Impact Project

Impact Research Centre, The University of Melbourne,
153 Barry Street, Carlton, Victoria 3053 Australia.

Telephone: (03) 344 7417 (*from overseas:* 61 3 344 7417)
Telex: AA 35185 UNIMEL Telegrams: UNIMELB, Parkville
Facsimile: (03) 344 5104 (*from overseas:* 61 3 344 5104)

THE IMPACT OF A RANGE OF ECONOMIC POLICIES ON AUSTRALIA'S BALANCE OF TRADE

by

Peter J. Higgs
IMPACT Research Centre
University of Melbourne

and

Andy Stoeckel
Centre for International Economics

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Abstract

Australia faces a very serious trade problem. A large improvement in our balance of trade is required simply to stop our international debt from rising above levels which are already considered too high. In this paper a range of economic policies are examined. Each generate a $A1 billion improvement (in 1985-86 prices) in the balance of trade after about 2 years. The following economic shocks are examined: an increase in world agricultural prices; a cut in real wages; a reduction in protection for manufacturing industries; a change in the tax mix in favour of indirect taxation; and a contraction in real domestic absorption. The impacts of these shocks are derived from simulations with ORANI, a computable general equilibrium (hereafter CGE) model of the Australian economy. The effects of these shocks on the agricultural sector are studied in detail.

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THE IMPACT OF A RANGE OF ECONOMIC POLICIES ON AUSTRALIA'S BALANCE OF TRADE*

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1. INTRODUCTION

Australia has a major trade problem. At the end of June 1987, her net external debt was estimated to be around $80 billion, or roughly 30 per cent of GDP.[1] This puts her, along with many Third World economies, among the highest debtor nations in the world.[2] Worsening terms of trade, causing a series of large current account deficits over the 1980s, were mainly responsible for the high rate of net capital inflow and deteriorating external debt position. This in turn led to a large real devaluation of the Australian dollar. Because our debt is largely denominated in foreign currency, our external debt position has been exacerbated by this devaluation. With such a high debt, Australia is extremely vulnerable to further adverse external events, such as further declines in the terms of trade, or a global economic recession.

How bad is Australia's debt problem? Dixon and Parmenter (1987) and EPAC (1986) have estimated the trade turnaround required to stop our net debt to GDP ratio from deteriorating. These studies have been contrasted by the Australian Mining Industry Council (1987). The extent of the trade turnaround required to stabilise our debt position

varies greatly depending on the assumptions made regarding such things as: the growth of the domestic economy: the outlook for commodity prices; and the time frame for stabilisation.

Dixon and Parmenter (1987) assume that annual real GDP growth will be about 3 to 3.5 per cent and that international commodity prices would continue to fall until the end of 1990. Taking into account the dynamics of debt accumulation and the increased burden of debt that a real devaluation contributes, Dixon and Parmenter project that an annual average improvement in the balance of trade over the period end-1984 to end-1990 of between 0.75 and 1.5 per cent of GDP would be required to stabilise Australia's net debt position by 1990. To quote Dixon and Parmenter,

> "A substantial surplus in 1990 will be required just to pay the interest bill on a net foreign debt, which by that time is likely to be in excess of 40% of GDP."[3]

By contrast, the EPAC document assumes a different outlook for the economy and commodity prices. However, to quote Whitelaw, the principal author of the EPAC paper,

> "[t]he key point to emerge from this analysis was that, given the high levels of real interest rates in world capital markets, debt stabilisation would require Australia to run a surplus on its trade account (rather than the substantial deficit of the mid-1980s)."[4]

15. Note that this result is not listed in Table 1. In the other simulations reported here the percentage change in the CPI is a good proxy for the percentage change in the prices received by producers.

16. Note that aggregate employment calculated using wage-bill weights, the relevant measure for use in equation (5), actually declined by 0.22 per cent.

17. See Higgs (1986, Appendix A.2) for the derivation of equation (6).

18. Note that the ORANI model accounts for the effects on the price at the farm gate of transportation costs and subsequent changes in world agricultural prices induced by changes in Australian exports.

19. Note that $\lambda_5 = 1.11$ and $\lambda_8 = 2.97$.

20. Note that $\lambda_6 = 1.65$.

21. Note that $\lambda_7 = 3.00$.

22. While labour costs vary across industries in ORANI, the percentage change in the hourly wage rate is assumed to be the same across industries, hence the lack of an industry-specific subscript on w.

23. The derivation of equation (9) can be found in Higgs (1986, Appendix A.4).

24. That is, an alternative to valuing the real wage rate as a cost to employers is to increase the real marginal product of labour at a given level of capital input.

NOTES

* The authors are indebted to Tony Lawson and Alan Powell for comments.

1. See Australian Mining Industry Council (1987). Note that this estimate takes into account Australia's holdings of debt offshore and of foreign currency.

2. See Australian Mining Industry Council (1987). Australia is the 6th most heavily indebted of the world's nations in terms of gross debt per capita. However, in terms of gross external debt as a percentage of GDP Australia is ranked as having only the 34th highest ratio.

