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THE MACROECONOMIC EFFECTS OF ALTERNATIVE EMPLOYMENT-GENERATING POLICIES

by

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ABSTRACT

During the 1980's, Australia has achieved one of the highest rates of employment growth amongst the major industrialized nations. Over the period 1980-87, employment in Australia grew by 13 per cent. Although this growth in jobs was not sufficient to contain the rise in the unemployment rate, which went up over this period from 6.0 per cent in 1980 to 8.1 per cent in 1987, nevertheless it has been a remarkable achievement. In this paper, we examine the effectiveness of two government policies that stimulated employment growth during this period: public demand expansion and wage moderation. For comparison, we also examine the effectiveness of private demand expansion. The analysis depends on simulations using an extended version of the ORANI model, taken in conjunction with an updated version of the 1981-82 Income and Housing Survey database.

CONTENTS

LIST OF TABLES

LIST OF FIGURES

Meagher, G.A. and B.R. Parmenter (1985), "Some Short-Run Effects of Shifts from Direct to Indirect Taxation", IAESR Working Paper No. 10/1985, University of Melbourne.

Meagher, G.A. and B.R. Parmenter (1987), "The Short-Run Macroeconomic Effects of Tax-Mix Changes: Option C Reconsidered", IAESR Working Paper No. 1/1987, University of Melbourne.

Pearson, K.R. (1986), "Automating the Computation of Solutions of Large Economic Models", IMPACT Project Preliminary Working Paper No. IP-27, March.

Powell, A.A. and A. Lawson (1986), "A Decade of Applied General Equilibrium Modelling for Policy Work", IMPACT Project General Paper No. G-69, (revised), November.

Robinson, S. (1986), "Multisectoral Models of Developing Countries: A Survey", Working Paper No. 401, Division of Agriculture and Natural Resources, University of California.

Russell, B. and W.J. Tease (1988), "Employment, Output and Real Wages", Research Discussion Paper No. 8806, Research Department, Reserve Bank of Australia.

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I INTRODUCTION

During the 1980's, Australia has achieved one of the highest rates of employment growth amongst the major industrialized nations. This is revealed in Table 1, which contains employment and unemployment statistics for 14 OECD countries for the period 1980-87. It shows that in 1980, half of these 14 countries, including Australia, had unemployment rates that were higher than 5 per cent. If we limit ourselves to a comparison of the employment performance of these seven countries (since the low base unemployment rates of the others makes it 'harder' for them to get a fast growth rate in employment), we find that Australia has performed relatively well. Employment in Australia grew by 13 per cent over 1980 to 1987, with all of this growth occurring in the last 4 years of this period. Although this growth in jobs has been outpaced by the growth in the labour force, so that the unemployment rate has still risen from 6.0 per cent in 1980 to 8.1 per cent in

* I am grateful to Alan Powell for helpful comments on an earlier draft of this paper.

TABLE 1

Employment and Unemployment in 14 OECD Countries, 1980-87

	Country	Unemployment Rate in		Employment in							
		1980	1987	1980 (Base Year)	1981	1982	1983	1984	1985	1986	1987
1	Australia	6.0	8.1	100	102	102	100	103	107	111	113
2	Canada	7.5	8.8	100	103	99	100	103	106	109	112
3	United States	7.0	6.1	100	101	100	101	106	108	110	113
4	Japan	2.0	2.8	100	101	102	104	104	105	106	107
5	New Zealand	4.0	9.8	100	100	100	98	100	103	102	100
6	Finland	4.6	5.0	100	101	102	103	104	105	104	104
7	France	6.3	10.8	100	98	96	100	99	99	99	na
8	West Germany	3.0	6.5	100	99	98	96	96	97	98	99
9	Italy	7.4	12.0	100	99	99	99	100	100	101	101
10	Norway	1.7	2.1	100	101	102	102	103	105	109	111
11	Spain	11.2	20.1	100	97	96	97	94	93	95	100
12	Sweden	2.0	1.9	100	100	100	100	101	100	101	103
13	Switzerland	0.2	na	100	101	98	97	97	97	98	na
14	United Kingdom	6.9	10.3	100	96	94	93	95	97	97	99
	Total	--	--	100	100	99	100	102	103	105	na

Source: Compiled from OECD's Main Economic Indicators.

REFERENCES

Agrawal, N. and G.A. Meagher (1988), "Tariff Reform and the Distribution of Employment", IAESR Working Paper 6/1988 , University of Melbourne.

Blampied, C.W. (1985), "A Listing of the 1977-78 Balanced ORANI Data Base with the Typical-Year Agricultural Sector Implemented", IMPACT Project Research Memorandum No. OA-262, 401 pp.

Bureau of Labour Market Research (1987), "Structural Change and the Labour Market", Research Report No. 11, AGPS.

Cooper, R.J., K.R. McLaren and A.A. Powell (1985), "Short-Run Macroeconomic Closure in Applied General Equilibrium Modelling: Experience from ORANI and Agenda for Further Research", Piggot, J. and J. Whalley (eds.), New Developments in Applied General Equilibrium Analysis, Cambridge University Press, Cambridge.

Dee, P. (1987), "The Theoretical Structure of Fiscal ORANI", Research Memorandum No. OA-371, Industries Assistance Commission, Canberra.

Dervis, K., J. de Melo and S. Robinson (1982), General Equilibrium Models for Development Policy, Cambridge University Press.

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.

Dixon, P.B., A.A. Powell and B.R. Parmenter (1979), Structural Adaptation in an Ailing Macroeconomy, Melbourne University Press, Melbourne.

Duff, I.S. (1977), "MA28 - A Set of FORTRAN Subroutines for Sparse Unsymmetric Systems of Linear Equations", Report R. 8730, AERE Harwell, HMSO, London.

