhaus and W. Godley, "Pricing in the Trade Cycle", The Economic Journal, September 1972.

(19) N.R. Norman, "Effects of Tariff Policy on Manufacturing Industries: A New Theoretical Approach", mimeographed, Fourth Conference of Economists, Canberra, 1974.

(20) Arthur M. Okun, "Inflation: Its Mechanics and Welfare Costs", Brookings Papers on Economic Activity, 2, 1975.

(21) Alan A. Powell, The IMPACT Project: An Overview, First Progress Report of the IMPACT Project, Volume One, Australian Government Publishing Service, Canberra, 1977.

(22) D.P. Vincent, P.B. Dixon, B.R. Parmenter and D.C. Sams. "The Short Term Effect of Oil Price Increases on the Australian Economy with Special Reference to the Agricultural Sector", Australian Journal of Agricultural Economics, Vol. 23, No. 2, August 1979, pp.79-101.

IMPACT PROJECT

A Commonwealth Government inter-agency project in co-operation with the University of Melbourne, to facilitate the analysis of the impact of economic demographic and social changes on the structure of the Australian economy

COMPARATIVE SHORT RUN BEHAVIOUR OF ORANI 77 IN NEO-CLASSICAL AND NEO-KEYNESIAN MODES

by

Jim Wright

and

Peter Cowan

Industries Assistance Commission

Canberra

Working Paper No. 0-29 Melbourne December 1980

The views expressed in this paper do not necessarily reflect the opinions of the participating agencies, nor of the Commonwealth Government.

IMPACT PROJECT RESEARCH CENTRE 153 Barry Street, Carlton 3053

Postal Address: Impact Centre, University of Melbourne, Parkville, Vic., 3052, Australia

Phones: (03) 345 1844 extensions 7417 & 7418
After hours (03) 341 7417 or 341 7418.

Printed by C. J. THOMPSON, Commonwealth Government Printer, Canberra

REFERENCES

(1) H.W. Arndt, "The Modus Operandi of Protection", The Economic Record, June 1979.

(2) Phillip Cagan, "The Hydra-Headed Monster", The Problem of Inflation in the United States", Domestic Affairs Study 26, American Enterprise Institute for Public Policy Research, Washington, D.C., October 1974.

(3) M.R. Cronin, "Export Demand Elasticities with Less than Perfect Markets", Australian Journal of Agricultural Economics, Vol. 23, No. 1, April 1979.

(4) M.R. Cronin, "The Treatment of Exports in ORANI Solutions", unpublished draft, Canberra, June 1979.

(5) Peter B. Dixon, B.R. Parmenter, Alan A. Powell, "Structural Adjustment and the Macro-economy", IMPACT General Paper No. G-18, Melbourne, February 1979.

(6) Peter B. Dixon, Alan A. Powell and B.R. Parmenter, Structural Adaption in an Ailing Macro-economy, Melbourne University Press, 1979.

(7) P.B. Dixon, B.R. Parmenter, A.A. Powell and D.P. Vincent, "The Agricultural Sector of ORANI 78: Theory, Data and Application", IMPACT Preliminary Working Paper No. OP-25, June 1979.

(8) Peter B. Dixon, G.J. Ryland, B.R. Parmenter, John Sutton, ORANI, A General Equilibrium Model of the Australian Economy: Current Specification and Illustrations of Use for Policy Analysis, First Progress Report of the IMPACT Project, Volume Two, Australian Government Publishing Service, Canberra, 1977.

(9) O. Eckstein and G. Fromm, "The Price Equation", The American Economic Review, Volume LVIII, No. 5, Part 1, December 1968.

(10) O. Eckstein and D. Wyss, "Industry Price Equations", in O. Eckstein (ed.), Econometrics of Price Determination Conference, October 30-31, 1970, Washington, D.C., proceedings published in June 1972 by the Board of Governors of the Federal Reserve System.

(11) V.W. FitzGerald, "A Variant of the ORANI Model for the Analysis of Short-Period Responses", IMPACT, Preliminary Working Paper No. OP-23, Melbourne, April 1979.

(12) Robert G. Gregory, "Determination of Relative Prices in the Manufacturing Sector of a Small Open Economy: The Australian Experience", in W. Kasper and T.G. Perry (eds), Growth, Trade and Structural Change in an Open Australian Economy, Centre for Applied Economic Research, University of New South Wales, 1978.

(13) J.R. Hicks, Capital and Growth, Clarendon Press, Oxford, 1956.

APPENDIX 5 : SUPPLEMENTARY INFORMATION TO TABLE 1

TABLE A5.1 : THE ENDOGENOUS EXPORT INDUSTRIES IN ORANI 77

Industry			
ORANI No.	IO Code	Description	Exports as a percentage of total sales
1	01.01	Sheep	68.5
2	01.02	Cereal Grains	56.5
9	04.00	Fishing, Trapping, Hunting	50.2
10	11.01	Iron	63.0
11	11.02	Other Metallic Minerals	33.4
12	12.00	Coal and Crude Petroleum	26.3
15	21.01	Meat Products	30.2
22	21.08	Food Products, nec	30.3
27	23.01	Prepared Fibres	58.1
60	29.01	Basic Iron and Steel	16.5
61	29.02	Other Basic Metal Products	37.9

TABLE A5.2 : THE EXOGENOUS INVESTMENT INDUSTRIES IN ORANI 77

Industry		
ORANI No.	IO Code	Description
14	16.00	Services to Mining
81	36.01	Electricity
82	36.02	Gas
83	37.01	Water, Sewerage and Drainage
100	61.06	Ownership of Dwellings
101	71.01	Public Administration
102	72.01	Defence
103	81.01	Health
104	82.01	Education, Libraries, etc.
105	83.01	Welfare Services
109	99.01	Business Expenses

CONTENTS

page

1. INTRODUCTION 1

2. SHORT TERM RESPONSES BY INDUSTRIES TO CHANGES IN TARIFFS AND DEMAND CONDITIONS 3

3. NEO-CLASSICAL AND NEO-KEYNESIAN MODES OF USE OF ORANI 8

4. INTERPRETATION OF STANDARD ORANI INVESTMENT EQUATIONS FOR OPERATION IN NEO-KEYNESIAN MODE 14

   4.1 Standard ORANI Investment Theory 14

   4.2 Comparison Of The Operation of Standard ORANI Investment Equations in Both Neo-Classical and Neo-Keynesian Modes 17

5. COMPARISON OF NEO-CLASSICAL AND NEO-KEYNESIAN SIMULATIONS 20

6. CONCLUDING REMARKS 30

APPENDICES

1 COMPARISON OF INDUSTRY RESPONSES IN TERMS OF OUTPUT, EMPLOYMENT AND PRICE IN BOTH NEO-KEYNESIAN AND NEO-CLASSICAL MODES 31

2 MODIFIED INVESTMENT THEORY FOR A PROPOSED NEO-KEYNESIAN VERSION OF ORANI 35

3 INDEXATION OF RENTAL PRICE OF CAPITAL TO CONSUMER PRICE INDEX 37

4 STANDARD IMPACT NOMENCLATURE 39

5. SUPPLEMENTARY INFORMATION TO TABLE 1 40

REFERENCES 41

APPENDIX 4 : STANDARD IMPACT NOMENCLATURE

1. In this guide definitions are given for the following terms:

   a. version (of a model);

   b. variant (of a version of a model);

   c. mode (of use of ORANI for simulations); and

   d. basic solution (of ORANI).

2. Version

   A version of a model is a completely algebraically specified structural form of a model.

3. Variant

   The same version may be presented with different sets of initial conditions and/or with different parameter files. This generates different variants of the same version.

4. Mode

   Any variant of any version of ORANI may be run for simulation purposes in a large number of different modes. A mode of use of ORANI for simulations is defined by the partitioning of the ORANI variables into endogenous and exogenous sets.

5. Basic solution

   A basic solution of ORANI is a matrix of the elasticities of the endogenous variables with respect to exogenous variables. For a given variant of a given version of ORANI this matrix depends only on the mode of use.

The values of α_i are known. The values of η_i^1 and η_j^2 can be obtained by carrying out the appropriate simulations[1]. Therefore the user can solve for $\xi^{(3)}$ and by setting all values of $p_{(g+2)2j}$ equal to the value obtained ensure that the rental price of capital is fully indexed to the CPI[2].

1 This can be done very simply and with minimal computer costs. The ORANI system is solved for a particular choice of exogenous variables and the solution stored as a matrix of elasticities between exogenous and endogenous variables. The one solution provides both the values of η_i^1 and η_j^2 and the final simulation results.

2 Less than full indexation can be obtained by modifying equation (A3-2) to read:

$$p_{(g+2)j} = \beta\xi^{(3)} .$$

The value of β is set equal to the degree of indexation required.