3. Australian Mining Industry Council (1987, p. 24).

4. Australian Mining Industry Council (1987, p. 31).

5. A complete list of the variables selected as exogenous is given in Higgs (1986, Table A1.3).

6. Note that we have reported our results to two decimal places to assist in tracing the mechanisms in the ORANI model. In policy work however, the appropriate level of precision is, say, to round these projections to whole numbers.

7. See Higgs (1986, Appendix A.7) for more details.

8. Note that strictly speaking we require a measure of aggregate employment calculated using wage-bill weights.

9. See Chai and Dixon (1985).

10. See Treasury (1985).

11. Many alternative closures are possible. For example, the closure could have been one where the size of the direct tax cut was chosen so as to leave the public sector borrowing requirement unchanged. Different choices will have different implications for the size of the direct tax cut made possible by the given increase in sales tax. The implications of these different choices are studied in Meagher and Parmenter (1985).

12. An alternative response is one where pre-tax wage rates are fully indexed to consumer prices. See, for example, Dixon (1985). Note however that Dixon concludes on p. 54 that "the results are so bad I don't think we could get a change in the tax mix without labour market reform."

13. The effective tax rate is the ratio of income tax collected to income.

14. For an analysis of the imposition of a new consumption tax under alternative assumptions with respect to the distribution of the offsetting tax cuts given to labour and capital income see Higgs (1986).

Of interest is that the two independent studies conclude that a large reduction in the deficit on current account is required to stabilise Australia's net debt position. For this study, the actual improvement that could be required is not so important. Rather, the issue addressed is: from which areas of policy change could we expect to see the greatest improvement in trade performance? This is one essential ingredient for allocating priority to these policy areas.

There are two classes of factors that have led to this trade problem: external and domestic. The main external factors are rising world protectionism (especially for agricultural products) and the slowdown in world economic growth over the 1980s. However, since we can influence international trade policy to some extent these external factors are not entirely beyond Australia's control; see Stoeckel (1985). There are many domestic factors which influence our trade performance. Some of the most obvious are those affecting the levels of our wage costs; and our taxes on trade (especially tariffs on manufactured imports). Aggregate demand also affects the size of the current account deficit.

Given the trade problem, in this paper we consider five options for improving Australia's trade performance. These are: an improvement in the terms of trade, through (say) trade policy reform abroad; a reduction in unit labour costs to employers; a reduction in tariffs; restructuring of the taxation system away from income taxes towards consumption taxes; and, a cut in real absorption.

One way to estimate the relative importance of the above variables on the balance of trade is to use a comprehensive model of the

Australian economy and test for what sort of changes in each would be required to generate an improvement in the balance of trade of, say, one billion dollars. The ORANI model (developed by Dixon, Parmenter, Sutton, and Vincent (1982)) is well suited to such analysis as it explicitly captures the above economic influences and their effects on the ability of Australian exporters to compete on world markets and the switching that occurs between imported and domestic sources of supply when there is a change in relative prices.

The rest of the paper is organized as follows. In section 2 the economic environment for the ORANI simulations is defined. The results are presented in section 3. First discussed are the short-run (two-year) effects on key macroeconomic variables. Then the effects on agricultural outputs and farm incomes are studied in detail. Finally, some concluding remarks are offered in section 4.

2. ECONOMIC ENVIRONMENT

Certain features of the macroeconomy 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 variables exogenously so that the number of unknown variables equals the number of equations.

The key features of the economic environment assumed for the ORANI simulations are as follows.[5] It is assumed that induced changes in national income appear as changes in the balance of trade and not as changes in real aggregate absorption (i.e., in the real value of

increase world agricultural prices). However, this probability might be increased to, say, 20 per cent if Australia offered to reduce its own tariffs in a negotiating stance taken at multilateral trade negotiations (such as the current Uruguay Round).

Finally, although estimates vary of the extent of the trade improvement required to stabilise our overseas debt burden, all point to a large improvement. The policy approaches studied in this paper are neither exhaustive nor mutually exclusive. Given that the size of the improvement in the trade balance is so large, realistic strategies would combine several elements. The current emphasis on productivity and on costs of labour to employers, however, must be a central part of any such strategy.

wage rate, a reduction in our tariffs, a change in our tax mix, or a lift in world prices brought about by a measure of reform in the trade policies of other countries, can secure an improvement in our trade balance with fewer undesirable macroeconomic effects.

Our second observation concerns the obvious importance of real labour costs to employers for Australia's competitive position. An alternative to reducing the real cost to employers of a person-hour of labour is to increase the productivity of that person-hour.[24] Current negotiations on so-called "work practices" are highly pertinent. Hence changes to our wages policy and/or productivity increases would have to be a major component of any feasible trade strategy - only small changes are required to obtain very significant benefits. The obverse to this point is also apparent. A wages policy that fails to take adequate cognizance of our trade position can significantly worsen Australia's trade performance.