11. The equations of the ORANI model are solved using the GEMPACK General purpose software system for CGE models (Pearson, 1986). The process of solving the linear equations used the Harwell sparse matrix code (Duff, 1977).

12. For the assignment of each of the 112 industries in ORANI to one of these trade classifications, see Table 45.4 of Dixon et al. (1982).

1987, nevertheless it has been a remarkable achievement. Of the seven countries with high initial unemployment rates, only the U.S. has matched this strong growth in employment achieved by Australia.

Several policies have been responsible for the Australian government's success in generating employment. One of the traditional tools that it has relied on is an expansionary fiscal policy. This is reflected in the high and sustained levels of deficits incurred by the Commonwealth Government, and by the public sector as a whole, during this period. The net public sector borrowing requirement (PSBR) was higher than 3 per cent of GDP in every year from 1980-81 to 1986-87, and ranged from 3.1 per cent of GDP in 1980-81 to a peak of 6.7 per cent in 1983-84.[1] The shares of the Commonwealth and State Governments in the net PSBR have fluctuated over this period. In the first two years, the State Governments jointly accounted for the larger share, whereas in all remaining years except the last year, the Commonwealth Government has been the dominant borrower. In the last year, i.e., in 1986-87, the Commonwealth Government accounted for just under 40 per cent of the net PSBR.

These high borrowing requirements of the Governments arose due to increased spending levels, rather than due to falling taxation revenues:

> "The basic reason for the sustained increase in public sector borrowing since the early 1970's has been the rapid growth in public sector outlays; taxation revenue has also increased significantly, but not sufficiently to finance fully the growth of public spending." (Budget Statements, 1986-87, p. 45)

Some of this increased spending took the form of increased transfer payments to the household sector. However, the net effect of the increased taxation revenues collected from the household sector and the increased transfer payments made to it, was that household disposable incomes as a proportion of gross household incomes in fact fell from 82.1 per cent to 79.1 per cent between 1980-81 and 1986-87.[2] Since real pre-tax per-capita incomes were falling as well during this period, this had a strong contractionary effect on real household spending. Compared with a real GDP growth of 19.1 per cent between 1980-81 and 1986-87, real private consumption expenditures grew by only 15.0 per cent. In contrast, real current government expenditures over this period grew by 22.7 per cent.[3] The relative share of the public sector in aggregate investment grew even more dramatically than its share in aggregate consumption during this interval; while real private expenditures on gross fixed capital formation grew by only 5.4 per cent over this entire six year period, their public counterparts grew by 20.8 per cent. Thus the evidence indicates that expansionary fiscal policy during this period stimulated public rather than private demand.

ENDNOTES

1. See Table 7 of Budget Statement No. 7, 1987-88, Budget Paper No. 1, AGPS.

2. See Table 45, Australian National Accounts: National Income and Expenditure, March Quarter, 1988. ABS Catalogue No. 5206.0.

3. All expenditure data are obtained from Table 36 of Australian National Accounts: National Income and Expenditure, March Quarter, 1988. ABS Catalogue No. 5206.0.

4. See Economic Round-up, The Treasury, June 1988, AGPS.

5. Powell and Lawson (1986) provide a review of the many policy applications of ORANI.

6. This section draws on the description of CGE models by Dervis et al. (1982) and Robinson (1986), and on the description of ORANI by the Bureau of Labour Market Research (1987).

7. A record of the relevant ORANI database can be found in Blampied (1985), while the NAGA database used in our simulations is listed in Agrawal and Meagher (1988).

8. The duration of the ORANI short-run has been estimated to be about two years (Cooper, McLaren and Powell, 1985).

9. Note that there is a new, extended version of ORANI, referred to as Fiscal ORANI (see Dee, 1987), which does allow us to endogenize both private absorption and the balance of trade.

10. The analysis in this section draws upon Dixon et al. (1979).

lead to an increase in aggregate employment in ORANI. If private absorption is exogenously determined, as in Dixon et al. (1979), then the model predicts that a 1.0 per cent cut in the average real wage rate will cause a 0.5 per cent increase in aggregate employment. On the other hand, if private absorption is made endogenous and linked to private disposable incomes, as is done in this paper, then the relationship between the real wage rate and employment becomes twice as strong: according to ORANI-NAGA, a 1.0 per cut in the average real wage rate, under these assumptions, would cause a 1.0 per cent increase in aggregate employment.

Not only does the model predict that a real wage cut would lead to higher employment, but it also indicates that it would reduce inflation and thus improve the international competitiveness of the economy. By stimulating exports and reducing imports, it would lead to an improvement in the balance of trade and hence facilitate the repayment of Australia's international debt. Though public demand stimulation could be used instead of wage moderation to create additional jobs, the model indicates that such employment increases would necessarily involve some tradeoffs with other policy objectives, especially with the inflation rate and the trade account. Attempting to generate employment via income tax cuts, on the other hand, would demand unrealistically high sacrifices in terms of these other policy goals. Given the current state of its economy, Australia can ill afford to adopt such an approach.