TABLES

		page
1.	LIST OF EXOGENOUS VARIABLES DRIVING ORANI 77 IN NEO-CLASSICAL SHORT RUN MODE WITH SLACK LABOUR MARKETS	9
2.	PROJECTED MACRO EFFECTS OF A 1 PER CENT ACROSS-THE-BOARD TARIFF CUT OBTAINED USING THE ORANI MODEL IN DIFFERENT MODES	23
3.	PROJECTIONS OF THE EFFECTS OF A 1 PER CENT ACROSS-THE-BOARD TARIFF CUT ON 109 INDUSTRIES' OUTPUT, PRICES AND EMPLOYMENT OBTAINED USING THE ORANI MODEL IN DIFFERENT MODES	24
4.	COMPARISON OF EXPORT PROJECTIONS OBTAINED USING ORANI IN NEO-CLASSICAL AND NEO-KEYNESIAN MODES	28
5.	COMPARISON OF RESULTS OF SIMULATING A 10 PER CENT REDUCTION IN THE POWER OF THE TARIFF FOR A LABOUR INTENSIVE INDUSTRY (CLOTHING) AND A CAPITAL INTENSIVE INDUSTRY (MOTOR VEHICLES AND PARTS) IN BOTH NEO-CLASSICAL AND NEO-KEYNESIAN MODES	29
A5.1	THE ENDOGENOUS EXPORT INDUSTRIES IN ORANI 77	40
A5.2	THE EXOGENOUS INVESTMENT INDUSTRIES IN ORANI 77	40

APPENDIX 3 : INDEXATION OF RENTAL PRICE OF CAPITAL TO CONSUMER PRICE INDEX

In the neo-Keynesian mode of ORANI the rental price of capital, $p_{(g+2)2j}$, is exogenous while the ORANI consumer price index, $\xi^{(3)}$ is endogenous. The fact that ORANI is linear in percentage changes allows the user to solve for values of $p_{(g+2)2j}$ which will result in an identical movement in $\xi^{(3)}$.

The value of $\xi^{(3)}$ is given by:

$$\sum_i \alpha_i \eta_i^1 + \sum_j p_{(g+2)2j} \eta_j^2 = \xi^{(3)} , \qquad \text{(A3-1)}$$

where:

α_i is the exogenous shocks actually under simulation (e.g., an across the board tariff change);

η_i^1 is the elasticity of $\xi^{(3)}$ with respect to α_i (that is it is the value of $\xi^{(3)}$ resulting from simulating a 1 per cent movement in α_i);

η_j^2 is the elasticity of $\xi^{(3)}$ with respect to $p_{(g+2)2j}$.

The other equation necessary is:

$$p_{(g+2)2j} = \xi^{(3)} , \text{ for all } j \qquad . \qquad \text{(A3-2)}$$

These two equations can be solved to give:

$$\xi^{(3)} = \sum_i \alpha_i \eta_i^1 / \left(1 - \sum_j \eta_j^2\right) . \qquad \text{(A3-3)}$$

The value of $p^*_{(g+2)2j}$ is determined by the equation:

$$p^*_{(g+2)2j} = h^*_{(g+2)2j}\, \xi^{(3)} + f^*_{(g+2)2j} \quad , \qquad (11.7)^{*1}$$

where:

$h^*_{(g+2)2j}$ is an indexation parameter with a value between 0 and 1 (chosen by the user);

ξ^3 is a price index of consumption goods; and

$f^*_{(g+2)2j}$ is a shift term in the price of capital services.

If $f^*_{(g+2)2j}$ is set equal to zero and $h^*_{(g+2)2j}$ is set equal to 1 the real income of the owners of a unit of capital stock providing a constant flow of capital services per period is fixed. Of course if the unit of capital is more fully utilised it will produce more units of capital services per period and the real income of the owners will rise.

COMPARATIVE SHORT RUN BEHAVIOUR OF ORANI 77 IN NEO-CLASSICAL AND NEO-KEYNESIAN MODES*

by

Jim Wright

and

Peter Cowan†

1. INTRODUCTION[1]

In this paper we look at some aspects of using ORANI, the industry model developed within the IMPACT[2] framework, for short term policy analysis[3]. We argue that, in what we term short run ORANI simulations conducted in neo-classical mode, the comparative responses for industry output, price and employment are not always reasonable reflections of actual short run behaviour. We suggest some amendments which, with the exception of the material introduced in Appendix 2, do not alter the specification of ORANI, but simply change the partitioning of variables into endogenous and exogenous sets in order to make some short run industry responses more acceptable. We (loosely) term this alternative mode of use of ORANI as 'neo-Keynesian'. In it firms are allowed to respond to demand increases purely in terms of quantity; a form of mark-up pricing is normally implied. It is argued that neither neo-classical nor neo-Keynesian mode of use is suitable for all industries and that the choice between them should be made at the industry level.

---

* Revised version of a paper presented at the Eighth Conference of Economists, La Trobe University, August 1979.

† We gratefully acknowledge the useful suggestions received from Mr M.R. Cronin, Dr V.W. FitzGerald, Mr P. Hagan, Dr J.S. Marsden. Professor Alan Powell's interest and his constructive suggestions in respect of successive drafts of this paper are also gratefully acknowledged.

1 In this paper the terms 'version', 'variant' and 'mode' (of use) of the ORANI model are each used in a precise technical sense. Those unfamiliar with the IMPACT nomenclature should consult Appendix 4 before reading further.

2 An overview of the IMPACT Project is provided by Powell (21). The specification of the current operational version of ORANI, and examples of its application, are given in Dixon, Ryland, Parmenter and Sutton (8). In the text below, this is referred to as the standard version of ORANI.

3 A number of papers dealing with short run applications of ORANI have been published. Some examples are : Dixon, Parmenter and Powell (5), and Vincent, Dixon, Parmenter and Sams (22).

Given the increasing acceptance of analysis based on ORANI[1] it is appropriate to examine closely industry behaviour implied by the model. When we describe below what we see as plausible characteristics for short run micro-economic behaviour, and the way in which ORANI in neo-classical mode models various responses, it will be apparent that there is some deviation between the two. We suggest that a better approximation of the short run, though still not an entirely satisfactory one, can be achieved by taking advantage of the inherent flexibility of linear models in choosing the endogenous variables simulated[2]. Specifically, we generate a short run solution with very different characteristics merely by making capital's rental price, rather than the amount of capital used, exogenous. Our aim is to show that results are sensitive to the way in which the model reflects the short run.

Our paper is structured as follows. In Section 2 we first discuss possible short run industry responses to a reduction in tariffs and follow by a dicussion of responses to fluctuations in demand of arbitrary origin. In Section 3 we contrast the relevant characteristics of the neo-classical and neo-Keynesian modes of ORANI. The operation of the ORANI model in neo-Keynesian mode is described in Section 4. Particular attention is given to explaining the operation of the investment equations. In Section 5 we give an empirical comparison of the two modes of use of standard ORANI for short run simulations. The simulations presented are used to illustrate the different policy implications of the results produced by the two modes of ORANI. Concluding remarks are given in Section 6.

1 IMPACT results are quoted frequently in the press. Examples are McGuiness (14) and (15).

2 This flexibility has been exploited in the design of the ORANI model and the associated computing systems. See Dixon, et al. (8), pp. 175-207.

APPENDIX 2 : MODIFIED INVESTMENT THEORY FOR A PROPOSED NEO-KEYNESIAN VERSION OF ORANI

In the proposed neo-Keynesian version of ORANI industries would be modelled as using the services of capital rather than physical units of capital. This necessitates the replacement of two variables in the standard version of ORANI, $P_{(g+2)2j}$, the rental price of capital and $X_{(g+2)2j}$, the demand for units of capital in the current period's general equilibrium solution. The new variables are:

$P^*_{(g+2)2j}$ the price of a unit of capital services; and

$X^*_{(g+2)2j}$ the demand for units of capital services per time period[1].

Note that:

$$P_{(g+2)2j} = P^*_{(g+2)2j}\, X^*_{(g+2)2j} \quad ,$$

and so the neo-Keynesion version of equations (10.8) is:

$$-\beta_j \left(k_j(1) - k_j(0)\right) + Q_j \left(p^*_{(g+2)2j} + x^*_{(g+2)2j} - \pi_j\right) = \lambda \quad . \qquad (10.8)^*$$

If the standard version of ORANI is run in neo-classical mode the allocation of investment is largely determined by the movement in $P_{(g+2)2j}$ for each industry. If the demand for an industry's output expands the excess demand for base period capital stocks forces up the rental price of capital and increases the industry's share of total investment expenditure. In the neo-Keynesian version of ORANI the sum of the values of $p^*_{(g+2)2j}$ and $x^*_{(g+2)2j}$ is analogous to the value of $p_{(g+2)2j}$ in the standard version. If the demand for an industry's output expands the demand for units of capital services rises and so the industries share of total investment expenditure increases.

1 The asterisk is used to indicate variables or equations unique to the neo-Keynesian version.

i,e,. the slope is an increasing function of the industry's capital intensity.

Again, from (A1-4) we note that since $0 < S_{(g+2)1j} < 1$,

$$|x_{(g+2)1j}| \geq |x_j| \quad , \qquad \text{(A1-7)}$$

i.e., the response in labour demanded always exceeds the response in output. In the neo-Keynesian mode the values of the variables $p_{(g+2)1j}$, wages, and $p_{(g+2)2j}$, the rental price of a unit of capital services, are equal, being set by indexation to the general level of prices. Hence equation (3.28) reduces to:

$$x_{(g+2)j} = x_j \qquad (s = 1,2); \qquad \text{(A1-8)}$$

that is, the usage of labour and capital services each expands (contracts) proportionately to gross output.

2. SHORT TERM RESPONSES BY INDUSTRIES TO CHANGES IN TARIFFS AND DEMAND CONDITIONS

In this section we discuss possible responses of industries' prices, outputs and employment to tariff reductions. This leads to a more general discussion of short term industry responses to fluctuations in demand.

On the assumption that neither overseas producers nor importers adjust prices in an offsetting direction, the immediate effect of a tariff reduction is to reduce the price of imported goods on the domestic market. Different branches of the literature posit different responses to a fall in import prices. The 'effective rate' literature assumes that the law of one price prevails and that domestic producers will have to adjust their prices to the new import price levels or cease production. This argument assumes perfect substitutability between the domestic and imported goods. A second branch of the literature assumes that in the short run the prices of import-competing commodities are determined primarily by the normal unit costs of production which are exogenous to the industry[1]. Imperfect substitution between local and imported goods is assumed.

