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THE SCOPE FOR TARIFF REFORM CREATED BY A RESOURCES BOOM : SIMULATIONS WITH THE ORANI MODEL

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General Paper No. G-40 (revised) Melbourne August 1983

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

ISBN 0 642 52402 5

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1. INTRODUCTION

High levels of protection have left Australia with an inflexible and economically inefficient manufacturing sector. The academic and the general communities have exhibited a growing awareness of this fact. However the community is apprehensive about the short-run adjustments required by tariff reform. Dixon, Parmenter, Sutton and Vincent, hereafter DPSV (1982, p.286) put it this way:

> "With the current recessionary conditions, members of the public find it difficult to imagine how a worker who has lost his job through a tariff cut could find alternative employment."

Again, Dixon (1980, p.2) observes that,

> "...only a very brave politician (e.g., Bert Kelly) is willing to do more than make windy and vague statements about the virtues of tariff reductions. Politicians who are willing to go even this far are usually quick to reassure their audiences

> that they are not suggesting immediate moves towards freer trade. They imply that free trade is a desirable long term objective to be pursued when 'conditions' are different from whatever is their present state."

Since Gregory's path-breaking article (1976) it has been well understood that protection, the real exchange rate, and expansion in the minerals exporting sector, are highly inter-related issues. What does not seem generally to have been realized is that a resources "boom" can create conditions which would ease the short-run structural adjustment problems that may occur with tariff reform. In this paper we present simulations with the ORANI model (DPSV (1982)) which illustrate this proposition. None of this is to deny that

> "The case for tariff reform is ... essentially independent of the existence or otherwise of the mining boom : a better resource allocation will support a higher standard of living irrespective of the base level of income" (Powell (1982, p. 25)).

To discuss the effects of tariff reform given the occurrence of a resources boom, requires some prior assumptions. The first assumption we make is that the boom will actually take place. There is, of course, a good deal of scepticism on this point. Even without the current weakening of demand in the export markets for many minerals, an overestimation of the fruits of the prospective boom by organized labour could be enough to abort it.

The excessive optimism of those pushing for higher real incomes comes in two forms: first, a misjudgement about timing; second a misjudgement about magnitude. Many government and business leaders have claimed in recent months that the community has attempted (mainly via wage push) to spend in advance the additional income which might have been generated by an expansion in mining. To the extent that this attempt has been successful it must, in a world of high interest rates, have added substantially to costs. But overall such an attempt could not succeed without massive public or private overseas borrowing. On the question of magnitude, analyses based on the ORANI model suggest that a successful mining expansion would offer a modest improvement in the macroeconomic climate (Powell (1982)), but not an improvement on anything like the scale needed to counter the inflationary effects of increases in labour costs experienced during 1981-82.

In spite of these and other very real doubts which must be entertained about the viability, timing, and magnitude of a new mining boom, this is an opportune juncture to explore its implications. We do not agree with the reasoning that led the Fraser Government, on the grounds of the current recession and the lack of a multi-national consensus, to refuse to embark upon a programme of tariff reform. Nevertheless that decision at least raises the hope that the matter might be reconsidered in an improved economic climate. The policy options should therefore be defined as clearly as possible <u>now</u> in order to ensure that future opportunities to harmonize structural adjustment with growth are not missed.

The crucial macroeconomic dimension of a minerals expansion is

its impact on the balance of trade. Before the current wave of pessimism set in, Johns (1981) the Director of the Bureau of Industry Economics, provided an estimate of the magnitude of the extra foreign currency thought likely to be forthcoming. Relative to a three-year base period centred on 1978, the additional net foreign exchange earnings in the late 1980's were projected to flow at an annual rate equivalent to about five per cent of GNP at the time.

The direct effects of the resources boom on the mining industry itself and its suppliers are assumed to be small compared with the indirect effect of the additional foreign exchange earnings of the resources boom[2] (an idea first highlighted by Gregory (1976)). During the early seventies the latter certainly was large enough to make a significant impact on the exchange rate and/or the domestic rate of inflation. As has been noted above, the boom of the eighties is projected to be of a similar size relative to national income.