The traditional demand management policy described above was supplemented by the government's so-called "Prices and Incomes" policy, which attacks the problem of unemployment from the supply side:

> "Prices and incomes policy will continue to augment the more traditional instruments of economic policy. By acting to restrain directly wage and price pressures in areas of market power, the policy aims to facilitate sustainable growth in economic activity and employment. The policy operates in conjunction with fiscal and monetary policies; it requires their support but can also bolster those policies in effecting economic adjustments in ways which moderate the ultimate impact on unemployment." (Budget Statements, 1986-87, p. 53)

This supply-side policy essentially consisted of negotiating for real wage reductions with the trade union movement. Between 1983-84 and 1986-87 these negotiations secured a fall in the real hourly wage rate of about 3.5 per cent.[4]

In this paper, we examine the relative effectiveness of public demand stimulation versus wage moderation in generating employment. For purposes of comparison, we also examine the employment effects of private demand stimulation. The analysis in this paper is based on simulations using an extended version of ORANI, a computable general equilibrium (CGE) model of the Australian economy. ORANI has been used earlier, by Dixon et al. (1979) to examine the employment effects of these policies. However, the results in this paper differ

substantially from those reported in the earlier study because of differences (described below in Section III) in the assumptions made about the economic environment of the simulations. Further, this paper is based on a more recent version of ORANI and uses 1977-78, rather than 1968-69, input-output data.

The three policies are also evaluated with respect to their effects on other policy goals, especially that of improving the international competitiveness of the Australian economy. In the current economic environment, with huge levels of foreign debts (amounting to over $100 billion or to about 30 per cent of GDP), one of the major goals of Australian policy makers is to generate balance of trade surpluses which can be used to pay, in the first instance, the interest owed on the debt, and eventually, the debt itself. Hence, to attain their various other objectives (such as reducing unemployment), they are increasingly constrained to rely on policies that have a relatively favourable effect on Australia's external trade accounts.

The paper assumes no prior knowledge either of the ORANI model, nor of CGE models in general. Section II explains what a CGE model is, and describes ORANI in terms of the various components of such a model. Section III lists the assumptions made about the economic environment in which the simulations are undertaken. Section IV describes the simulations. The results are analysed in Section V. Finally, Section VI concludes with a discussion of the policy implications of the study.

and an increase in tax revenues. Though there is a fall in the tax revenues collected from the previously employed persons, this is more than offset by the increased revenues collected from the newly employed persons and the profit-earners. Since real current government expenditures are held constant in this simulation, the higher tax revenues and the lower benefit payments result in a decline in the PSBR of 0.3 per cent of GDP.

VI CONCLUSION

A recent report (26 September 1988) in the *Australian Financial Review* on the results of a study by Russell and Tease (1988) of the relationship between employment and real wages, was headlined:

"Verdict: higher wages do cost jobs".

For those familiar with ORANI results, this news came as no surprise. For over a decade, simulations with the ORANI model have affirmed this inverse relationship between the real wage (as a cost) and employment. While the exact size of this relationship depends upon the particular assumptions made about the economic environment of each simulation, the qualitative nature of this relationship is firmly established in all ORANI simulation results: with given technology, decreases in the average real wage rate always

given world prices for their outputs, the fall in nominal wages leads to an improvement in the price/cost situation of exporters. This fall in labour costs is augmented by the fall in costs of material inputs. Together, these cost reductions lead to a rightward shift of the supply curve in Figure 3(c), which results in a 1.5 per cent increase in the output of the exporting sector.

The sectoral results indicate that though wage reductions stimulate all sectors of the economy, they have a relatively more favourable effect on the exporting sector. This is because in the MC and NT sectors (where demand curves have significant downward slope), some of the cost reductions are passed on to demanders in the form of price reductions rather than output expansions. In the exporting sector (where demand curves are relatively flat), on the other hand, the cost reductions mainly influence the quantities produced, rather than the prices that foreigners are willing to pay for the products. The expansion in exports causes export revenues to increase by 1.7 per cent in this simulation. The switching away from imports towards the relatively cheaper domestic substitutes causes a 0.1 per cent fall in import expenditures. Together these effects lead to the projected improvement in the balance of trade by 0.3 per cent of GDP.

Simulation III is also projected to cause a decline in the fiscal deficit. The increased economic activity under this simulation causes a fall in unemployment benefit payments

II THE MODEL

ORANI is a large CGE model of the Australian economy which has been applied by many users to a wide range of policy issues.[5] In recent appplications, it has often been augmented with a system of equations, referred to as NAGA, that has been designed to describe the national and government accounts. The purpose of this section is to provide the reader with a basic understanding of this ORANI-NAGA model.[6] For a complete description of ORANI, the reader is referred to Dixon et al. (1982), and for a description of NAGA, they should see Meagher and Parmenter (1985, 1987). [7]

The purpose of a CGE model is to explain how an economy responds to changes in its economic environment. In order to do this, a set of equations is used to describe the "circular flow" of goods and services that occurs in the economy as a result of the interaction of its various economic agents across its markets. Figure 1 contains a very simplified version of such economy-wide flows. The arrows in the figure indicate the real flow of goods and services in the system. In this simplified economy, if we exclude foreign trade, there are only two sets of actors: 'producers' who take in inputs and deliver products, and 'households' who taken in products and deliver factor services. There are also only two markets: factor markets and product markets. However, in the product market there are two sets of customers. Producers not only deliver final goods to households, but also intermediate goods for other producers. Foreign trade in this diagram is depicted

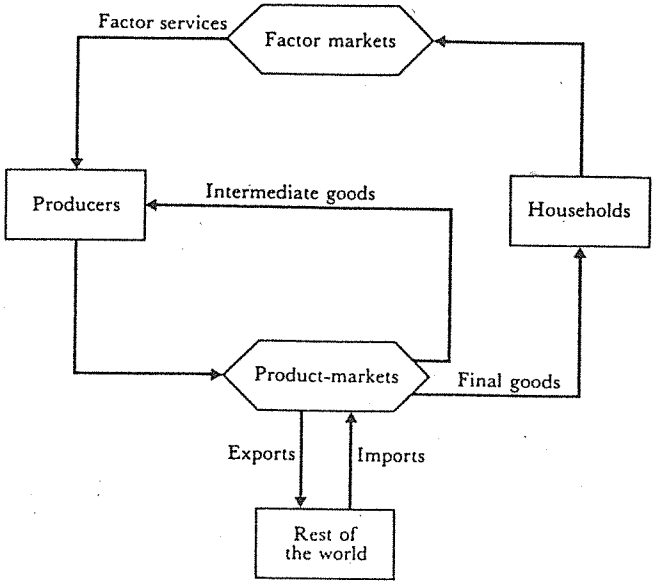

FIGURE 1 The Economy-Wide Circular Flow

Source: Dervis, de Melo and Robinson (1982).