In a recent article H.W. Arndt (1) discusses the implications of changing protection under the alternative assumptions which he, adopting Hicks' (13) shorthand, terms flex-price and fix-price. To quote Arndt:

> "... protection in the flex-price case, in the first instance, merely redistributes income in favour of the protected producers but does not affect output and employment. In the fix-price case, there is an immediate favourable effect on output and employment through the shift in demand from imports to the domestic import competing product. The size of the effect will depend on the cross elasticity of demand between the imported and domestic goods, and thus on the degree of substitutability between them, as well as on the domestic elasticity of supply."[2]

---

1 Norman (19) puts this view.

2 Arndt ((1), p.154) discusses an increase in protection whereas our discussion is of a decrease; however the argument still applies.

Arndt acknowledges that the relevance of the fix-price case is limited to the short run. Because the fix-price and flex-price specifications lead to different behaviour of prices and quantities, the choice of specification has important implications for the analysis of the short run effects of changes in protection[1].

The two factors which need to be considered in determining to which category an industry would be classified are the elasticity of substitution between imports and domestic products, and the response of industries to a change in demand. The assumption of perfect substitutability between domestic and imported goods is incompatible with the fix-price story because any deviation of the domestic from the foreign price would lead to annihilation of the domestic industry, or else to its complete capture of the domestic market. Indeed, even in the flex-price world it is difficult to identify what determines the domestic market share if perfect substitutability is assumed. The existence of imperfect substitution between imported and domestic goods allows producers to choose between price and quantity responses[2]. A price differential between their product and an imported good will not now result in a corner solution, but in an adjustment of the relative market shares. The question is, what factors might lead firms to prefer a quantity rather than price adjustment in the short term?

We believe it is important to recognise that:

> "... most sellers of products in the real world are quantity takers and price makers; even those with miniscule market shares put price tags on their commodities. In the short run they are never surprised by the price, and always subject to surprise about the quantities they sell."[3]

1 Or of any other changes which may alter the relative prices of domestic and imported goods.

2 Domestic and imported goods may be less than perfect substitutes because the attributes or the availability of the goods differ, or may appear to be imperfect substitutes, in the sense that identical goods are sold at different prices because the information available to purchasers is incomplete. Okun (20) points out that the lack of knowledge by purchasers and the cost of obtaining information allows price differentials to exist in respect of similar goods. The purchasers knowledge is likely to increase over time, increasing the level of substitutability of domestic for imported goods in the long run.

3 Okun (20), p.360.

this case the demand equation for the primary factor labour is:

$$x_{(g+2)1j} = x_j - \sigma_{(g+2)j}\left(p_{(g+2)1j} - p_{(g+2)2j}\right)\left(1 - S_{(g+2)1j}\right) \quad . \qquad \text{(A1-1)}$$

The CES production functions in ORANI 77 imply that the proportional change in the gross output of an industry is equal to the factor-share weighted sum of the proportional changes in its primary factor inputs. Thus:

$$x_j = S_{(g+2)1j}\, x_{(g+2)1j} + S_{(g+2)2j}\, x_{(g+2)2j} \quad . \qquad \text{(A1-2)}$$

In neo-classical short run mode, capital services in use do not change, and:

$$x_{(g+2)2j} = 0 \quad , \qquad \text{(A1-3)}$$

so that:

$$x_{(g+2)1j} = x_j \Big/ S_{(g+2)1j} \quad . \qquad \text{(A1-4)}$$

Using (A1-4) in (A1-1), we obtain an equation for the rental price of capital:

$$p_{(g+2)2j} = \frac{x_j}{\sigma_{(g+2)2j}\left(1 - S_{(g+2)2j}\right)} + p_{(g+2)1j} \quad . \qquad \text{(A1-5)}$$

Substituting from (A1-5) for the rental price of capital into the pricing equation (9.2), the effect output has on price through the demand for capital[1] is:

$$\frac{\delta p_{j1}}{\delta x_j} = \frac{a_{(g+2)2j}}{\sigma_{(g+2)2j}\left(1 - S_{(g+2)2j}\right)} \quad . \qquad \text{(A1-6)}$$

Since $a_{(g+2)2j} \geq 0$, $\sigma_{(g+2)2j} \geq 0$ and $0 \leq S_{(g+2)2j} \leq 1$ it follows that:

$$\frac{\delta p_{j1}}{\delta x_j} \geq 0 \quad ,$$

i.e., the supply curve is upward sloping. Further:

$$\underset{S_{(g+2)2j} \to 1}{\text{Limit}} \frac{\delta p_{j1}}{\delta x_j} = \infty \quad ,$$

1 Of course the change in output x is associated also with other indirect effects on p_{j1} via the other terms in equation (9.2).

$a^{(1)}_{isj}$ is the cost share of good i from source s used in industry j in total costs of industry j; s = 1 for domestic production and 2 for imports;

$p^{(1)}_{isj}$ is the price of good i from source s used in industry j;

$a_{(g+1)j}$ is the cost share of non-competing imports used by industry j, in the total costs of industry j;

$p_{(g+1)j}$ is the price of non-competing imports used by industry j;

$a_{(g+2)1mj}$ is the cost share of labour of type m used by industry j in the total costs of industry j; m = 1,...,9 as there are nine types of labour in the current ORANI;

$p_{(g+2)1m}$ is the price of labour of type m for all industries;

$a_{(g+2)sj}$ is the cost share of primary factor s used by industry j in the total costs of industry j;

$p_{(g+2)sj}$ is the price of primary factor s used by industry j;

$a_{(g+3)j}$ is the cost share of 'other cost tickets' used by industry j, in the total costs of industry j, ('other cost tickets' include such things as indirect taxes and the costs of working capital);

and

$p_{(g+3)j}$ is the price of 'other cost tickets' used by industry j.

Equation set (3.28) deals with demands by industries for primary factors. Land is only used by agricultural industries in ORANI so for most industries $S_{(g+2)3j}$ is zero. This simpler case is discussed below. From (3.28) in

Firms are normally unaware of the precise demand function they face and so are unable to determine the price they should set in order to achieve a desired level of output. Firms are unable to predict the movements of all the factors which influence demand. The decreased demand arising from a tariff reduction may shortly be offset by a host of other factors.

The firm faces costs in changing the price of its product. There is the cost of printing sales brochures, informing wholesale and retail outlets, advertising, etc. There is also the cost of possible damage to customer relationships resulting from frequent price changes, particularly increases. Okun[1] argues that over time it is possible for a customer-supplier relationship to develop which is based on the mutual understanding of a fair price policy; customers accept price changes due to changes in the costs of producing some standard output and the supplier bears the cost of deviating from 'normal' factor proportions in response to demand fluctuations. Firms confronted by the combination of their lack of knowledge concerning the demand function they face, the uncertainty about the permanence of any change in demand, costs of changing prices, and the existence of a customer-supplier relationship, may be reluctant in the short term to change prices in response to demand changes. However it is reasonable for firms to adopt some rule-of-thumb pricing policy to take account of cost increases. This preserves Okun's customer-supplier relationship so there may be less uncertainty about the level of demand faced at the new price level. Furthermore, an increase in costs is a much more immediate and direct incentive to management to increase prices than is an increase in demand. If firms do not, in the short term, adjust prices in response to demand changes, the resultant quantity adjustments will be achieved by means such as using inventories as a buffer, imposing queuing on customers, and varying production by changing the rate of utilisation of capital and labour.

Some econometric evidence has been advanced supporting the argument that mark-up pricing is practised by manufacturing industries. Overseas, studies by Nield (16), Nordhaus and Godley (18), Eckstein and Fromm (9), and Eckstein and Wyss (10), find support for the proposition that prices are sensitive to costs but not to short term fluctuations in demand.

---

1 Okun (20), p.362.

Indeed, Cagan[1] states:

> "Empirical studies have long found that short run shifts in demand have small and often insignificant effects, and that, instead costs play a dominant role"

and quotes Nordhaus (17) and Eckstein and Wyss (10) in support. In the Australian context Gregory[2] finds that:

> "... import price changes do not appear to affect relative domestic prices, they do affect import flows and hence the output of Australian industries ... . Consequently, in the short run and on average, Australian industries do not adjust prices to match import price changes and as a result their market share adjusts. In the short run Australian industries tend to be quantity adjusters rather than price adjusters."

The above discussion suggests the desirability of modelling industry behaviour to take account of the full range of possible responses to a change in demand. Whether a firm's response is mainly in terms of price or quantity depends on a wide range of factors including:

a. the existence or otherwise of under-utilised capital stock;

b. the degree of competitiveness in the local industry;

c. inventory levels;

d. the extent to which labour can be more fully utilised[3]; and

e. length of order books.

A version of ORANI, ORANI-S has been proposed[4] which attempts to account for most of these factors by the imposition of short period adjustment lags.

---

1 Cagan (2), p.22.
2 Gregory (12), p.220.
3 This encompasses the possibility of labour hoarding or of working overtime.
4 FitzGerald (11). The paper sets out the rationale of the model and the form of the equations. Estimation of the parameters of the model is not yet complete.