Our third point has a sectoral focus. As is well known, cutting tariffs leads to an expansion in exporting at the expense of the import-competing secotrs. By contrast, a cut in real wages or a cut in real absorption leads to expansion in both import competing and in exporting. Thus if an improvement in the balance of trade is required to alleviate Australia's debt position, then this should be done in a balanced way with due consideration of the sectoral consequences.

The fourth observation we make concerns how the possibilities of implementing the options studied above might be interlinked. For example, there may be a 10 per cent chance of Australia convincing the EEC to liberalize some of its restrictive trade policies (which would

consumption plus investment plus government spending) which is set exogenously. In other words, we are assuming no increase in real absorption when there is, say, an improvement in our terms of trade. Next it is assumed that there are no shortages of labour at the going real wage rates. Thus employment levels are demand determined. It is assumed that plant and equipment in use in every industry do not change (from the levels they otherwise would have reached) due to the shock under analysis (i.e., industry capital stocks in use are exogenous). Note that the short-run time period simulated allows for revisions in all industries' investment plans, for orders for capital goods to be placed and met, and for the new plant and equipment to be installed (but not yet switched on). The length of the short run in ORANI has been estimated by Cooper (1983) as 7.9 quarters. In policy work 'about two years' is the appropriate level of precision for describing the ORANI 'short run'. Finally, the ORANI model does not distinguish between changes in the relative prices of traded and non-traded goods brought about on the one hand by a change in the nominal exchange rate or on the other hand by a change in the domestic price level. Here it is assumed that induced changes in the real exchange rate appear as changes in domestic relative to foreign price indices and not as changes in the nominal exchange rate. In other words, the nominal exchange rate is the numeraire.

3. RESULTS

In this section we will discuss the results of simulations of an increase in world agricultural prices, an across-the-board tariff cut, a change in the tax mix in favour of indirect taxation, a cut in the real wage rate, and a cut in real absorption calibrated to each

generate a one billion Australian dollar (1985-86 prices) improvement in the balance of trade after about 2 years.

3.1 Macroeconomic Projections

The short-run effects of the above economic shocks on some key macroeconomic variables are given in Table 1. It can be seen from the table that to improve the balance of trade by one billion dollars (1985-86 prices) world agricultural prices would have to increase by 6.28 per cent.[6] The increase in world agricultural prices stimulates our aggregate exports by 4.75 per cent. The expansion in the export sector and the higher agricultural prices cause an increase in the consumer price index (hereafter CPI). The increase in the CPI feeds into wages and then back into prices, etc. The end result is a 1.86 per cent increase in the CPI. As this increase in domestic costs is passed on to the import-competing sectors, there will be some switching from domestically produced goods to imported goods such that there is a small increase in aggregate imports of 1.23 per cent. Note also that although not shown in the table, the increase in world agricultural prices causes a slight decline in Australia's non-agricultural exports such as mineral products. The net effect is for an increase in real GDP and aggregate employment of about half a per cent.

It is possible to check for consistency between the foreign currency value export and import projections with the projection for the balance of trade measured in billions of Australian dollars at 1985-86 prices. The following equation is contained in the ORANI model:

$$BT = \phi E - \phi M \quad ; \qquad (1)$$

this industry's output to increase by 2.99 per cent; see Table 2, first column. Since wages are assumed to be maintained in real terms ($w = \xi$) the change in real NFR for the Pastoral Zone is equal to $2.99 \times 2.76 = 8.25$ per cent.

Given equation (9) it is not surprising that similar to the industry output responses, real NFR would be increased most by the tariff cut, followed by the increases in world agricultural prices, the cut in real wages, and the cut in real absorption in that order.

On average, the change in the tax mix has an unfavourable effect on pre-tax real NFR. This can be explained as follows. The pre-tax nominal wage rate is projected to fall by 2.88 per cent, as compared with the 3.04 per cent increase in the CPI; see Table 1, fourth column. Thus the term $(w - \xi)$ in equation (10) is equal to $-2.89 - 3.04 = -5.91$ per cent. This represents the change in the farmer's pre-tax purchasing power due to the fall in the return to farm labour. However this is substantially offset by the positive effects on industry outputs induced by the change in the tax mix (i.e., by the $z_j \pi_j$ terms in equation (9)). Finally, note that the effects of the compensating tax cuts on post-tax real NFR have not been estimated here.