The results reported in this paper were obtained by using the ORANI model to simulate the indirect (i.e., balance of payments) effects of expansions in mineral exports. This was done by allowing the pre-mining boom economy to run a balance of trade deficit which is financed by a 'free' gift of foreign exchange representing the export receipts from the new mineral exports. By contrast with Gregory's analysis, our simulations allow an increase in domestic absorption (i.e., consumption plus investment plus government expenditure) to be generated by the resources boom. That is, we make allowance for the income effects of the newly exploited mineral wealth as well as for the relative price effects stressed by Gregory. The new export income induces increases in domestic absorption combined with an

acceleration in domestic inflation and/or an appreciation of the nominal exchange rate which are sufficient to ensure that the additional foreign currency is absorbed by reductions in traditional exports and by increases in imports. Therefore although the resources boom worsens the terms on which Australian industries in the traded goods sector compete, it also increases income, and thus the size of the domestic market. The end result is that many industries will gain as much (or more) from the increased size of the cake as they lose by virtue of capturing a smaller slice of it.

It is important to note that traditional mining exports, as well as other exports, will be curtailed by these processes. Our simulations show only these 'adjustment' effects on the mining industries. As indicated above, the direct effects on the mining industries of increased export potential are not modelled. This should be kept in mind when interpreting the results for the mining industries given in the following tables.

The new set of conditions created by the resources boom, which is favourable to adjustment, is a higher growth rate of the economy. As a general rule, economies which are experiencing at least moderate rates of growth will accommodate structural pressures more easily. One such structural pressure is the short-run adjustments that occur with tariff reform. Therefore, although the case for tariff reform is essentially independent of the existence or otherwise of the resources boom, the resources boom provides an opportunity for implementing a relatively painless tariff reform.

Two types of tariff reform are examined in this paper. In section 2 the ORANI model has been used firstly to project the year-by-year effects of an across-the-board tariff cut, under the conditions created by the resources boom, subject to the constraint that aggregate employment in the import competing sector is to remain unchanged. Secondly, the ORANI model was used to analyse the effects of an additional constraint, namely that the employment levels of certain industries are not allowed to fall when the tariff measures are taken concurrently with the mining boom. The industries involved are the motor vehicle (MV) industry and most of the textile, clothing and footwear (TCF) sector.[3] Brief concluding remarks are contained in section 3 and the technical details of the ORANI simulations are given in the appendix.

2. TARIFF REFORM AND THE RESOURCES BOOM

Although the resources boom will cause some redistribution of employment among the import competing industries, aggregate employment in the sector is projected to rise.[4] It is this additional employment within the import competing sector that creates some scope for concurrent tariff reform. The effect of such a reform would be to redistribute the additional jobs made available by the resources boom from the import competing sector towards the relatively more efficient export and non-traded goods sectors. Implicit in the view that this is a relatively painless approach to tariff reform is the assumption that reallocation within the import competing sector would not involve serious adjustment costs (whereas contraction of this sector would).

In this paper we have assumed that the resources boom will by the end of the 'eighties, generate additional annual foreign exchange earnings equivalent to 3.5 billion Australian dollars (at 1974-75 prices).[5] We assume that this additional foreign exchange earning capacity will have built up at a linear rate through the decade. That is, in a typical year of the decade the additional pressure imposed on the economy by the evolution of the boom is an augmentation of its foreign exchange earning capacity equal to 0.35 billion 1974-75 dollars. The results which we report in the first columns of Tables 2.2 and 2.3 are projections of the short-run effects of one such incremental shock.[6]

All our simulations have been made on the slack labour market

assumption; namely, that the real wage level remains unaffected by the respective tariff reforms and/or the resources boom. Rather, it is the aggregate employment level which is assumed to respond to these shocks. Given the current conditions of unemployment in Australia, slack labour markets would appear to be the appropriate assumption to make.

The balance of trade is exogenous in these simulations. Thus the component of GDP affected by the tariff reforms and/or resources boom is domestic absorption. We further assume that the three major components of real absorption -- private consumption, private investment, and government spending -- all change by the same percentage in response to the shocks.

The nominal exchange rate is exogenous and has been set to zero change. It is the numeraire in our simulations. Thus changes in the domestic price level are to be interpreted as changes in domestic prices relative to world prices; i.e., as changes in the real exchange rate.