APPENDIX 1 : COMPARISON OF INDUSTRY RESPONSES IN TERMS OF OUTPUT, EMPLOYMENT AND PRICE IN BOTH NEO-KEYNESIAN AND NEO-CLASSICAL MODES

This appendix uses the ORANI equations as specified in Table 1 of Dixon, Ryland, Parmenter and Sutton (8) to illustrate the points made in Section 2 of the paper. The relevant equation sets are (3.28) and (9.2):

$$x_{(g+2)sj} = x_j - \sigma_{(g+2)j}\left(p_{(g+2)sj} - \sum_{s=1}^{3} S_{(g+2)sj}\, p_{(g+2)sj}\right), \qquad (3.28)$$

(Primary Factor Demands) $(s = 1,\ldots,3,\ j = 1,\ldots,g)$,

where g is the number of industries; and

$$p_{j1} = \sum_{i=1}^{g}\sum_{s=1}^{2} a^{(1)}_{isj}\, p^{(1)}_{isj} + a^{(1)}_{(g+2)j}\, p^{(1)}_{(g+1)j} + \sum_{m=1} a^{(1)}_{(g+2)1mj}\, p_{(g+2)1m} + \sum_{s=2}^{3} a^{(1)}_{(g+2)sj}\, p_{(g+2)sj} + a^{(1)}_{(g+2)j}\, p_{(g+3)j}, \quad (j = 1,\ldots,g), \qquad (9.2)$$

(Product Pricing Equations)

where:

$x_{(g+2)sj}$ is the demand for primary factor s by industry j, s = 1 for labour, 2 for capital and 3 for land;

x_j is the output of industry j;

$\sigma_{(g+2)j}$ is the elasticity of substitution between the three types of primary factors in industry j;

$p_{(g+2)sj}$ is the price of primary factor s used by industry j;

$S_{(g+2)sj}$ is the share of primary factor s in total primary factors used by industry j;

p_{j1} is the output price of industry j;

6. CONCLUDING REMARKS

The aim of this paper has been to show that the flexibility inherent in linear models can be utilised to allow ORANI to depict economic environments in which the implied behaviour of economic agents differs. In neo-classical mode, the existing capital stock is substitutable with labour, and prices respond to demand pressures. Labour productivity reflects diminishing returns to labour. The neo-Keynesian mode imposes fixed proportions on the input mix of labour, capital services, and materials. Consequently, changes in the use of capital services and labour closely follow the rate of production. In response to increased demand producers tend to increase output rather than price.

In both modes some important short run behaviour is omitted, as discussed in Section 2. We have demonstrated that the policy implications vary, for some purposes, according to the way in which the economy is seen to operate.

In the simulations reported here the same assumptions have been applied to all industries, not because we believe all industries exhibit the same behaviour, but so that the differences could be highlighted. We advocate that the choice be made at the industry level. A simulation would then include industries specified according to both sets of assumptions. A rational choice would be aided by empirical evidence on industry price behaviour and capital utilisation.

However, ORANI-S is not currently operational. On the other hand, a number of short run applications have been reported using the standard version of ORANI in neo-classical mode as described in Section 3. We propose the use of standard ORANI in neo-Keynesian mode as an alternative[1]. It will be obvious from later sections of the paper that neither mode can represent some observed short run phenomena which it is hoped will be captured in the implementation of ORANI-S. Two purposes are served by proposing the neo-Keynesian version of standard ORANI. Firstly, we believe that this version offers a better approximation of the short run price/quantity response of many industries than does the neo-classical version. Secondly, the sensitivity of ORANI results to the particular mode used, neo-classical or neo-Keynesian, can be examined.

1 This suggestion was taken up by Dixon, Powell and Parmenter in (6), pp.36-40, in conducting sensitivity analysis of the policy implications of results produced from ORANI in neo-classical mode. These authors did not, however, examine industry responses, but confined their attention to macro aggregates.

3. NEO-CLASSICAL AND NEO-KEYNESIAN MODES OF USE OF ORANI[1,2]

Both modes of ORANI share certain common features. The level of real absorption is exogenous. It is assumed in the short run that real consumption and investment expenditure is not affected by the other changes in the economy. The level of employment, both in aggregate and for each occupation is endogenous. Sufficient labour is always available at the going real wage to supply the demand. The exchange rate is exogenous and acts as a numeraire. The model determines all domestic price levels relative to this exchange rate. World prices are fixed with the exception of Australian exports, which face downward sloping demand curves. The combination of a fixed exchange rate and fixed world prices means that the price of imports (cif) to Australia is fixed.

The variables specified as exogenous in the neo-classical mode are listed in Table 1. In this mode, the capital stock available to each industry is assumed fixed, reflecting the attempt to model the short run response of industries to specified exogenous shocks. In order to run ORANI in the neo-Keynesian mode this treatment must be modified. In Table 1 the variable $k_j(0)$ (current capital stocks) is replaced by $p_{(g+2)2j}$ (rental price of capital). Therefore in the neo-classical mode the supply of capital is fixed while in the neo-Keynesian mode the rental price of capital is fixed.

The more important differences between the two modes of ORANI rest in the interpretation of the capital stock variables. The standard version of ORANI includes the equation:

$$k_j(0) = x_{(g+2)2j}\ , \qquad (11.7)^3$$

where $x_{(g+2)2j}$ is the usage of capital stocks.

1 Appendix 1 repeats the arguments of this section in terms of the ORANI equations as set out in Dixon, Ryland, Parmenter and Sutton (8, Table 1).

2 This section refers to both modes and versions of ORANI. A mode of ORANI is unique in terms of the choice of exogenous variables. A version of ORANI is unique in terms of its algebraic specification. Both the neo-classical and neo-Keynesian modes of ORANI discussed in this paper are based on the standard version.

3 Where an equation is reproduced from the standard version of ORANI, as described in Dixon, Ryland, Parmenter and Sutton (8), the numbers in that volume will be used.

In Table 5 we present some results for simulations of 10 per cent reductions in the power of the tariff for industries 24.02 'Clothing' and 32.01 'Motor Vehicles and Parts'. The aim is to illustrate that the use of neo-classical or neo-Keynesian mode affects the policy implications at the industry level. 'Clothing' is a labour intensive industry and we find that the results in respect of industry output and employment are very similar for both modes of ORANI. The results for the macro variables are also very close. 'Motor Vehicles and Parts' is a more capital intensive industry. The output movement suggested by the neo-classical mode is much smaller than the equivalent figure in the neo-Keynesian mode. The movement in output prices also differ significantly. The differences in the industry employment figures are much smaller than for output. This will typically be the case although it cannot be expected that the employment figures will always be as close as in this case. If industry output, employment and price are factors for consideration in any policy analysis, and the industry is capital intensive, the choice of which mode of ORANI to use is an important one. For most simulations where the exogenous shock is applied to a single industry the macro results will not be particularly sensitive to the mode of ORANI used.

TABLE 5 : COMPARISON OF RESULTS OF SIMULATING A 10 PER CENT REDUCTION IN THE POWER OF THE TARIFF FOR A LABOUR INTENSIVE INDUSTRY (CLOTHING) AND A CAPITAL INTENSIVE INDUSTRY (MOTOR VEHICLES AND PARTS) IN BOTH NEO-CLASSICAL AND NEO-KEYNESIAN MODES*

	Clothing		Motor vehicles and parts	
Variable	Neo-classical	Neo-Keynesian	Neo-classical	Neo-Keynesian
Industry output	-1.2860	-1.3086	-6.5371	-9.5971
Industry employment	-1.4027	-1.3056	-9.4596	-9.5971
Industry price	-0.1545	-0.0572	-3.1201	-0.3595
Consumer price index	-0.0684	-0.0758	-0.5407	-0.3856
Balance of trade	0.0006	0.0128	-0.0176	0.0116
Aggregate employment	-0.0054	0.0365	-0.0550	0.0456

* All values are percentage changes with the exception of the balance of trade which is in billions of 1968-69 Australian dollars. The power of the tariff is defined as one plus the ad valorem tariff rate (when the latter is expressed as a proportion).

explained by the relative sizes of the inter-industry effects in the two simulations. Industry 33 sells the majority of its output to non-traded industries such as transport, restaurants and hotels. The output of these industries is much higher in the neo-Keynesian simulation and so their demands for the output of industry 33 are higher.

The results for the endogenous export industries are set out in Table 4. The increases in exports for some industries appear to be unrealistically high in the neo-Keynesian version. These export movements are the combined result of industry output price movements and the export demand elasticity specified in ORANI. We believe that the short-run pricing behaviour of the export industries is not accurately captured in either mode of use of ORANI[1] and that the export demand elasticities currently specified for some industries are too high[2].

TABLE 4 : COMPARISON OF EXPORT PROJECTIONS OBTAINED USING ORANI IN NEO-CLASSICAL AND NEO-KEYNESIAN MODES*

Industry			Export projections	
ORANI No.	ABSIO Code	Description	Neo-classical specification	Neo-Keynesian specification
1	01.01	Sheep	1.2625	.2322
2	01.02	Cereal Grains	1.1730	.1119
9	04.00	Fishing and Hunting	4.8855	17.4166
10	11.01	Iron	- 2.0846	15.8897
11	11.02	Other Metallic Minerals	1.8528	18.3105
12	12.00	Coal and Crude Oil	10.1115	19.5522
15	21.01	Meat Products	12.9490	6.1899
22	21.08	Food Products, nec	12.8383	9.2821
27	23.01	Prepared Fibres	3.3362	.9433
60	29.01	Basic Iron and Steel	10.3515	18.5925
61	29.02	Other Basic Metal Products	3.1487	17.9574

* All projections are percentage changes in physical volumes.