(of 0.5 per cent) caused by the increase in real aggregate private disposable incomes (see Column 3, Table 3). This increase in demand comes from two sources. Firstly, there is an increase in the incomes and consumption expenditures of those who were previously unemployed and can now find a job at the lower real wage rates. Secondly, as profits rise, there is an increase in the consumption and investment demands of profit earners. Together, these increases in expenditures are enough to offset the decreases in the consumption expenditures of previously employed persons who experience income losses due to the wage cuts.

Table 3 reveals that in Simulation III, the output of the MC sector rises by more than in either of the other two simulations. This is because now, instead of offsetting each other, the shifts in the demand and supply curves reinforce each other. The fall in nominal wages and other production costs leads to a rightward shift in the supply curve in Figure 3(b), causing an increase in the output of the MC sector. On the demand side, both the income and the substitution effect work towards an increase in demand, causing a rightward shift of the demand curve in Figure 3(b). The combined effect is a relatively strong growth in the output of the MC sector. Note that Simulation III is the only simulation in which the size of the MC sector increases relative to the NT sector.

Simulation III is also the only simulation in which there is an increase in the output of the exporting sector. With

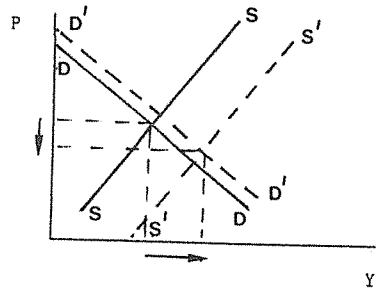

Figure 3(a) Non-traded Sector

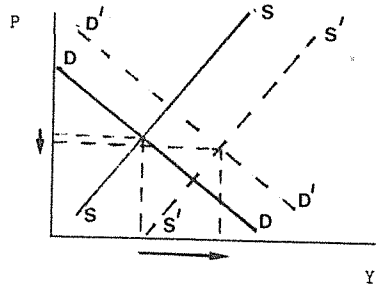

Figure 3(b) Import-competing Sector

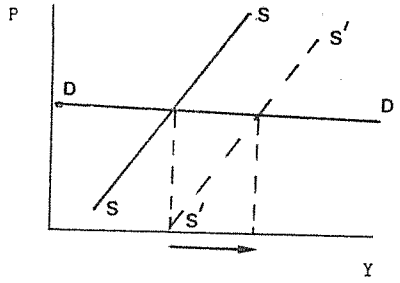

Figure 3(c) Exporting Sector

FIGURE 3 The Sectoral Effects of Wage Moderation

simply as a source of supply of, and demand for, goods in the product markets.

The ORANI-NAGA model essentially captures the economy-wide flows described in Figure 1, but at a substantially greater level of detail and disaggregation. Below, we describe ORANI-NAGA in terms of the various components of a CGE model identified by Robinson (1986).

Economic agents

The model contains 4 sets of agents or actors whose behavior is analysed:

(i) producers, who purchase intermediate and primary inputs and deliver products;

(ii) a representative household that purchases products and delivers factor services;

(iii) a government that levies taxes and uses the revenue to purchase products and to make transfer payments to the household sector; and

(iv) the 'rest of the world' which buys Australian exports and sells Australian imports.

Markets:

There are two sets of markets in ORANI:

(i) Product markets: There are domestic and/or foreign markets for each of the 114 domestically-produced commodities identified in ORANI. The demand for each

commodity consists of both intermediate and final demands. The product is demanded for intermediate use when it is used as a raw material in domestic production. Final demand is the sum of four components: (1) domestic consumer demand; (2) domestic demand for investment use; (3) domestic government demand ; and (4) export demand.

For each domestically-produced commodity in ORANI, there exists a distinct (but similar) foreign substitute that can be imported from abroad. Thus, the level of domestic demand for a commodity is influenced by the world price of its substitute. For some commodities, especially services, high transportation costs (amongst other characteristics of these products) make it prohibitively expensive to trade internationally in them. For such 'non-traded' commodities, domestic demand has to be supplied in domestic markets.

(ii) Factor markets: There are markets in the model for each of the three primary factors identified in ORANI: agricultural land, labour, and capital. In the labour market, labour of 10 different skill-types is traded. Note that in the model, any shortfall between domestic saving and investment can be financed by capital inflow from abroad. In contrast, land and all types of labour can only be traded in domestic markets. The factors are supplied by the households and generate household incomes. They are demanded by producers to undertake production activities.

V.3 The Effects of a Cut in Real Wages

A glance at Column 3 of Table 3 confirms that, according to ORANI-NAGA simulations, real wages are the key to increasing employment. A 1.0 per cent reduction in the average hourly real wage rate leads to a 1.0 per cent increase in employment, and causes the CPI to be about 1 per cent lower, two years later, than it would otherwise have been. It also improves the balance of trade (by 0.3 per cent of GDP), and reduces the PSBR (also by 0.3 per cent of GDP). Thus, of our three policy simulations, wage moderation is the only one that produces an outcome compatible with our twin goals of increasing employment and improving the international competitiveness of the economy.