Two resources-boom/tariff-reform packages are examined in this paper. In the first we impose an across-the-board tariff cut which keeps aggregate employment in the import competing sector unchanged in the conditions created by the resources boom. The required annual across-the-board cut in tariffs is 0.58 per cent. The effects of the resources boom and this across-the-board tariff cut are analysed in subsection 2.1.

The second resources-boom/tariff-reform package examined is of a political origin. Although the mining boom is projected to increase employment in the import competing sector as a whole, it has an adverse effect on employment in the most heavily protected parts of this sector;

namely, the TCF and MV industries. Recent Australian governments have taken the view that these industries should, to a large extent, be insulated from economic developments adverse to them. Hence in our second package we hold employment constant in each of the TCF and MV industries listed in Table 2.1. To accomplish this we endogenize the rates of protection afforded them.

Thus, our second package includes projected increases in tariff rates within the TCF and MV sector rather than falls in employment (see Table 2.1). These are the tariff increases required to hold employment constant in each of the designated TCF and MV industries in the presence of:

(a) the mining boom shock, and

(b) a 15.83 per cent cut in tariff rates for all industries in the remainder of the import-competing sector. This is the tariff cut required to hold employment constant in the import-competing sector as a whole in the face of the mining boom shock when TCF and MV exemptions are in force.

The economic effects of the second package are discussed in subsection 2.2.

2.1 Across-the-board tariff reform and the resource boom

The projected short-run macroeconomic effects of the resources-boom shock alone are listed in column 1 of Table 2.2. Column 2 of the table contains corresponding projections of the effects of the 0.58 per cent across-the-board tariff cut which accompanies the resources boom in our first package. To get the projected effects of the package as a whole, we just add the two columns. Note that this procedure yields the projection (as

TABLE 2.1 : TWO RESOURCES-BOOM/TARIFF-REFORM PACKAGES*

Commodity	Annual Percentage Change in the Ad Valorem Nominal Tariff Equivalent of Protection when the Employment Levels of the first Seven Industries Listed	
	Are Allowed to Fall	Are Not Allowed to Fall
Man-made fibres, yarn	-0.58	4.04
Cotton, silk, flax	-0.58	3.99
Textile products n.e.c.	-0.58	4.87
Knitting mills	-0.58	3.16
Clothing	-0.58	0.37
Footwear	-0.58	2.70
Motor vehicles, parts	-0.58	0.81
All other commodities	-0.58	-15.83

* The numbers in the second column are the percentage changes in the tariff rates which would be required in a typical year of the resources boom to ensure (a) that employment demand in the import competing sector as a whole does not change as a result of the resources boom and (b) that employment levels in the first seven industries listed are not depressed as a result of the resources boom. The first column satisfies (a) but not (b). The technical details of how these percentage changes were calculated are given in the appendix.

TABLE 2.2 : SHORT-RUN PROJECTIONS OF SELECTED MACROECONOMIC VARIABLES[a]

Macroeconomic Variable	Projections of the effects of		
	Annual Additional Foreign Exchange Earnings Generated by a Typical Year of the 1980's Resources Boom (ΔB=-$A0.35(1974-75) Billion)[b]	Annual Across-the-board Tariff Cut of 0.58 per cent	Annual Tariff Package When Employment Levels in the TCF and MV Sector are not Allowed to Fall
Consumer Price Index	1.87	-0.04	-0.26
Aggregate Imports (foreign currency)	1.41	0.05	0.41
Aggregate Exports (foreign currency)	-2.27	0.05	0.41
Aggregate Real Domestic Absorption[c]	0.80	0.01	0.10
Aggregate Employment (persons)	0.11	0.01	0.14
Aggregate Employment in the Import Competing Sector (hours)[d]	0.02	-0.02	-0.02

(a) All projections are in percentage deviations from the value which the variable would have assumed in the absence of the shock shown at the head of the respective column.

(b) The resources boom is modelled as if it allows the economy as it exists at the beginning of year t to run a balance of payments deficit of $A0.35 (1974-75) billion in year t without exerting any pressure on the exchange rate, where t is any year in the 1980's. Note that the direct effects of the resources boom have not been modelled.

(c) That is, consumption plus investment plus government expenditure.