1 A version of ORANI, ORANI 78, attempts to capture the agricultural supply response more accurately (see Dixon, Parmenter, Powell and Vincent (7)). The pricing behaviour of export industries is complicated, in the case of some industries, by the existence of long term contracts and/or price discrimination between domestic and export markets.

2 Cronin (3) and (4) supports this view.

TABLE 1 : LIST OF EXOGENOUS VARIABLES DRIVING ORANI 77 IN NEO-CLASSICAL SHORT RUN MODE WITH SLACK LABOUR MARKETS

Exogenous Variable	Subscript Range	Number	Description
p^m_{j2}	$j=1,\ldots,g$[1]	g)	C.i.f. foreign currency import prices
p^m_{g+1}		1)	
t_j	$j=1,\ldots,g+1$	g+1	One plus the ad valorem tariffs
ϕ		1	The exchange rate, $A per $US, say
s_j	$j\varepsilon G$[2])	g	One plus the ad valorem export subsidies
$x^{(4)}_j$	$j\notin G$)		Export demands
$k_j(0)$	$j=1,\ldots,g$	g	Current capital stocks
c_R		1	Real aggregate household expenditure
i_R		1	Aggregate real private investment
n		1	Supply of agricultural land
$f_{(g+2)1m}$	$m=1,\ldots,M$	M	Wage shift variables
$f^{(5)}_{is}$	$i=1,\ldots,g$ $s=1,2$	2g)	"Other" demand shift terms
$f^{(5)}_{g+1}$		1)	
$f^{(2)}_j$	$j\notin J$[3]	g-J*	Exogenous investment
f^e_j	$j=1,\ldots,g$	g	Shifts in foreign export demands.
$f_{(g+3)j}$	$j=1,\ldots,g$	g	Shifts in the real price of "other" cost tickets
q		1	Number of households
	TOTAL = 8g + (g-J*) + M + 8		

1 g is the number of industries in ORANI. In ORANI 77, g = 109.

2 G is a subset of (1,...,g). If $j\varepsilon G$ the quantity of exports by industry j is exogenous. The industries belonging to G are shown in Appendix 5, Table A5.1.

3 J is the subset of (1,...,g) in which investment is endogenous. The industries not belonging to J are given in Appendix 5, Table A5.2.

Therefore, fixing $k_j(0)$ in the neo-classical mode of ORANI effectively fixes both the supply and usage of capital stock. In the neo-Keynesian mode of ORANI the supply of capital stock is assumed fixed but the usage of capital services is allowed to vary. In order to achieve this the variable $x_{(g+2)2j}$ is defined as usage of capital services and is made variable by utilising equation (11.7) and making $k_j(0)$ endogenous. This creates a problem in relation to the definition of $k_j(0)$ and the interpretation of the ORANI investment equations. The implications of this are discussed in Section 4; Appendix 2 sets out alternative equations which are part of a proposed neo-Keynesian version of ORANI which would completely resolve this problem. The variable $p_{(g+2)2j}$ which is defined as the rental price of capital in the neo-classical mode is redefined as the price of a unit of capital services.

The production functions in ORANI are Leontief with respect to effective material and primary inputs. Substitution between imported and domestically sourced material inputs is allowed for, as is substitution between the three primary inputs, labour, capital and land[1].

In the neo-classical short run mode of use of ORANI with slack labour markets it is assumed that each industry has a fixed stock of industry specific capital and that each type of labour is in perfectly elastic supply at its economy-wide wage rate[2]. If an industry experiences an increase in demand for its output its demand for effective primary inputs will rise proportionately; however, as the stock of capital is fixed, the increase in primary inputs used has to be satisfied entirely by increased inputs of labour. Consequently a given increase in output results in a greater than proportional increase in the usage of labour[3]. The industry's initial increase in demand for capital results in the rental

1 Only agricultural industries use land and in ORANI 77 the quantity available in total is assumed fixed in both the neo-classical and neo-Keynesian modes. For the sake of simplicity the discussion will be in terms of non-agricultrual industries but, unless stated otherwise, the conclusions drawn will apply to all industries.
2 Below, the term 'neo-classical short run mode with slack labour markets' is abbreviated to 'neo-classical mode'.
3 This is a strict logical consequence only for industries where land is not a primary factor. For the agricultural industries which use land the conclusions in principle could be modified by the relative price movements of labour and land.

In the neo-classical simulations the labour demand-output elasticity[1] must always be greater than or equal to unity and will be higher, the higher is the share of capital in primary inputs. Capital accounts for 87 per cent of the base period primary inputs to industry 10 (the iron ore mining industry) and the labour demand-output elasticity is approximately eight. The elasticity in industry 35 (Clothing) where capital inputs in the base period account for only 8 per cent of primary factor inputs is just above unity. In the neo-Keynesian mode the labour demand-output elasticity is unity for all industries due to the fixed relative price of capital and labour services[2]. In the neo-Keynesian simulations, movements in industry output prices are unaffected by the level of demand for the industry's output. Industries 10 and 35 illustrate the importance of capital intensity in determining price response to output changes in the neo-classical specification. The demand for the output of industry 10 rises and this causes the rental price of capital in industry 10 to rise. This in turn forces up the output price. The average movement in input prices for industry 10 excluding capital costs is negative. However the capital intensity of the industry combined with the relatively large rise in the rental price of capital more than offsets the fall in input costs[3]. For industry 35 the effect of the output movement on the rental price of capital is much smaller and because of this industry's low capital intensity the effect on the output price is insignificant.

The interaction of the direct import substitution effect and the indirect inter-industry effects is illustrated by industry 33 (Textile products nec.). This is an import competing industry and the direct effect of a reduction in tariffs reduces its output in both simulations, but by a greater amount in the neo-Keynesian mode. The net reduction in the output of industry 33, however is larger in the neo-classical mode. This is

1 That is, the ratio of percentage change in labour demand to the percentage change in output.
2 The discussion in this paragraph is only strictly applicable to industries not using land as a primary factor.
3 The situation where the fall in non-capital input costs is more than offset by the rise in the rental price of capital can only occur where the expansion in the industry's sales is due largely to increased purchases by other industries which themselves are responding to improved trading conditions.

Table 3 - continued

Industry			Output Projections (per cent)		Price Projections (per cent)		Employment Projections (per cent)	
ORANI No.	ABSIO Code	Description	Neo-classical mode	Neo-Keynesian mode	Neo-classical mode	Neo-Keynesian mode	Neo-classical mode	Neo-Keynesian mode
95	61.01	Banking	.0001	.0306	-.0673	-.0715	.0001	.0306
96	61.02	Finance and Life Insurance	.0002	.0100	-.0671	-.0714	.0003	.0100
97	61.03	Other Insurance	.0006	.0217	-.0672	-.0716	.0008	.0217
98	61.04	Investment, Real Estate Etc	.0006	.0196	.0680	-.0720	-.0010	.0196
99	61.05	Other Business Services	.0024	.0282	-.0667	-.0717	.0032	.0282
100	61.06	Ownership of Dwellings	0.0000	-.0011	-.0702	-.0723	-.0020	-.0011
101	71.01	Public Administration	-.0001	.0007	-.0660	-.0701	-.0001	.0007
102	72.01	Defence	0.0000	0.0000	-.0826	-.0853	0.0000	0.0000
103	81.01	Health	.0005	.0015	-.0709	-.0749	.0005	.0015
104	82.01	Education, Libraries, Etc	-.0001	.0003	-.0694	-.0737	-.0001	.0003
105	83.01	Welfare Services	.0004	.0076	-.0714	-.0754	.0004	.0076
106	91.01	Entertainment	.0089	.0195	-.0781	-.0855	.0134	.0195
107	92.01	Restaurants, Hotels, Clubs	-.0019	.0014	-.0709	-.0744	-.0027	.0014
108	93.01	Personal Services	.0005	.0063	-.0711	-.0754	.0008	.0063
109	99.01	Business Expenses	.0002	.0341	-.0688	-.0738	.0002	.0341

price of capital rising until demand for capital is once again equated with the industry's stock of capital. This increase in the industry's capital costs per unit of output causes the price of its output to rise.

In the neo-Keynesian mode the variables $k_j(0)$, which are defined in the standard ORANI documentation[1] as the stocks of capital, are reinterpreted as the supply of capital services. No variable corresponding to the capital stocks now appears in the neo-Keynesian mode, in which it is assumed that the supply of capital services is infinitely elastic at given prices, $p_{(g+2)2j}$. Because of the slack labour market assumption, and because the prices of capital services and labour are both indexed in our neo-Keynesian simulations to the ORANI CPI, no change in the relative prices of these factors occurs in the neo-Keynesian simulations reported below. Industries will increase their usage of effective primary inputs by equal increases in their usage of capital and labour services. The two points of contrast which we wish to emphasise are: the relative movements in output quantity and price, and the relative movements in labour usage and output.

In the neo-clasiscal mode industries have upward sloping short run supply curves. Short run elasticities of supply are inversely related to the capital intensities of the industries. That is, capital-intensive industries tend to be price adjusters rather than quantity adjusters. This result reflects the specification in neo-classical mode that the amounts of capital in use are equal to the supplies of capital, and the maintained assumption (in neo-classical mode) that capital services are proportional to capital stocks.

If on the other hand capital services (as well as labour) are in infinitely elastic supply in the short run[2], then non-agricultural industry supply curves are virtually horizontal in the short run. These industries respond to an increase in demand by expanding output rather than by raising prices. This is the result produced by the neo-Keynesian mode.

1 Dixon, Ryland, Parmenter and Sutton (8).
2 Strictly speaking, the supply of capital services is assumed to be infinitely elastic over the expected range of increase or decrease in supply.