4. CONCLUSIONS

This paper has highlighted a number of different approaches towards moderating Australia's current account deficit. The first conclusion we make is that while a cut in real absorption will improve the balance of trade, it has less desirable implications for growth and employment than the other changes. That is, a cut in the real hourly

and through an increase in real wages. On the other hand, capital and agricultural land do not respond to the shocks (i.e., $k_j = v_j = 0$); therefore the earnings of these factors can only increase through an increase in rental rates. The rental rate on capital and agricultural land in industry j will rise as the ratio of labour to capital and agricultural land in use in the industry increases (i.e., as the industry's output increases). In fact the percentage change in real net returns to industry j can be written:[23]

$$(nr_j - \xi) = z_j\pi_j + (w - \xi) \quad ; \qquad (9)$$

where

$$\pi_j = 1 + S_{Kj}/(\sigma S_{Lj}) \quad . \qquad (10)$$

According to Equation (9) the percentage change in real net returns in industry j depends upon: z_j, the percentage change in the output of industry j, multiplied by π_j (as defined above); and $(w - \xi)$, the percentage change in the real wage. If there is full wage indexation (i.e., $w = \xi$), then the percentage change in real net returns $(nr_j - \xi)$ is equal to $z_j\pi_j$. Furthermore, if the only primary factor is labour (i.e., $\pi_j = 1$), to take an extreme case, then the percentage change in real net returns will equal the percentage change in industry output (which in turn equals the percentage change in the size of the workforce employed in the industry). However, as the share of fixed factors (i.e., capital and agricultural land) increases, the percentage change in real net returns increases by more than the percentage change in output. The π_j's can be calculated from the ORANI database and are equal to 2.76, 3.56, 2.71, 3.12, 2.39, 1.94, 1.58, and 2.34 for industries 1 through 8. To take the Pastoral Zone as an example, a 6.28 per cent increase in world agricultural prices is projected to cause

TABLE 1 : THE MACROECONOMIC IMPACTS OF A RANGE OF ECONOMIC SHOCKS THAT GENERATE AN IMPROVEMENT IN THE BALANCE OF TRADE OF ONE BILLION (1985-86) AUSTRALIAN DOLLARS AFTER ABOUT TWO YEARS*

Variable	An increase in world agricultural prices[a] of	A cut in the real wage rate as a cost to employers of	An across-the-board tariff cut[b] of	The imposition of a consumption tax of 4.80 per cent accompanied by compensating cuts in income taxes[c]	A cut in real absorption[d] of
	6.28 per cent	1.08 per cent	81.96 per cent		0.77 per cent
Consumer Price Index	1.86	-1.87	-7.64	3.04	-1.80
Aggregate Exports (foreign currency value)	4.75	2.59	8.57	2.55	1.97
Aggregate Imports (foreign currency value)	1.23	-0.92	5.03	-0.93	-1.52
Real Gross Domestic Product	0.54[e]	0.64[f]	0.56[f]	0.64[f]	-0.15[f]
Aggregate Employment[g]	0.43	0.94	0.92	0.95	-0.15
Balance of Trade	1.00	1.00	1.00	1.00	1.00

* All projections, with the exception of the balance of trade, are percentage deviations from the value the variable in question would have taken in the absence of the shock at the head of the column. The balance of trade, while also a deviation from control, has the units billions of 1985-86 Australian dollars ($1 billion = $1000 million).

a The results presented in this column were generated by a 6.28 per cent increase in the world prices (at initial Australian export levels) of the ORANI commodities wool, wheat, barley, other cereal grains, meat products, other food products, and a composite commodity consisting of cotton ginning, wool scouring and top making.

b Note that quantitative restrictions have been expressed in terms of tariff equivalents.

c It is assumed that post-tax wage rates are maintained in real terms and that the direct tax cuts in effective tax rates on labour are calculated to hold constant real private disposable income.

d Absorption is defined as the sum of household consumption, investment, and government spending.

e Real GDP is calculated here according to equation (4). It includes terms-of-trade effects.

f Real GDP is calculated here according to equation (5).

g Aggregate employment is calculated using persons weights. The seasonally adjusted number of persons employed in June 1985 was 6,637,900; Australian Bureau of Statistics (1985). Therefore an increase of, say, 0.51 per cent is equivalent to the addition of 33,853 people in the total number of people employed.

where BT is the balance of trade measured in Australian dollars; ϕ is the exchange rate, say \$A/\$US; and E and M are the foreign currency value, say in \$US, of exports and imports, respectively. Equation (1) can also be written:

$$\Delta BT = (\phi + e)\,\phi E/100 - (\phi + m)\,\phi M/100 \quad ; \qquad (2)$$

where ΔBT is the Australian dollar change in the balance of trade; ϕ is the percentage change in the exchange rate; and e and m are the percentage changes in the foreign currency values of exports and imports, respectively. Recall from above that in the economic environment assumed here the nominal exchange rate is the numeraire, thus $\phi = 0$. Furthermore, if we express the coefficients in equation (2) in terms of millions of Australian dollars at 1985-86 prices we obtain:

$$\Delta BT = 284.52e - 285.86m \quad . \qquad (3)$$

If we then substitute the projected percentage changes in the foreign currency value of exports (i.e., $e = 4.75$) and imports (i.e., $m = 1.23$) into equation (3), we find that the balance of trade improves by one billion Australian dollars measured in terms of 1985-86 prices.