To explain the macro results, we again employ the demand-supply diagrams to examine the underlying sectoral results. Figures 3(a), 3(b) and 3(c) depict the effects of wage restraint on the non-trading, the import-competing and the exporting sectors, respectively.

Reductions in the real wage rate lead to a fall in the costs of production and hence, to a rightward shift of the supply curve in the NT sector, as shown in Figure 3(a). The result is an increase in output and a fall in prices. This expansion in output is reinforced by the small increase in private demand

round effects due to the increased economic activity under this simulation partially offset the initial adverse effect on the PSBR for two reasons. Firstly, as economic activity rises, the tax base expands and government revenues increase . Secondly, the increase in economic activity leads to a decline in some components of government spending that are inversely related to it, such as unemployment benefit payments.

To sum up,our analysis indicates that public demand stimulation is more effective than private demand stimulation in creating employment. However, it also reveals that it would still require substantial increases in government spending to generate enough jobs to significantly lower our current unemployment rate. Quite apart from the feasibility of such a policy in today's political environment in which the trend is to reduce the size of the public sector relative to the private one rather than to enlarge it, and even apart from the foreign debt constraint facing policy makers, there is still the question of long-run resource allocation. "A policy based on engaging people in public employment, not in response to demands for public services but merely from the point of view of creating jobs, can be enormously wasteful of human effort" (Dixon et al. (1979)).

Behavioural assumptions

All producers in ORANI are assumed to be profit-maximizers. In other words, given the costs of various inputs, and given technological constraints, they always produce a given level of output in the least costly manner. The representative consumer is assumed to be a utility-maximizer. He/she receives income by selling factors of production and uses this income to buy his/her most preferred consumption bundle. No motivational rules are specified for the other agents in the model, i.e., for the government and for the rest of the world. The government simply levies taxes and undertakes expenditures on goods and services. The rest of the world is postulated to be large relative to Australia. Specifically, it is assumed that the prices of imported goods are independent of the quantities purchased by Australia, and that the terms on which Australia borrows overseas do not respond (in the short run) to the amount borrowed. Our major exports, on the other hand, are assumed to face (on the whole, slightly) downward sloping demand curves.

Sets of equations in ORANI describe how, given the behavioural assumptions, the various economic agents in the model respond to changes in prices, income and other influences. These responses are captured in terms of changes in the demands for, and the supplies of, the various factors and commodities in the model. In addition to positing

qualitative relationships, the model contains parameters which indicate the size of these relationships.

Institutional assumptions

An important assumption in ORANI is that Australian industries are highly competitive. It is assumed that each industry consists of many firms, each of which accounts for only a small share of the market. (An exception is the government sector, which consists of industries such as public administration and defence.) The consequence of this assumption is that each firm is too small to have a significant impact on the prevailing price for its output. Thus, in deciding how much to produce, firms take the prevailing price as given.

Technological assumptions

It is assumed that all firms in an industry produce the same type of output with the same technology. Production requires intermediate and primary inputs, which cannot be substituted for each other. Primary inputs consist of labour, capital and, in the case of agriculture, land. It is assumed that technology permits firms to apply labour at different levels of intensity to the given plant and equipment. This means that even in the short-run period considered here, labour, capital and land (where relevant) can be substituted for each other according to their relative costs. In addition, the technology also permits varying degrees of substitutability between the ten different skill-types of labour.

II than in Simulation I, the negative substitution effect, which causes demand to switch away from domestic goods towards imports, is smaller in Simulation II. However, because the government, as compared with the private sector, buys relatively more of the services produced by the NT sector and relatively less of the manufactured goods produced by the MC sector, the positive expansionary effect is also smaller in Simulation II. The combined result is that Simulation II has a relatively minor effect on the output and employment in the MC sector.

These differences between the sectoral results of Simulations I and II lead to some important differences in the macro outcomes under the two simulations. Because the export sector contracts by less under Simulation II, export revenues fall by less in this simulation. Further, because domestic prices rise by less, there is less of an incentive to substitute away from domestic goods towards imports, and as a result import expenditures rise by less. The net effect is that in Simulation II, the BOT deficit increases by only 0.6 per cent of GDP, as compared with an increase of 10.1 per cent of GDP in Simulation I.

Finally, a comment on the perhaps smaller than expected effect of the increase in government spending on the PSBR in Simulation II. The first round effect of a 4.5 per cent increase in government spending would of course be a significantly larger increase in the PSBR than that reported in Column 2 of Table 3. However, the second and subsequent

without leading to large increases in the costs of capital, and ultimately in the prices of commodities. In other words, the supply curve for the goods consumed by the government is relatively flatter than that for the goods consumed by the private sector. As a result, any given change in public demand has a larger effect on output (and hence, employment) and a smaller effect on prices than an equivalent change in private demand.

A comparison of Columns 1 and 2 in Table 3 reveals that there are some important differences in the sectoral effects of the two simulations. Firstly, we notice that in Simulation II, output in the ER sector falls by only 1.0 per cent as compared with the 21.4 per cent fall in output in Simulation I. This is because in Simulation II, the CPI increases by only 1.6 per cent as compared with the increase of 31.1 per cent in Simulation I. Therefore, to maintain real wages, nominal wages now need to rise by only 1.6 per cent instead of by 31.1 per cent. This in turn means that costs in the exporting sector rise by less, and output therefore contracts by less in Simulation II. Since there is a smaller contraction of the exporting sector output in Simulation II, the same expansion in aggregate economic activity as in Simulation I can now be achieved by a smaller expansion of output in the non-traded sector. Thus, in Simulation II, output in the non-traded sector increases by only 1.2 per cent, instead of the 6.1 per cent increase projected in Simulation I. Finally, we notice that in Simulation II, output in the MC sector rises by less than in Simulation I. Since domestic prices rise by less in Simulation