Industry usage of labour in ORANI is measured in man-hours. When the labour usage by industry is aggregated to produce an economy wide figure, however, the result is presented in terms of persons. That is, man-hours worked per week per person are implicitly assumed to be constant. As pointed out above, the movement in labour usage is more than proportional to the movement in output in the neo-classical mode of ORANI. That is, labour productivity moves in the opposite direction to output in violation of what is known as 'Okun's Law'[1]. In neo-Keynesian simulations reported below, average labour productivity is constant.

The scope for short-run expansion in real GDP is limited by the assumption of fixed real aggregate absorption. This means that the size of the domestic market for any commodity is relatively constant and so significant changes in an industry's output level are normally due either directly or indirectly, to changes in the share of the domestic market taken by imports or to changes in the level of exports. The extent to which output expands or contracts is determined by:

a. the fixity assumed for the available quantities of certain primary factors;

b. by the less than infinite elasticities assumed to apply to export demand schedules; and

c. by the less than perfect substitutability assumed to apply between domestically produced and imported commodities.

In the neo-Keynesian mode the only fixed primary factor is agricultural land; this leads directly to upward sloping export supply schedules, and contributes an element of upward slope to the supply schedule for the economy as a whole. In neo-classical mode the assumption of fixed industry specific capital stocks leads directly to positive slopes in the supply

1 Essentially 'Okun's Law' states that labour productivity moves in the direction of output change. Recent experience has not offered as much support for 'Okun's Law' as did the relativley short business cycles occuring prior to the mid-1970s.

Table 3 - continued

Industry			Output Projections (per cent)		Price Projections (per cent)		Employment Projections (per cent)	
ORANI No.	ABSIO Code	Description	Neo-classical mode	Neo-Keynesian mode	Neo-classical mode	Neo-Keynesian mode	Neo-classical mode	Neo-Keynesian mode
48	27.03	Paints, Varnished, Lacquers	-.0291	-.0215	-.0916	-.0886	-.0390	-.0215
49	27.04	Pharmaceuticals and Chemicals	-.0211	-.0096	-.0851	-.0776	-.0345	-.0096
50	27.05	Soap and Detergents	-.0063	.0024	-.0810	-.0809	-.0091	.0024
51	27.06	Cosmetics, Toilet Preparations	-.0148	-.0140	-.0863	-.0805	-.0245	-.0140
52	27.07	Chemical Products nec	-.0395	.0224	-.0882	-.0843	-.0505	.0224
53	27.08	Oil and Coal Products	.0026	.0528	-.0294	-.0410	.0092	.0528
54	28.01	Glass and Glass Products	-.0265	-.0261	-.0825	-.0757	-.0370	-.0261
55	28.02	Clay Products	-.0081	.0225	-.0695	-.0730	-.0122	.0225
56	28.03	Cement	.0064	.1019	-.0528	-.0713	.0151	.1019
57	28.04	Ready-Mixed Concrete	-.0014	.0054	-.0625	-.0734	-.0030	.0054
58	28.05	Concrete Products	.0006	.0198	-.0600	-.0693	.0009	.0198
59	28.06	Non-Metal Mineral Products	-.0100	.0063	-.0704	-.0728	-.0156	.0063
60	29.01	Basic Iron and Steel	.0616	.2456	-.0220	-.0727	.0985	.2456
61	29.02	Other Basic Metal Products	.0674	.5687	-.0085	-.0738	.1298	.5687
62	31.01	Structural Metal Products	-.0140	-.0041	-.0605	-.0777	-.0169	-.0041
63	31.02	Sheet Metal Products	-.0068	.0029	-.0574	-.0767	-.0086	.0029
64	31.03	Metal Products nec	-.0667	-.0485	-.0739	-.0761	-.0853	-.0485
65	32.01	Motor Vehicles and Parts	-.1321	-.1781	-.1218	-.0773	-.1912	-.1781
66	32.02	Ship and Boat Building	-.0038	.0322	-.0759	-.0824	-.0045	.0322
67	32.03	Locomotives, Rolling Stock	.0146	.1060	-.0728	-.0835	.0155	.1060
68	32.04	Aircraft Building	-.0124	.0059	-.0678	-.0742	-.0135	.0059
69	33.01	Scientific Equipment Etc	-.0128	.0019	-.0711	-.0817	-.0129	.0019
70	33.02	Electronic Equipment	-.1196	-.1237	-.0865	-.0792	-.1353	-.1237
71	33.03	Household Appliances nec	-.0311	-.0284	-.0741	-.0840	-.0348	-.0284
72	33.04	Electrical Machinery nec	-.0396	-.0151	-.0669	-.0796	-.0465	-.0151
73	33.05	Agricultural Machinery	.0392	.0602	-.0638	-.0804	.0444	.0602
74	33.06	Construction Equipment	-.0057	.0316	-.0717	-.0828	-.0070	.0316
75	33.07	Other Machinery, Equipment	-.0212	.0105	-.0682	-.0782	-.0242	.0105
76	34.01	Leather Products	-.0751	-.0752	-.0707	-.0691	-.0863	-.0752
77	34.02	Rubber Products	-.0339	.0092	-.0940	-.0864	-.0415	.0092
78	34.03	Plastic Products	-.0380	-.0240	-.0938	-.0845	-.0492	-.0240
79	34.04	Signs, Writing Equipment Etc	-.0336	-.0109	-.0808	-.0807	-.0409	-.0109
80	34.05	Other Manufacturing	-.0251	-.0181	-.0762	-.0803	-.0306	-.0181
81	36.01	Electricity	.0010	.0581	-.0599	-.0715	.0027	.0581
82	36.02	Gas	-.0059	.0101	-.0622	-.0715	-.0089	.0101
83	37.01	Water, Sewerage and Drainage	.0024	.0195	-.0659	-.0744	.0053	.0195
84	41.01	Residential Buildings	0.0000	0.0000	-.0710	-.0772	0.0000	0.0000
85	41.02	Building nec, Construction	-.0029	.0023	-.0701	-.0779	-.0032	.0023
86	46.01	Wholesale Trade	.0093	.0444	-.0644	-.0725	.0131	.0444
87	48.01	Retail Trade	.0036	.0046	-.0670	-.0727	.0050	.0046
88	48.02	Motor Vehicle Repairs	.0128	.0302	-.0876	-.0882	.0179	.0302
89	48.03	Other Repairs	.0105	.0461	-.0812	-.0899	.0146	.0461
90	51.01	Road Transport	.0177	.0948	-.0620	-.0737	.0279	.0948
91	52.01	Rail Transport	.0265	.1762	-.0667	-.0755	.0292	.1762
92	53.01	Water Transport	.0103	.0552	-.0590	-.0676	.0138	.0552
93	54.01	Air Transport	.0064	.0224	-.0523	-.0577	.0095	.0224
94	55.01	Communication	.0086	.0290	-.0731	-.0842	.0146	.0290

TABLE 3 : PROJECTIONS OF THE EFFECTS OF A ½ PER CENT ACROSS-THE-BOARD TARIFF CUT ON 109 INDUSTRIES' OUTPUT, PRICES, AND EMPLOYMENT, OBTAINED USING THE ORANI MODEL IN DIFFERENT MODES