It should be noted that two indices of real GDP are reported in Table 1. The first is notionally an index of real GDP that accounts for changes in the terms of trade. In percentage-change form it is denoted gdp_R. The second index is notionally a quantity index of the flow of goods and services produced in the economy. In percentage-change form this index is written gdp_Q. This second index

TABLE 3: SHORT-RUN EFFECTS ON REAL NET FARM RETURNS*

Industry[a]	An increase in world agricultural prices[b] of 6.28 per cent	A cut in the real wage rate as a cost to employers of 1.08 per cent	An across-the-board tariff cut[c] of 81.96 per cent	The imposition of a consumption tax of 4.80 per cent accompanied by compensating cuts in income taxes[d]	A cut in real absorption[e] of 0.77 per cent
1. Pastoral Zone	8.24	3.83	13.57	-1.27	3.21
2. Wheat-Sheep Zone	9.22	4.11	15.08	-0.75	3.43
3. High Rainfall Zone	10.05	4.62	16.46	-0.35	3.75
4. Northern Beef	18.46	9.14	30.52	4.56	6.78
5. Milk Cattle and Pigs	4.57	1.61	7.87	-3.23	1.68
6. Other Farming (Sugar Cane, Fruit and Nuts)	12.10	5.17	18.85	0.36	4.07
7. Other Farming (Vegetables, Cotton, Oilseeds and Tobacco)	1.64	0.71	2.69	-4.15	0.60
8. Poultry	6.98	2.76	11.51	-2.09	2.53
Agriculture[f]	8.64	3.82	14.06	-1.06	3.15

* All projections are percentage deviations from what real net farm returns in each industry would have been in the absence of the shock at the head of the column. Real net farm returns is the before-tax earnings of capital, agricultural land, and labour (hired and owner-operator) deflated for increases in the CPI.

a A detailed description of these industries is given in Higgs (1986).

b The results presented in this column were generated by an 6.28 per cent increase in the world prices (at initial Australian export levels) of the ORANI commodities wool, wheat, barley, other cereal grains, meat products, other food products, and a composite commodity consisting of cotton ginning, wool scouring and top making.

c Note that quantitative restrictions have been expressed in terms of tariff equivalents.

d It is assumed that post-tax wage rates are maintained in real terms and that the direct tax cuts in effective tax rates on labour are calculated to hold constant real private disposable income.

e Absorption is defined as the sum of household consumption, investment, and government spending.

f The effect on real net farm returns for agriculture is calculated by weighting the effects on industry real net farm returns by the industry's base-period share of primary factors in the total input of primary factors for all of agriculture.

real absorption causes a contraction in the size of the domestic economy. As a result imports fall and exports need only increase a relatively small amount to achieve the balance-of-trade target. Note also that the contraction in the domestic economy means that sales are relatively suppressed for those agricultural industries which sell to the domestic economy.

3.3 Farm Incomes

The effects of the above economic shocks on real net farm returns (hereafter real NFR) are shown in Table 3. Real NFR is defined as the earnings of labour (hired and owner-operator), capital, and agricultural land all deflated by the CPI:

$$(nfr_j - \xi) = S_{Lj}(\ell_j + w - \xi) + S_{Kj}(k_j + q_j - \xi) + S_{Vj}(v_j + r_j - \xi) \; ; \qquad (8)$$

where $(nfr_j - \xi)$ is the percentage change in real NFR in industry j; S_{Lj}, S_{Kj}, and S_{Vj} are the shares of returns to labour, capital, and agricultural land in primary factors in industry j, respectively; ℓ_j, k_j, and v_j are the percentage changes in the employment levels of labour, capital, and agricultural land in industry j, respectively; w is the percentage change in the nominal wage rate;[22] q_j and r_j are the percentage changes in the rentals on capital and agricultural land in industry j, respectively; and ξ is the percentage change in the CPI.

Recall from section 2 that labour is a variable input in the environment under which these simulations were made; therefore its earnings can increase through an increase in the amount of labour used

does not take account of any movements in our external terms of trade except in so far as they cause changes in the volume of domestic output. Thus, if the overseas prices of our major exports (wool, meat, cereals, minerals) were to rise without any change in the overseas prices of imports, and if we allowed insufficient time for any changes to occur in the quantities of goods and services produced at home, this favourable circumstance would be reflected as a positive value of gdp_R, but would leave gdp_Q unchanged.

In percentage-change form we may write:[7]

$$gdp_R = S_E e - S_M m \; ; \qquad (4)$$

where e and m are as before; and S_E and S_M are the shares of exports and imports in GDP, respectively. From the ORANI data base $S_E = 0.1528$ and $S_M = 0.1535$. Using the projected values from Table 1 of the 6.28 per cent increase in world agricultural prices for e and m, equation (4) gives:

$$gdp_R = 0.1528 \times 4.75 - 0.1535 \times 1.23 = 0.54 \text{ per cent.}$$

On the other hand, real GDP as a quantum index of domestic output can be equated to a quantity index of the employment of primary factors. Hence, in percentage-change form:

$$gdp_Q = S_L \ell + S_K k + S_V v \; ; \qquad (5)$$

where ℓ, k, and v are the percentage changes in the employment of labour, capital, and agricultural land; and S_L, S_K, and S_V are the

shares of returns to labour, capital, and agricultural land in GDP. In the standard short-run economic environment (as defined in section 2) k = v = 0. From the ORANI data base S_L = 0.57. If we substitute the above, with the aggregate employment projection of an increase of 0.43 per cent from ORANI[8] (see Table 1, first column), into equation (5) we find that gdp_Q = 0.57 × 0.43 = 0.25 per cent.