Equilibrium conditions

These are 'system' constraints that must be satisfied by the economy as a whole, but that are not taken into account explicitly by any agent in making his/her decisions. Robinson (1986) defines an equilibrium as a set of signals such that the resulting decisions of all agents jointly satisfy the system constraints. In the short-run, comparative-static version of ORANI employed for our analysis, the equilibrium state is defined by several conditions:

(i) There are no shortages or surpluses in the product markets, i.e., demand equals supply for every commodity;

(ii) for capital and land, which are assumed to be immobile across industries in the short-run, demand equals supply in each industry. This is ensured by movements in the rates of return to these factors in each industry; and

(iii) the employment of labour of each skill type is equal to the demand for it. Note that this does not imply that ORANI is necessarily a full-employment model. Full employment could be imposed by setting the supplies of labour of each skill-type exogenously at its full-employment level. Alternatively, wages might be set exogenously and the labour supplies would become endogenous. ORANI would then generate the employment levels corresponding to the given wage rates.

A major purpose of ORANI is to explain how the economy responds when components of the economic environment change. With the use of equations and a database, it captures the responses of the various economic agents to an economic 'shock', i.e., to some relatively permanent change in an

exogenous variable. Without the shock the economy would have moved to some new position. When the shock is introduced, it causes the new position taken by the economy about two years later to be different from what it would otherwise have been.[8] The reason that we wait two years to measure the response of the economy is that it takes about this long for very temporary (or "transient") influences of the shock to work themselves out. What is left after this period is what we term the short-run impact of the shock on the equilibrium two years later. Hence a simple interpretation of the policy-analytic versions of the ORANI model is that they compare the state of the economy on a control path with its state at the same future date given a change in the economic environment now.

This concludes our description of the theoretical structure of the ORANI model. Before the model can be applied to analyse the effects of an economic change, the user of the model needs to specify certain assumptions about the economic environment. These are discussed in the next section.

III THE ASSUMED ECONOMIC ENVIRONMENT

Certain features of the economy are not projected endogenously by ORANI. For these, the user of the model must specify an environment before computing a solution. In other words, there are more variables than equations in the model; therefore, the user must set values for some of the

V.2 The Effects of Government Demand Stimulation

In constrast to the results of private demand stimulation, the results of public demand stimulation presented in Column 2 of Table 3 show highly favourable trade-offs between employment creation, inflation and the balance of trade. In Column 2, we see that a 1.0 per cent increase in employment obtained through a 4.5 per cent increase in real current government spending leads to a relatively small increase in the CPI (1.6 per cent) and to a marginal deterioration in the balance of trade (0.6 per cent of GDP) . In addition, it leads to only a minor increase in the PSBR (0.7 per cent of GDP).

What causes the difference between Simulation I and II results? The answer lies in the differences in the product-mix consumed by the private and public sectors. The private sector buys goods that are relatively more capital-intensive, whereas the government buys a commodity bundle that contains extremely labour-intensive commodities such as public administration and defense. In Figure 2(a), we saw that even with fixed nominal wages, prices in the NT sector increased substantially due to private demand stimulation. In other words, even with no shifts in the supply curve, prices rose as we moved up along an existing supply curve. These price increases were caused partly by an increase in the costs of the fixed factor, capital, as it became scarce relative to the abundant factor, labour. Since the production of commodities consumed by the government is relatively less capital-intensive, increases in government demand can be supplied

that cost increases in the domestic economy, which lead to a switching away from domestic goods towards imports, are responsible for the 25.6 per cent increase in import expenditures. The combined effect is the considerable increase in the balance of trade deficit projected for Simulation I.

What aspects of the ORANI model are responsible for these rather pessimistic results? As explained by Dixon et al. (1979), the overall hypothesis about the behaviour of producers in ORANI is that they will respond to an aggregate demand increase with an increase in output and employment only if the demand increase allows an improvement in their price/cost situation. With full wage indexation, prices and costs tend to move together in the non-export industries. For a typical firm in these industries, there is therefore little incentive for expanding output. Moreover, in the export industries, which are unable to pass on the cost increases, output and employment contract as a result of demand expansion. With selling prices set on world markets, producers in these industries are caught in a cost/price squeeze because of the induced rise in money wages. As a result, according to ORANI, private demand expansion, by and large, leads to a reallocation of output and employment from the traded to the non-traded sectors, without leading to any significant rise in the aggregate level of activity in the economy.

variables exogenously so that the number of unknown variables equals the number of equations.

The key features of the economic environment in the simulations reported below are as follows:

(i) labour markets are slack, i.e., there are no shortages of labour at the going real wage rates. Thus, employment is demand-determined in every skill category;

(ii) industry-specific land and capital in use are exogenous;

(iii) real private absorption varies with real private disposable income;

(iv) the shares of real private consumption and real private investment in total real private absorption remain unchanged;

(v) real public investment varies with real private investment, i.e., the shares of the public and private sectors in aggregate investment remain unchanged;

(vi) the nominal exchange rate is exogenous;

(vii) all tax rates and the level of real current government spending are exogenous.

Assumption (i) is descriptive of the Australian labour market in its present state: with few exceptions, there are high rates of unemployment at the going real wage rates. Assumption (ii) means that the results are short-run and hence there is insufficient time for the quantity of land and fixed capital

available for use by each industry to respond to the changes in the economic environment. Assumptions (iii) to (v) indicate that aggregate real private absorption, as well as real private investment and real public investment, are all endogenously determined in all simulations. Assumption (vi) reflects our choice of the numeraire. In other words, all price changes are measured relative to the nominal exchange rate. This means that changes in the domestic price level measure changes in the real exchange rate and can be taken as an indicator of changes in the economy's international competitiveness. Finally, assumption (vii) states that all tax rates and the level of real current government spending are exogenous and can thus be 'shocked', if necessary, to simulate the effects of various fiscal policies.