Industry			Output Projections (per cent)		Price Projections (per cent)		Employment Projections (per cent)	
ORANI No.	ABSIO Code	Description	Neo-classical mode	Neo-Keynesian mode	Neo-classical mode	Neo-Keynesian mode	Neo-classical mode	Neo-Keynesian mode
1	01.01	Sheep	.0361	.0640	-.0117	-.0179	.0797	.1082
2	01.02	Cereal Grains	.0392	.1637	.0213	.0046	.1079	.2239
3	01.03	Meat Cattle	.0824	.1790	-.0001	-.0202	.1342	.2195
4	01.04	Milk Cattle and Pigs	.0283	.0633	.0169	.0078	.0922	.1251
5	01.05	Poultry	.0264	.0574	-.0410	-.0585	.0292	.0574
6	01.06	Other Farming	.0278	.0816	-.0079	-.0088	.0797	.1394
7	02.00	Services to Agriculture	.0380	.0896	-.0455	-.0705	.0504	.0896
8	03.00	Forestry and Logging	.0070	.0889	-.0694	-.0789	.0119	.0889
9	04.00	Fishing and Hunting	.0788	.7728	.0043	-.0739	.1499	.7728
10	11.01	Iron	.0085	1.0151	.0117	-.0731	.0670	1.0151
11	11.02	Other Metallic Minerals	.0571	.8759	.0045	-.0756	.1181	.8759
12	12.00	Coal and Crude Oil	.0972	.4687	.0162	-.0735	.1643	.4687
13	14.00	Non-Metallic nec	.0073	.0477	-.0563	-.0726	.0172	.0477
14	16.00	Services to Mining	.0435	.4359	-.0588	-.0832	.0610	.4359
15	21.01	Meat Products	.0841	.1821	-.0151	-.0337	.1063	.1821
16	21.02	Milk Products	-.0014	.0003	-.0220	-.0298	-.0022	.0003
17	21.03	Fruit and Veg Products	-.0071	-.0052	-.0519	-.0583	-.0089	-.0052
18	21.04	Marg, Oils and Fats	-.0154	.0059	-.0532	-.0582	-.0208	.0059
19	21.05	Flour and Cereal Products	.0049	.0203	-.0344	-.0459	.0071	.0203
20	21.06	Bread, Cakes, Biscuits	-.0004	.0004	-.0575	-.0647	-.0005	.0004
21	21.07	Confectionery Products	-.0357	-.0356	-.0746	-.0744	-.0463	-.0356
22	21.08	Food Products nec	.1153	.2989	-.0172	-.0463	.1698	.2989
23	21.09	Soft Drinks, Cordials Etc	-.0022	.0008	-.0641	-.0724	-.0032	.0008
24	21.10	Beer and Malt	-.0084	-.0077	-.0663	-.0661	-.0185	-.0077
25	21.11	Alcoholic Drinks nec	-.0693	-.0823	-.0932	-.0548	-.1377	-.0823
26	22.01	Tobacco Products	-.0154	-.0138	-.1014	-.1024	-.0209	-.0138
27	23.01	Prepared Fibres	.0206	.0288	-.0288	-.0357	.0258	.0288
28	23.02	Man-Made Fibres, Yarns Etc	-.1112	-.1465	-.1233	-.0809	-.1615	-.1465
29	23.03	Cotton, Silk, Flax Yarns Etc	-.1420	-.1643	-.1063	-.0774	-.1777	-.1643
30	23.04	Wool and Worsted Yarns Etc	-.0278	-.0278	-.0617	-.0617	-.0325	-.0278
31	23.05	Textile Finishing	-.0298	-.0281	-.1317	-.1259	-.0357	-.0281
32	23.06	Textile Floor Covering	-.0240	-.0275	-.1005	-.0931	-.0297	-.0275
33	23.07	Textile Products nec	-.0361	-.0076	-.1099	-.0986	-.0495	-.0076
34	24.01	Knitting Mills	-.0271	-.0276	-.1060	-.0958	-.0329	-.0276
35	24.02	Clothing	-.0323	-.0306	-.1058	-.1017	-.0353	-.0306
36	24.03	Footwear	-.1089	-.1102	-.0873	-.0816	-.1181	-.1102
37	25.01	Sawmill Products	-.0102	.0037	-.0700	-.0733	-.0132	.0037
38	25.02	Plywood, Veneers and Boards	-.0412	-.0368	-.0757	-.0766	-.0466	-.0368
39	25.03	Joinery and Wood Products	-.0094	-.0040	-.0772	-.0799	-.0120	-.0040
40	25.04	Furniture, Mattresses, Brooms	-.0132	-.0160	-.0797	-.0827	-.0159	-.0160
41	26.01	Pulp, Paper and Paperboard	-.0227	.0052	-.0723	-.0746	-.0290	.0052
42	26.02	Fibreboard, Paper Containers	-.0096	.0213	-.0830	-.0825	-.0140	.0213
43	26.03	Paper Products nec	-.0151	.0019	-.0802	-.0767	-.0260	.0019
44	26.04	Newspapers, Books	.0035	.0274	-.0730	-.0777	.0046	.0274
45	26.05	Commercial Printing	-.0131	.0131	-.0772	-.0783	-.0161	.0131
46	27.01	Chemical Fertilizers	.0299	.1042	-.0336	-.0489	.0551	.1042
47	27.02	Industrial Chemicals nec	-.0539	-.0290	-.1018	-.0704	-.0965	-.0290

schedules for individual industries. In the face of the same initial shift in domestic prices relative to world prices the neo-Keynesian mode will produce a larger movement in real GDP and a smaller movement in prices than will the neo-classical mode.

Neither mode can capture all of the short run behaviour which we believe to be relevant to determining output, price and employment responses. On the price side, both capture the effect of changes in the costs of materials inputs, but the neo-classical mode contains a demand effect dependent on capital intensity. For output responses, neither mode models buffering, so all sales lead to production. The neo-classical mode restricts output movements by fixing the supply of capital available, whereas in the neo-Keynesian mode greater output can be produced at constant unit costs simply by using previously idle capacity. In both modes of use, it is assumed that labour is in infinitely elastic supply at the going real wage rates. Neither mode captures, on the employment side, labour hoarding or overtime, but we believe that the neo-Keynesian responses, compared to output, are more realistic in terms of conforming to observed short run movements.

4. INTERPRETATION OF STANDARD ORANI INVESTMENT EQUATIONS FOR OPERATION IN NEO-KEYNESIAN MODE

The standard version of ORANI contains a mechanism which allocates a given investment budget across those industries where investment is determined by economic criteria[1]. When ORANI is run in neo-classical mode movements in the relative rental prices of capital in different industries are the major determinants of the investment allocation. Thus expanding industries increase their share of total investment relative to contracting industries. In neo-Keynesian mode rental prices of capital are determined by factors other than demand for the industries' product. Consequently the rental price of capital no longer serves as a useful allocating device. Appendix 2 sets out a neo-Keynesian version of ORANI which includes investment equations which restore the role of the rental price of capital in investment allocation. In this section, however, we concentrate on the interpretation of the investment allocation mechanism when the standard version of ORANI 77 is used in neo-Keynesian mode. In the interests of clarity, it is convenient to commence with a recapitulation of the standard ORANI investment theory[2].

4.1 Standard ORANI Investment Theory

The marginal efficiency of capital (MEC) schedule currently expected by industry j to apply to investments coming on stream next period is given by:

$$MEC_j = \left[\frac{K_j(1)}{K_j(0)}\right]^{-\beta_j} ,$$

where R_j is the existing rate of return (in the current general equilibrium solution), defined by:

1 ORANI explains investment for a set of industries, J. For industries where $j \notin J$ investment expenditure is set exogenously. The choice of these industries is made by the user but usually includes those industries (such as Health) where investment levels are set on other than economic criteria.

2 A complete explanation of the standard ORANI treatment of investment is given in Dixon, Parmenter, Ryland and Sutton (8), Chapter 2, Section 10.

TABLE 2 : PROJECTED MACRO EFFECTS OF A 1 PER CENT ACROSS-THE-BOARD TARIFF CUT OBTAINED USING THE ORANI MODEL IN DIFFERENT MODES*

Variable projected	Mode of use of ORANI	
	Neo-classical short run	Neo-Keynesian short run
Aggregate employment	.0061	.0451
Employment by occupation:		
Professional white collar	.0037	.0367
Skilled white collar	.0000	.0289
Semi unskilled white collar	.0021	.0290
Skilled blue collar (metal and electrical)	-.0074	.0417
Skilled blue collar (building)	-.0043	.0106
Skilled blue collar (other)	.0044	.0270
Semi and unskilled blue collar	-.0030	.0530
Rural workers	.0773	.1385
Armed services	.0000	.0000
Aggregate exports (foreign currency value)	.0966	.4378
Aggregate imports (foreign current value)	.0749	.1065
Balance of trade	.0005	.0119
Index of consumer prices	-.0672	-.0711
Capital goods price index	-.0899	-.0946

* All units are percentage changes with the exception of the balance of trade which has the units 'billions of 1968-69 Australian dollars'.

and so fails to pass on the cost reduction fully. With the price of capital services determined independently of industry output in the neo-Keynesian mode, the full extent of the cost reduction feeds through the model.

When a change in the domestic cost structure affects the international competitiveness of industries in the traded goods sector, this affects the level of their demand for inputs and these quantity effects flow through the economy via the inter-industry relationships. In the neo-classical mode the quantity movements do not have to be as large as in the neo-Keynesian mode because a larger part of the adjustment is carried by prices in the former case.

Before considering the projections for individual industries, the results for the macro variables, as set out in Table 2, are discussed briefly.

The macro results illustrate some points of difference between the neo-classical and neo-Keynesian modes. In both simulations real domestic absorption and the exchange rate are exogenous and fixed, so variations in gross domestic product only arise through movements in the balance of trade. The 1 per cent reduction in all ad valorem tariff rates creates a net expansion of demand for the output of Australian industries in both simulations: that is the balance of trade improves and the level of gross domestic product rises.

In the neo-Keynesian mode industries respond to an increase in potential sales almost purely in terms of output quantity whereas in the neo-classical mode industries respond with a mixture of price and output increases. This is reflected in these results as the neo-Keynesian simulation produces a much larger improvement in the balance of payments, while the neo-classical simulation produces the higher price levels. The increase in both imports and exports is higher in the neo-Keynesian case reflecting the greater output movements by industries.

The industry responses for output, employment and price are set out in Table 3. The industry results are very sensitive to which set of assumptions, neo-classical or neo-Keynesian, are adopted. Industry 10 (Iron) and industry 35 (Clothing) are used to illustrate the points of contrast discussed in Section 2.

$$R_j = \frac{P_{(g+2)2j}}{\Pi_j} - \delta_j \quad ;$$

and where

$K_j(1)$ is capital stock planned for next period;

$K_j(0)$ is current capital stock;

$P_{(g+2)2j}$ is the current rental on a unit of real capital per time period;

Π_j is the current price of a unit of capital; and

δ_j is the rate of capital depreciation (assumed constant overtime).

It is assumed that the available economy-wide investment budget is allocated so as to equate the ex ante marginal efficiencies of capital in each of the endogenously investing industries. That is

$$\left(\frac{K_j(1)}{K_j(0)}\right)^{-\beta_j} R_j = \Lambda, \text{for all } j \in J, \qquad (10.5)$$

where Λ is an economy wide rate of return. An industry would not intentionally be in a situation where it planned that

$$MEC_j < \Lambda \quad ,$$

but this could occur if prospective depreciation failed to reduce next period's capital stock by an amount sufficient to equate its MEC with the prospective economy wide rate of return. Both in the standard ORANI theory and in the analysis below, however, this possibility is ignored. In linearised form equation (10.5) becomes:

$$-\beta_j \left[k_j(1) - k_j(0)\right] + Q_j \left[p_{(g+2)2j} - \pi_j\right] = \lambda, \text{ for } j \in J \quad , \qquad (10.8)$$

where the lower case letters indicate percentage changes in the variables and:

$Q_j = \frac{R_j + \delta_j}{R_j}$ is the ratio of gross rate of return to net rate of return.