(d) The technical details of how this is computed are given in the appendix.

required) that the package will not change employment in the import-competing sector.

Column 1 of Table 2.2 shows that the resources-boom shock allows an increase (0.80 per cent) in real domestic absorption. This can be thought of as having both income and price effects on the demand for commodities, and hence on the activity levels of domestic industries. The price effects derive from the inflationary consequences of the expansion in absorption in an environment where wage costs are assumed to be fully indexed to consumer prices. Note that the projected annual effect of the boom is to raise the CPI by 1.87 per cent. This represents a rise in the price of domestically produced goods relative to world prices. For the domestic import competing sector the income and price effects work in opposite directions: the former stimulating demand for importable commodities but the latter generating substitution away from the domestic source of supply. The net effect is only slightly expansionary, hence the very small increase (0.02 per cent) in employment in the import-competing sector. A corollary of this is a strong expansion (1.41 per cent) in the demand for imports: in the case of imports both the income and price effects work in the same direction.

The implications for exporters of the income and price effects of the resources boom are illustrated in Figure 2.1. In ORANI, export demand elasticities are assumed to be high, but not infinite. To simplify the story, the figure is drawn for the limiting case of perfectly elastic foreign demand.

D_d and D_f are respectively the domestic and foreign demand curves in the pre-boom situation. S is the domestic export industry's supply curve.

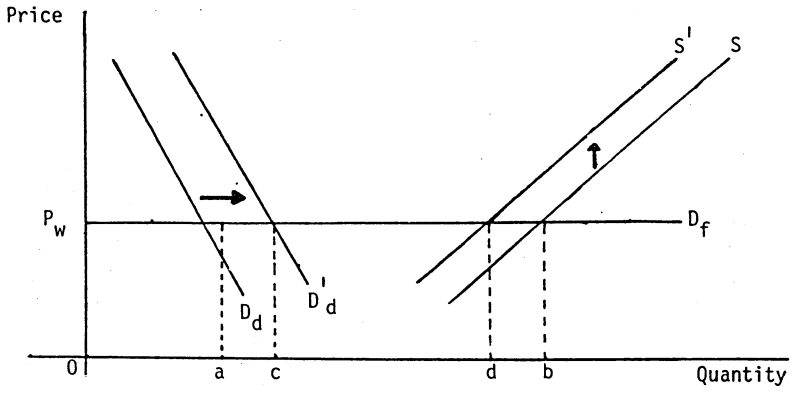

FIGURE 2.1 : Simplified Representation of Effect of the Resources Boom on Domestic Demand, Output, and Exports of an Export Commodity in ORANI

Before the boom the industries output is Ob, domestic demand is Oa and exports are ab. The income effect of the boom shifts the domestic demand curve to D_d^1. The price effect increases the costs of the exporter, shifting his supply curve to S^1. Following the boom, output is Od, domestic demand is Oc and exports are cd. Note that the output response is determined mainly by the price effects of the boom while the domestic demand response is determined mainly by its income effects. The contraction of exports (2.27 per cent in Table 2.2) however depends on both the income and the price effects.

According to column 1 of Table 2.2 the resources-boom shock causes an expansion in aggregate domestic employment of 0.11 per cent. As well as the effects on the import competing and exporting sectors (discussed in the previous paragraphs) this includes an expansion in activity in the non-traded-goods sector, due primarily to the income effects of the boom. The adverse consequences of the price effects are only minor in this sector because, facing no international competition, producers of non-traded goods can easily pass on cost increases to their customers.

The 0.58 per cent across-the-board tariff cut which completes our first package is projected to have only a minor macroeconomic impact. It causes the consumer price index to rise at a rate which is 0.04 per cent per year slower than would otherwise have been the case. This restraining influence on domestic costs is favourable to exporters, producing an annual increase in aggregate exports of 0.05 per cent relative to what their level would otherwise have been. Even though the domestic price level is restrained, the tariff cut causes an annual increase in aggregate imports

and a fall in aggregate employment in the import-competing sector relative to their ceteris paribus levels. Economy-wide employment, however, is not projected to change significantly, reflecting the fact that tariffs have little impact on total employment within the ORANI model.