The next economic shock to be studied is a cut in the real wage rate. The real wage is defined as the money wage deflated by some index of the general level of prices. For this simulation, the CPI will serve as a deflator. We need to distinguish between real wages as a cost to employers of labour, and real wages as take-home pay. The real wage as a cost to employers includes the gross wage, payroll taxes and other costs of employing labour, such as superannuation contributions. It can be seen from Table 1 that a 1.08 per cent cut in the real wage rate as a cost to employers would generate a one billion dollar (1985-86 prices) improvement in the balance of trade after about 2 years.

A real wage cut is deflationary. The CPI is projected to fall by 1.87 per cent due to a 1.08 per cent real wage cut. As domestic costs fall, the international competitiveness of the traded sectors improves. This leads to an increase in exports of 2.59 per cent and a decline in imports of 0.92 per cent. Furthermore, the cut in the real wage rate as a cost to employers is projected to increase employment by 0.94 per cent and real GDP by 0.64 per cent. Note that real GDP is calculated here as a quantum index of domestic output; see equation (5).

The detrimental effects of Australia's continuing high levels of protection for its manufacturing industries[9] are specifically

The results for the effects of a real wage cut and a change in the tax mix are given in the second and fourth columns of Table 2. These results are very similar since, as discussed above, the change in the tax mix results in a fall in the real wage as a cost to employers. The Pastoral, Wheat-Sheep, and High Rainfall Zones all directly export a significant portion of their output. Due to competitive pressures on world markets the exports of these industries will rise if there is a fall in real wages. The Northern Beef and Other Farming (Sugar Cane, Fruit, and Nuts) industries sell a significant portion of their produce to domestic processing industries which do the exporting. Because the produce of these export-related industries must be processed before export, they are exposed to greater opportunities for domestic cost reductions and consequently are particularly sensitive to the cut in real wages. The three remaining industries - Milk Cattle and Pigs, Other Farming (Vegetables, Cotton, Oilseeds, and Tobacco), and Poultry - also sell some of their output to food processing export industries. However, these industries are not affected to the same extent as the other agricultural industries since a significant amount of their sales is to domestic household consumption.

The agricultural industries are all projected to increase their output if there is an across-the-board tariff cut or a cut in real absorption; see Table 2, third and fifth columns. However the size of the increases generated by the tariff cut are the largest in the table while those generated by the cut in real absorption are, for the most part, the smallest. This can be explained as follows. The cut in tariffs results in increased imports which must be offset by a relatively large increase in exports to achieve the targeted improvement in the balance of trade; see Table 1, third column. However the cut in

The Northern Beef industry produces only meat cattle which it sells to the Meat Products industry. Largely as a result of the increase in the world price of meat products, the increased demand for meat cattle causes the price of meat cattle to rise by 17.17 per cent. The λ_j for the Northern Beef industry is equal to 0.67. Thus the relatively large increase in output for this industry of 5.91 per cent is due to the relatively large increase in the selling price of meat cattle over the costs of the industry (i.e., approximately equal to 17.17 - 1.86 = 15.31).

The Milk Cattle and Pigs and Poultry industries also sell some of their output to the Meat Products industry. However, these industries do not benefit from the world price rise to the same extent as the Northern Beef industry since a significant amount of their sales is to domestic household consumption.[19]

Both the Other Farming industries are projected to increase their output due to the world agricultural price rises. The Other Farming (Sugar Cane, Fruit, and Nuts) industry sells approximately half of its output to the Other Food Products processing industry. This industry in turn exports about one-third of its output.[20] Finally, the Other Farming (Vegetables, Cotton, Oilseeds, and Tobacco) industry experiences a small increase in output. This industry sells to a number of sectors in the economy. However it is largely stimulated by increased sales to the Other Food Products and Cotton Ginning processing sectors.[21]

concentrated on the export sector. This can be seen from the third column of Table 1 which shows that an 81.96 per cent across-the-board tariff cut would generate a one billion dollar (1985-86 prices) improvement in the balance of trade after about 2 years. The direct impact of such a tariff cut is to cause a fall in purchasers' prices due to the now cheaper imported goods. In view of our assumption of fixed real wages, a fall in (or a moderation in the rate of increase of) domestic prices would lead to lower money wages. The lower wage demands would feed into domestic prices which in turn would generate lower wage demands, etc. The ORANI model captures these general equilibrium effects and an 81.96 per cent across-the-board tariff cut is projected to cause the CPI to be 7.64 per cent lower after about two years relative to what it would have been in the absence of the tariff cut (see Table 1, third column). As domestic costs fall, the international competitiveness of the traded sectors improves. Exports are projected to increase by 8.57 per cent while imports are only projected to increase by 5.03 per cent. Aggregate employment and real GDP are projected to increase in response to the across-the-board tariff cut.