It should be noted that assumptions (iii) to (v), which endogenize private absorption, have been made possible with the use of the NAGA add-on to the ORANI model. When using the standard version of ORANI in stand-alone mode, the user can either endogenize private absorption or the balance of trade, but not both.[9] In this paper, however, both private absorption and the balance of trade are endogenous. It is this difference in the assumptions about the economic environment of the simulations that accounts for the substantial differences between the results reported by Dixon et al. (1979), when they analysed the economic effects of the three policies examined by us, and the results obtained in this paper.

smaller increase in the demand for the output of the MC sector as compared with that of the NT sector.

Figure 2(c) presents the effect of the private demand expansion on the exporting sector. The demand curve in this sector is considerably flatter than those of the other two, reflecting our assumption that prices for Australia's export commodities are determined largely on world markets and not controlled by domestic producers. Since exporters use some of the commodities produced by the other two sectors as inputs in their production processes, the first round effect in the ER sector is that as the costs of material inputs increase, the supply curve shifts to the left. Since the demand curve is relatively flat, the effect of the cost increases is felt largely as a contraction in output, with only minor effects on the price level. The second round effect, which arises from the rise in nominal wages (by 31.1 per cent) further shifts the supply curve to the left, leading to an even greater contraction in output. The final outcome of the 13.9 per cent private demand increase is a sizeable (21.4 per cent) decrease in the output of the exporting sector. This leads to a 30.0 per cent reduction in employment in this sector.

The sectoral results discussed above help to explain the macro results for the external sector in Simulation I. They reveal that private demand expansion leads to an increase in output and employment in the non-traded sector at the expense of the exporting sector. This contraction of the ER sector is responsible for the 33.9 per cent fall in export receipts reported in Column 1 of Table 3. Further, we find

upon the 'labour market closure'. We have assumed that the real wages remain constant in this simulation. Hence, nominal wages must rise in line with the CPI (by 31.1 per cent) . This increase in costs shifts the supply curve to the left, thus partly offsetting the positive impact of the demand expansion on outputs, and reinforcing the effect on prices. The net effect of the 13.9 per cent increase in private demand on the output of the non-traded sector is a 6.1 per cent increase. This causes employment in this sector to rise by 8.6 per cent.

Figure 2(b) depicts the mechanisms underlying the effect of Simulation I on the import-competing sector. It reveals that, qualitatively at least, the effects of Simulation I on output and prices in the MC sector is the same as its effect in the NT sector. However, in contrast to the significant effect on the output of the NT sector, Table 3 indicates that the enormous expansion of private demand in Simulation I has virtually no effect on the output of the MC sector, which increases by a mere 0.7 per cent. This is because there is one crucial difference between the outputs of the MC and the NT sectors: there are close foreign substitutes available for the commodities produced in the MC sector. Hence, as prices of MC commodities rise due to cost increases, demanders of these products switch away from the domestic commodities towards the now cheaper foreign substitutes. This fall in demand due to the negative substitution effect largely offsets the rise in demand due to the positive income effect, so that the net effect is that private demand stimulation leads to a

IV THE SIMULATIONS

In this paper, we undertake three simulations. In the first two simulations, we examine the effects of increasing private and public demands, respectively. In the third simulation, we examine the effects of wage moderation policies.

Each of the three policy changes analysed in this paper is made operational through the government's control over some relevant policy instrument. In Simulation I, it is assumed that the government stimulates private demand by reducing income tax rates. In Simulation II, public demand is stimulated via an increase in the government's current expenditures on goods and services. Finally, in Simulation III, it is assumed that the government is able to negotiate the extent to which nominal wages are indexed to the CPI, and is therefore able to manipulate the average real wage rate .

For purposes of comparison, we calibrate our three simulations so that they each result in a one per cent increase in aggregate employment. Table 2 summarises the policy simulations. It reveals that, according to our model, the targeted 1.0 per cent increase in aggregate employment can be attained by any of the following:

1) a 71.0 per cent cut in the average income tax rate; or

(2) a 4.5 per cent increase in real current government expenditures; or

TABLE 2

The Three Policy Simulations

	Variable	SIMULATION* I Private Demand Stimulation	II Public Demand Stimulation	III Wage Moderation
	TARGET			
1	Aggregate employment	1.00	1.00	1.00
	POLICY			
	Changes in:			
1	Average income tax rate	-71.08	0.00	0.00
2	Real current government expenditure	0.00	4.50	0.00
3	Pre-tax real wage rate (CPI deflated)	0.00	0.00	-1.00

* Simulation results are expressed as percentage changes.