All possible combinations of the effects on industry outputs[7] of this resources-boom tariff-reform package are depicted in Figure 2.2. Industries lying in quadrant A are stimulated by both the resources boom and the tariff reform. Industries in quadrants B and D are stimulated by one, but harmed by the other. Those located in the unshaded regions of quadrants B and D experience a net increase in output and employment, while industries in the shaded regions experience net decreases. Finally, industries in quadrant C suffer contractions on account of both the resources boom and the tariff reform.

The industry-output responses to the two parts of our first resources-boom/tariff-reform package are listed in columns 1 and 2 of Table 2.3. It can be seen from the table that 69 out of 111 industries experience a net stimulation as a result of the package. (These are the industries that would be in the unshaded portion of Figure 2.2). The majority of these industries belong to the non-trading sector of the economy and therefore, while benefitting from the increase in domestic absorption caused by the resources boom, they are insignificantly affected by the across-the-board tariff reform.

No industry responses lie in the unshaded region of quadrant B of Figure 2.2. Because it tends to reduce domestic cost levels, the tariff reform favours activity in a number of industries, which are adversely

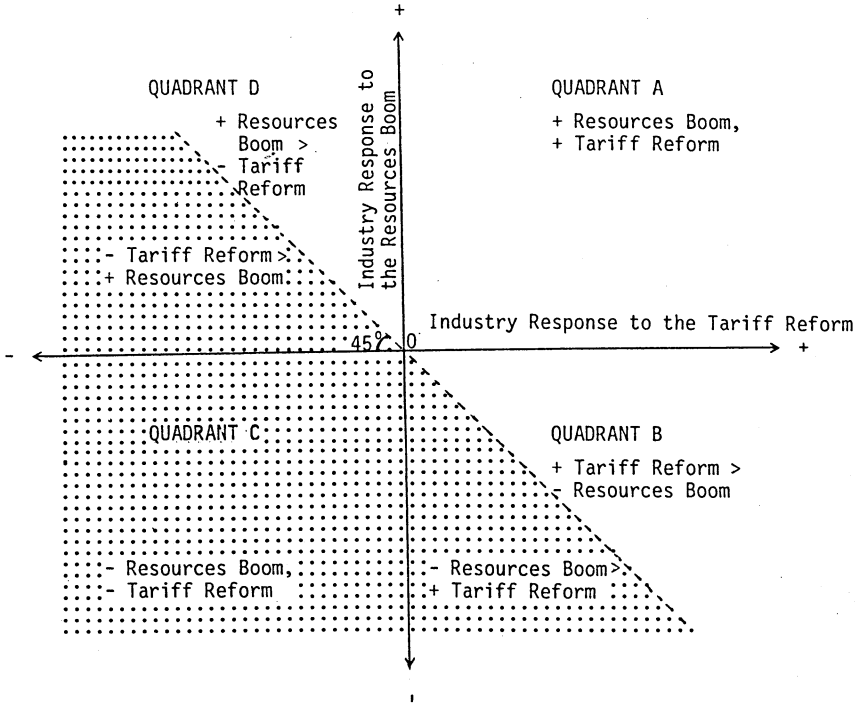

FIGURE 2.2: Possible Combinations of Year-by-Year Effects on Industry Outputs of the 1980's Resources Boom and the Tariff Reform Policies

TABLE 2.3 : SHORT-RUN PROJECTIONS ON INDUSTRY OUTPUTS[a]