The next aspect of domestic economic management studied here concerns a change in Australia's tax mix in favour of indirect taxation. Reform of Australia's tax system is another policy option available to the government. Prior to the tax summit in 1985 the preferred option of the Australian government involved a shift towards indirect taxation with compensating income tax cuts.[10] To trace the effects of such a shift in policy on the balance of trade the ORANI National and Government Accounts module, NAGA, as developed by Meagher and Parmenter (1985) was used. A compensating tax cut is defined here to be a tax cut which when combined with the household consumption tax leaves real

private absorption (i.e., real household consumption plus real private investment) unchanged.[11] The outcome of any tax package is going to depend crucially on the response of the labour movement. The response studied here is one where post-tax wage rates (i.e., rates of take-home pay) are fully indexed to consumer prices.[12] The outcome also depends on the distribution of the compensating tax cuts between labour and capital income. Here it is assumed that only the effective tax rate[13] on labour income is cut.[14] Under the above conditions, the imposition of a consumption tax of 4.80 per cent would generate a one billion dollar (1985-86 prices) improvement in the balance of trade after about 2 years; see Table 1, fourth column.

Recall that it is important to distinguish between wage rates as a cost and wage rates as an income. The wedge between these two largely consists of the income tax rate. In the ORANI data base, the initial effective tax rate on labour income is 21.73 per cent. Thus, if the average worker receives a pre-tax wage of \$400 (i.e., wages as a cost), then the take-home pay is \$313.08 (i.e., wages as an income = \$400 × (1 - 0.2173)). The imposition of the household consumption tax will increase the CPI by 3.04 per cent; see Table 1, fourth column. (The reason that the CPI rises by less than the 4.80 per cent of the consumer tax is that, as will be seen below, there is some savings of labour costs that feed into prices.) If an agreement is reached with the labour movement to fully index take-home pay, then the latter must increase by \$9.52 (i.e., 0.0304 × \$313.08). If such a payment is made, then there will be no change in the purchasing power of an employed worker (i.e., the real wage as an income will not have changed). The implicit bargain struck between employers and employees, through the interventions by the government in the tax field, guarantees that such a

$$\lambda_j = \sigma(1 - S_{Fj})/(S_{Fj}H_{Xj}) \quad . \tag{7}$$

The percentage change in industry j's output is represented by z_j, p_j is the percentage change in the farm-gate price of industry j's output[18] (this is an appropriately weighted index for the multi-product industries); ξ is the percentage change in the index of consumer prices; σ is the elasticity of substitution between primary factors (assumed to be 0.5 for all industries in the short run); S_{Fj} is the share of the fixed factors in industry j's primary-factor inputs; and H_{Xj} is the share of primary factor inputs in industry j's total costs.

Equation (6) suggests that we need look only at three influences to determine an industry's output response. The first is λ_j which, according to equation (7), consists of base-period shares and an elasticity. The second is the change in the industry output price, and the third is the CPI (i.e., an index of costs). The greater the fixed factor share, S_{Fj}, and the primary-factor share, H_{Xj}, the less responsive is the industry (i.e., the smaller is λ_j). For the three zonal industries the λ_j's are as follows: $\lambda_1 = 0.75$, $\lambda_2 = 0.57$, and $\lambda_3 = 0.92$. Thus of the zonal industries we would expect the High Rainfall Zone ($j = 3$) to be the most responsive, followed by the Pastoral Zone ($j = 1$), and finally by the Wheat-Sheep Zone ($j = 2$). These relative responses are reflected in the projections listed in Table 2. Furthermore, if we make the crude approximation (for the purpose of this back-of-the-envelope calculation) that the output price of these industries increased by 6.28 per cent, and we substitute this and the CPI response from Table 1 into equation (6), then the percentage change in the output of, say, the Pastoral Zone is roughly equal to 3 per cent (i.e., 0.75 × (6.28 - 1.86)).

TABLE 2: SHORT-RUN EFFECTS ON AGRICULTURAL INDUSTRY OUTPUTS*

Industry[a]	An increase in world agricultural prices[b] of 6.28 per cent	A cut in the real wage rate as a cost to employers of 1.08 per cent	An across-the-board tariff cut[c] of 81.96 per cent	The imposition of a consumption tax of 4.80 per cent accompanied by compensating cuts in income taxes[d]	A cut in real absorption[e] of 0.77 per cent
1. Pastoral Zone	2.99	1.78	4.92	1.69	1.16
2. Wheat-Sheep Zone	2.59	1.46	4.23	1.45	0.96
3. High Rainfall Zone	3.71	2.11	6.07	2.05	1.39
4. Northern Beef	5.91	3.27	9.77	3.35	2.17
5. Milk Cattle and Pigs	1.91	1.12	3.28	1.12	0.70
6. Other Farming (Sugar Cane, Fruit and Nuts)	6.25	3.23	9.70	3.24	2.09
7. Other Farming (Vegetables, Cotton, Oilseeds and Tobacco)	1.04	1.13	1.70	1.12	0.39
8. Poultry	2.98	1.64	4.88	1.63	1.08
Agriculture[f]	3.23	1.85	5.25	1.83	1.16