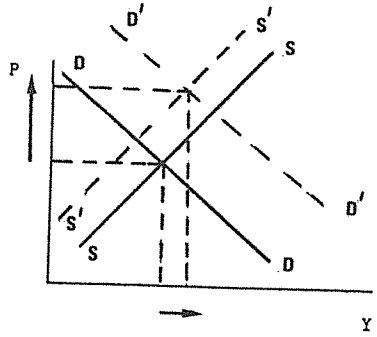

Figure 2(a) Non-traded Sector

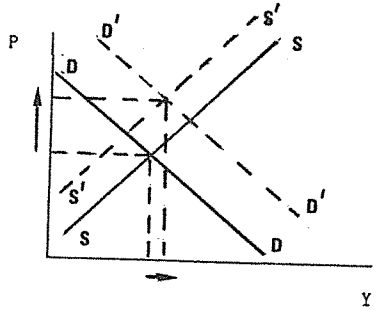

Figure 2(b) Import-competing Sector

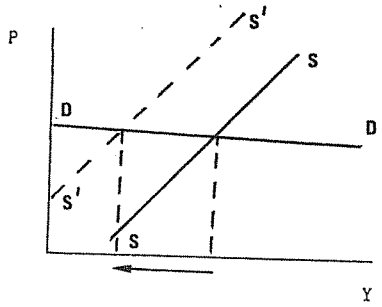

Figure 2(c) Exporting Sector

FIGURE 2 The Sectoral Effects of Demand Stimulation

export-related category (which we combine with the exporting) includes industries producing commodities which are not exported directly but which are sold largely to export industries. The import-competing industries are those which sell in markets where the level of import penetration is significant and where imports and domestic output are close substitutes. The final trade classification, non-trading, is applied to all the remaining industries, i.e., to those that do not belong to any of the previous groups. The important distinguishing feature of this last group is that their output performance is dominated by domestic conditions rather than international trade.

The mechanisms underlying the sectoral results presented in Column 1 of Table 3 are explained with the aid of demand and supply diagrams in Figure 2. The NT, MC, and ER sectors are depicted in Figures 2(a), 2(b) and 2(c), respectively. Dashed lines in the figures indicate the new positions of the curves after they have been shocked. Note that these diagrams are used only to provide an understanding of the mechanisms at work and are not drawn to scale.

Figure 2(a) examines the effects of the private demand increase on the output of the non-traded sector. The 'first round' or immediate effect of a rise in private absorption is that it shifts the demand curve for the output of the non-traded sector to the right and leads to an increase in prices and outputs in that sector. The second round effect depends upon the assumptions made regarding the labour market, i.e.,

(3) a 1.0 per cent cut in the average hourly real wage rate as a cost to employers.

The mechanism generating the employment increase in each simulation is discussed in the next section.

V RESULTS

Table 3 contains the projected effects of the three policy simulations on a number of variables.[10] Our results are typically presented in percentage change form. Thus the value 13.88 given for real private disposable income in the first column of Table 3 has the following interpretation: about two years after the 71 per cent cut in average income tax rates specified in Simulation I, real private disposable income would be about 14 per cent higher than it would have been in the absence of the tax cut. Note that since the model is solved[11] in a linearized form, the reader can easily calculate the effect of, say, halving a shock by halving all the projected values reported for that shock. Furthermore, if the reader is interested in projecting the total effects of all three policy shocks together on any given variable, he/she can do so by summing across the three columns of Table 3 for that variable.

V.1 The Effects of Private Demand Stimulation

Some of the difficulties of increasing aggregate employment by stimulating private demand are illustrated in Column 1 of Table 3. It reveals that to get a 1.0 per cent increase in employment, private demand would have to increase by almost 14 percent. In our simulation, the

TABLE 3

Projected Effects of Three Employment-Generating Policies

	Variable	SIMULATION* I: A 7½% Cut in the Average Income Tax Rate	II: A 4.5% rise in Real Current Government Expenditure	III: A 1% Cut in the Average Real Wage Rate
	MACRO EFFECTS			
1	Real private disposable income	13.88	0.53	0.48
2	Real private absorption	13.88	0.53	0.48
3	Real GDP	0.74	0.65	0.74
4	Consumer price index (CPI)	31.13	1.62	-1.01
5	Pre-tax nominal wage rate	31.13	1.62	-2.01
6	Export receipts	-33.94	-1.82	1.71
7	Import expenditures	25.57	1.56	-0.13
8	Balance of trade surplus	-10.06	-0.57	0.30
9	Public sector borrowing requirement (PSBR)	13.54	0.74	-0.34
	SECTORAL EFFECTS			
1	Non-traded sector			
	(a) Output	6.10	1.16	0.51
	(b) Employment	8.62	1.79	0.69
2	Import-competing sector			
	(a) Output	0.66	0.14	0.99
	(b) Employment	0.76	0.16	1.19
3	Exporting sector			
	(a) Output	-21.36	-0.98	1.45
	(b) Employment	-29.96	-1.34	2.06

* Simulation results are expressed as percentage changes for all variables except the balance of trade surplus and the PSBR, which are expressed as percentages of GDP.

percentage change in real private absorption (consumption plus investment) is equal to the percentage change in real private disposable incomes. Hence, to get a 14 per cent increase in private absorption, the government would have to first increase private incomes by 14 per cent. In Simulation I, this is attained by a cut in the average income tax rate (AYTR). In 1984-85 (the base year for NAGA), this rate was approximately 20 per cent. Hence, to get a 14 per cent increase in disposable incomes, the AYTR has to be reduced by about 70 per cent.

What are the implications of these massive tax cuts for the economy? Column 1 of Table 3 reveals that according to ORANI, private demand stimulation can be a very expensive method (in terms of other policy objectives) of creating additional employment. Under fixed real wages, a 1.0 per cent increase in employment is bought at the cost of a 31.1 per cent increase in the CPI, and an increase in the balance of trade deficit equal to 10.1 per cent of GDP. Further, because income taxes account for almost 50 per cent of government income in our 1984-85 database, the tax cut also causes an increase in the PSBR equal to 13.5 per cent of GDP.

To explain these macro results, we examine the underlying sectoral results. For ease of exposition, the 112 industries identified in ORANI have been aggregated into three sectors on the basis of their trade classification: exporting and export-related (ER), import-competing (MC), and non-trading (NT).[12] Export industries are those which sell a significant proportion of their output to foreigners. The