Two further equations are required to apply the budget constraint imposed by the exogenous aggregate investment. In linearised form they are:

$$k_j(1) = k_j(0)\left(1-g_j\right) + y_j\, g_j \quad , \text{ for all } j, \tag{10.9}$$

$$\sum_{j\epsilon J}\left(\pi_j+y_j\right) Z_j = \left(\sum_{j\epsilon J} Z_j\right) i \quad , \text{ for all } j, \tag{10.10}$$

where

g_j is the ratio of annual gross investment to capital stocks in industry j;

y_j is the investment demand for industry j;

Z_j is the base period share of industry j in the total investment budget; and

i is the aggregate nominal investment.

Equation (10.9) reflects the fact that capital stock in the next period is equal to capital in this period less depreciation plus investment, while (10.10) ensures that the total of investment by each of the industries sums to the available investment budget.

will be subject to a number of influences. Firstly, industries whose exposure to import competition is limited by the tariff will suffer increased import competition as the level of the tariff is reduced. Secondly, to the extent that the import competitors adjust their outputs in response to increased import competition, these output adjustments will cause changes in demands for the output of industries which sell to industries directly affected by the tariff reductions. Thirdly, the reduction in import prices will reduce the domestic cost structure, increasing the competitiveness of exports, and leading to a reallocation of consumption budgets in response to relative price changes and providing some offset to the increased import competition. Further secondary input-output effects will follow. The combination of these effects makes it impossible to generalise about the comparative movements in industry outputs in the alternative simulations.

If the direct import effect, that is, the initial effect on one industry of the reduction in its tariff alone were considered in isolation, then all import competing industries would have greater output reductions in the neo-Keynesian simulations, for the following reason. The effect of a reduction in the tariff is to shift demand from domestically produced to imported goods. Output is reduced, reducing the demand for capital services. In the neo-classical mode, the reduction in demand for capital lowers capital's rental price, which is reflected in lower industry selling prices. That is, the industry lowers its selling price, offsetting to some extent the tariff reduction. No such demand induced price reduction occurs in the neo-Keynesian mode: industries must adjust their output fully, to the full relative price movement generated by the tariff cut.

The inter-industry effect operates through both prices and quantities. Both modes of use of ORANI allow the initial price reduction, due to the reduction in the price of imported goods on the Australian market, to permeate the economy. Reductions in industries' input costs are reflected in lower output prices and in the consequent reduction in consumer prices. The latter lowers primary input costs via indexation: of wages in the neo-classical case, and of wages and capital charges in the neo-Keynesian case. However, the two modes of ORANI differ in the extent to which the initial price reduction is transmitted to the rest of the economy. In the neo-classical mode, an industry receiving a cost reduction and consequently a potential expansion in its sales, increases the rental price of capital

5. COMPARISON OF NEO-CLASSICAL AND NEO-KEYNESIAN SIMULATIONS

In this section we compare results of simulations carried out with ORANI in neo-classical and neo-Keynesian modes. The simulations are intended to illustrate the theoretical aspects raised earlier in the paper. It is worth emphasising that, as with any model, results produced by ORANI will always be subject to qualification. All models abstract from the real world, so some factors and mechanisms which have effects on the workings of the economy will be omitted from the equation specification. This could be either because the excluded phenomena may not be amenable to sensible mathematical representation, or simply because of the need to simplify in order to constrain the size and complexity of the model to manageable proportions. Simulation results should then be seen, not as answers, but merely as a convenient starting point for analysis - users should specify the model in a way expected to provide the most realistic, and therefore most useful, starting point.

In the earlier discussion, the neo-Keynesian mode of use of ORANI was defined by a partitioning of the variables in which the prices of capital services purchased by different industries were set exogenously. No particular choice of values for the rental prices of capital services was suggested in that discussion. In these simulations we have fully indexed the rental price of capital, for all industries, to the consumer price index[1]. Since wages also have been fully indexed, the relative price of these two primary factors is therefore fixed in these simulations, and no substitution between them occurs. The choice of technique, in terms of combinations of capital and labour services producing a given output, is given. With this specification, mark up pricing is approximated[2].

We present results for a 1 per cent reduction in the ad valorem tariffs for all industries with the intention of comparing the differences between the results generated using the alternative modes[3]. Each industry

1 The method of achieving this indexation is described in Appendix 3.
2 A more accurate reflection of mark-up pricing would have each industry's rental price of capital indexed to that industry's production costs excluding capital, with the elasticity of substitution between capital and labour set to zero.
3 The results of a 1 per cent increase in all ad valorem tariffs are reported by Dixon, Ryland, Parmenter and Sutton (8), Chapter 4. As the ORANI system is linear, these results (except for small changes due to revisions in the data base) are identical to those obtained here for the neo-classical mode apart from a change of sign. The explanation of the relative performances of industries given in Chapter 4 can be readily adapted to explain the industry performances in the neo-Keynesian version.

4.2 Comparison Of The Operation Of Standard ORANI Investment Equations In Both Neo-Classical And Neo-Keynesian Modes

In the neo-classical mode of ORANI $k_j(0)$ is set to zero and in both modes the values of λ and π_j are set largely outside the industry. Therefore, to a good first approximation (10.8) and (10.9) can be writtin as:

$$- \beta_j \, k_j(1) + Q_j \left(p_{(g+2)2j} - \bar{\pi} \right) = \bar{\lambda} \quad , \tag{1}$$

$$k_j(1) = y_j \, g_j \quad , \tag{2}$$

where the bar indicates exogeneity with respect to the actions taken by any one industry.

Combining (1) and (2):

$$y_j = - \frac{\bar{\lambda}}{\beta_j g_j} + \frac{Q_j}{\beta_j g_j} \left(p_{(g+2)2j} - \bar{\pi}_j \right) \quad . \tag{3}$$

From (3),

$$\frac{\delta y_j}{\delta p_{(g+2)2j}} = \frac{Q_j}{\beta_j g_j} > 0 \quad .$$

Consequently, since the rental price of capital is a positive function of output, in neo-classical mode industries whose outputs are expanding will tend to expand their investment relative to industries whose ouputs are contracting.

In the neo-Keynesian mode $p_{(g+2)2j}$ is fixed and $k_j(0)$ is endogenous, so (10.8) and (10.9) can be written as:

$$- \beta_j \left(k_j(1) - k_j(0) \right) + Q_j \left(\bar{p}_{(g+2)2j} - \bar{\Pi}_j \right) = \bar{\lambda} \quad . \tag{4}$$

$$k_j(1) = \left(1 - g_j \right) k_j(0) + y_j \, g_j \quad . \tag{5}$$

Substituting for $k_j(1)$ in (4) gives:

$$y_j = k_j(0) - \frac{\bar{\lambda}}{\beta_j g_j} + \frac{Q_j}{\beta_j g_j} \left(\bar{p}_{(g+2)2j} - \bar{\Pi}_j \right) \quad . \tag{6}$$

From (6):

$$\frac{\delta y_j}{\delta k_j(0)} = 1$$

With $k_j(0)$ a positive function of output, industries expanding output will again increase their share of the investment budget at the expense of contracting industries. The results are qualitatively similar regardless of the treatment of the base period capital stock.

However there are naturally some quantitative differences and these are largely determined by the nature of the capital matrix in the ORANI database. If an industry, i, sells a significiant proportion of its output as capital goods to any industry, j, obviously the demand for industry's i output will be sensitive to the allocation of investment funds to industry j. In the data base for the standard 109 industry classification used by ORANI only 21 industries sell more than 10 per cent of their output to investment. Nine of these industries sell capital goods mainly to industries whose investment demands are determined exogenously so the output of these industries will not be sensitive to changes in the allocation of investment funds. The following six industries:

39 Joinery and Wood Products,
40 Furniture and Mattresses,
74 Construction Equipment,
75 Other Machinery,
85 Building and Construction, nec.,

and

94 Communication,

sell their capital goods output to a wide cross-section of industry and so demand for their output is unlikely to be sensitive to the allocation of investment across industries. A further five investment goods supplying industries, namely:

63 Sheet Metal Products,
65 Motor Vehicles and Parts,
66 Ship and Boat Building,
67 Locomotives,

and

70 Electrical Machinery,

sell their capital goods output to such areas as trade, communications and transport. These areas sell their output to a very wide cross-section of the economy. Therefore in any simulation the movements in their output, and their investment demands, tend to be similar to the economy wide mean. That is the output of industries 63, 65-67 and 70 is not likely to be sensitive to the distribution of investment demand. However, the remaining supplier of capital goods, industry 73 (Agricultural Machinery) sells 62 per cent of its output to investment and its main source of demand is the agricultural sector. Hence industry 73 will be sensitive to changes in the allocation of investment to agricultural industries. Whether the allocation of investment funds to agricultural industries differs markedly between the two short run modes of ORANI will depend on the exact type of simulation being carried out.

The above considerations imply that the effects on industry outputs of demands for investment goods are not likely to be significantly different for the two short run modes of ORANI. This is basically due to two factors. Firstly, the allocation of investment demands in the two modes will tend to be similar in terms of the relative positions of industries. Secondly, the pattern of demand for capital goods is such that the investment demands for particular industries rarely have a significant effect on the demand for a particular industry's output.