* All projections are percentage deviations from the values the outputs would have taken in the absence of the shock at the head of the column.

a A detailed description of these industries is given in Higgs (1986).

b The results presented in this column were generated by a 6.28 per cent increase in the world prices (at initial Australian export levels) of the ORANI commodities wool, wheat, barley, other cereal grains, meat products, other food products, and a composite commodity consisting of cotton ginning, wool scouring and top making.

c Note that quantitative restrictions have been expressed in terms of tariff equivalents.

d It is assumed that post-tax wage rates are maintained in real terms and that the direct tax cuts in effective tax rates on labour are calculated to hold constant real private disposable income.

e Absorption is defined as the sum of household consumption, investment, and government spending.

f The effect on total agriculture is calculated by weighting the effects on agricultural industry outputs by their respective base-period shares in total output for all of agriculture.

payment will indeed be made. The bargain thus underwrites the interests of workers who retain employment after the implementation of the package.

The key question then is: will the real wage rate as a cost have risen, fallen, or not have changed? This depends on the extent to which the relativity between producers' costs and prices received by them changes in the aftermath of the imposition of the package. If the prices received by producers increased by more than the percentage change in the pre-tax money wage rate, then the real wage rate as a cost will have fallen; in the contrary case, it will have risen.

Our calculations depend on what else is assumed about macroeconomic management when the package is implemented. Here it is assumed that the size of the direct tax cut is chosen in such a way that the sum of take-home labour income and post-tax returns to capital are held steady in real terms. This turns out to imply that the income tax rate paid by workers is reduced to 16.95 per cent. Under these conditions, the package entails some secondary deflation, leading to a fall in producers' prices of about 2 per cent.

Is the cut in income taxes described above enough to provide in full the $9.52 compensation needed to maintain the purchasing power of our hypothetical worker? If the pre-tax wage stayed put at $400, the tax saving is worth $19.12 ((0.2173 - 0.1695) × $400). This would represent $9.60 of over-compensation (i.e., $19.12 - $9.52). As employers are only required under the bargain to exactly compensate workers for the effects of the consumption tax, there is scope for the reduction of pre-tax wages. If take-home pay is required to be $322.60

(i.e., \$313.08 + \$9.52), then the pre-tax wage, with the effective income tax rate now at 16.95 per cent, can be reduced to \$388.44 (i.e., \$322.60/(1 - 0.1695)).

We are now in a position to say what will have happened to the real wage rate as a cost. Nominal wages, as a cost, have fallen by \$11.56 (i.e., \$388.44 - \$400) or 2.89 per cent (i.e., (\$11.56/\$400) × 100). It turns out, however, that prices received by producers have fallen by 2.01 per cent.[15] Thus the real wage rate as a cost has fallen by 0.88 per cent (= -2.89 - (-2.01)).

As the change in the tax mix is projected to cause a fall in the real wage as a cost, the international competitiveness of the traded sector improves. Exports are projected to increase by 2.55 per cent and imports are projected to fall by 0.93 per cent. Aggregate employment and real GDP are projected to increase due to the change in the tax mix.

The final economic shock to be studied is a change in aggregate demand. A reduction in domestic demand, say through reduced government spending, would cause contractions in the non-traded sectors of the economy. However, it would also tend to reduce domestic costs and thus improve the competitiveness of domestic export and import-competing industries. It can be seen from the fifth column of Table 1 that a 0.77 per cent cut in real absorption (i.e., the sum of real household consumption, real investment, and real government spending) would generate a one billion dollar (1985-86 prices) improvement in the balance of trade after about 2 years. This cut in real absorption causes the CPI to fall by 1.80 per cent. Exports are projected to increase by 0.97 per cent and imports are reduced by 1.52

per cent. The reduction in imports is partially due to the contraction in the size of the domestic economy. Real GDP and hence aggregate employment are both projected to decline.[16]

3.2 Agricultural Outputs

As agriculture is an export sector it benefits from the effects of policies designed to improve the balance of trade. However the increases in outputs are not uniform across the simulations nor across the agricultural industries. This is due in the first instance to the different mixes of aggregate export and import responses observed to achieve the balance of trade target, and in the second instance to the different cost structures, sales patterns, and product mixes of the agricultural industries. The short-run effects on agricultural industry outputs of the economic shocks discussed above are given in Table 2.

The first column of Table 2 shows the effects of a 6.28 per cent increase in the world prices of wool, wheat, barley, other cereal grains, meat products, other food products and a composite commodity consisting of cotton ginning, wool scouring and top making. If it is assumed that wages are maintained in real terms and we make the approximation that the costs of intermediate inputs move in line with the CPI, then the ORANI short-run supply function for industry j can be written:[17]

$$z_j = \lambda_j(p_j - \xi) \quad ; \qquad (6)$$

where