Industry Number	Industry	Projections of the effects of			Quadrant[b]	
		Annual Additional Foreign Exchange Earnings Generated by a Typical Year in the 1980's Resources Boom (ΔB=-$A.0.35 (1974-75) Billion)	Annual Across-the-board Tariff Cut of 0.58 per cent	Annual Tariff Package when Employment Levels in the TCF and MV Sector are not Allowed to Fall	Resources Boom Plus Across-the-Board Tariff Cut	Resources Boom Plus Tariff Package When Employment Levels in the TCF and MV Sector are not Allowed to Fall
1	Pastoral zone	-2.16	0.04	0.35	B	B
2	Wheat/sheep zone	-1.33	0.03	0.22	B	B
3	High rainfall zone	-2.81	0.06	0.47	B	B
4	Northern beef	-3.65	0.08	0.58	B	B
5	Milk cattle & pigs	-0.59	0.01	0.10	B	B
6	Other farming (export)	-2.00	0.04	0.33	B	B
7	Other farming (import competing)	0.07	0.01	0.04	A	A
8	Poultry	-1.07	0.02	0.18	B	B
9	Services to agriculture	-1.10	0.03	0.23	B	B
10	Forestry	0.41	0.01	-0.08	A	D
11	Fishing	-0.43	0.01	0.10	B	B
12	Iron	-0.54	0.01	0.10	B	B
13	Other metallic minerals	-1.44	0.03	0.26	B	B
14	Coal	-1.59	0.03	0.27	B	B
15	Crude oil	-0.12	0.00	0.02	B	B
16	Non-metallic minerals n.e.c.	0.24	0.01	0.05	A	A
17	Services to mining	-1.00	0.03	0.22	B	B
18	Meat products	-2.52	0.05	0.41	B	B
19	Milk products	-0.00	0.00	0.00	B	B
20	Fruit & veg products	0.24	0.00	-0.08	A	D
21	Margarine, oils & fats	-0.23	0.00	-0.24	B	C
22	Flour & cereal products	-2.86	0.06	0.50	B	B
23	Bread, cakes	0.11	0.00	0.01	A	A
24	Confectionery	0.18	-0.00	-0.14	D	D
25	Food products n.e.c.	-2.77	0.06	0.47	B	B

Table 2.3 (continued)

26	Soft drinks, cordials	0.42	0.00	0.04	A	A
27	Beer & Malt	0.46	0.00	0.04	A	A
28	Alcoholic drinks n.e.c.	0.11	-0.00	-0.18	D	D
29	Tobacco	0.48	0.00	-0.02	A	D
30	Prepared fibres	-2.11	0.01	0.40	B	B
31	Man-made fibres, yarn	-1.27	-0.14	1.27	C	B
32	Cotton, silk, flax	-1.05	-0.10	1.05	C	B
33	Wool & worsted yarns	0.09	-0.03	-0.17	D	D
34	Textile finishing	0.10	-0.02	0.08	D	A
35	Textile floor covers	0.89	-0.02	-0.82	D	D
36	Textile products n.e c.	-0.32	0.00	0.32	B	B
37	Knitting mills	-0.81	-0.10	0.81	C	B
38	Clothing	-0.03	-0.04	0.03	C	B
39	Footwear	-1.48	-0.18	1.48	C	B
40	Sawmill products	0.08	0.01	-0.09	A	D
41	Plywood, veneers	0.48	-0.01	-0.53	D	D
42	Joinery & wood products	0.65	0.00	-0.04	A	D
43	Furniture, mattresses	1.29	0.01	0.02	A	A
44	Pulp, paper	-0.20	0.00	-0.14	B	C
45	Fibreboard	-0.06	0.01	0.05	B	B
46	Paper products n.e.c.	0.14	0.00	-0.10	A	D
47	Newspapers & books	0.16	0.01	0.10	A	A
48	Commercial printing	0.25	0.00	-0.02	A	D
49	Chemical fertilisers	-1.36	0.03	0.23	B	B
50	Industrial chemicals	-0.96	-0.02	-0.75	C	C
51	Paints, varnishes	0.17	-0.01	-0.04	D	D
52	Pharmaceuticals	-0.01	0.01	0.02	B	B
53	Soap & detergents	0.92	0.01	0.12	A	A
54	Cosmetics, toiletry	0.89	0.01	0.04	A	A
55	Chemical prods n.e.c.	-0.43	-0.01	-0.54	C	C
56	Oil & coal products	0.01	0.01	0.07	A	A
57	Glass	0.08	-0.00	-0.08	D	D
58	Clay products	0.07	0.02	0.10	A	A
59	Cement	0.69	0.01	0.07	A	A
60	Ready-mixed concrete	0.84	0.00	0.07	A	A

Table 2.3 (continued)

61	Concrete products	0.82	0.00	0.06	A	A
62	Non-metal min. products	0.29	0.01	-0.10	A	D
63	Basic iron & steel	-2.92	0.06	0.62	B	B
64	Other basic metals	-2.20	0.05	0.41	B	B
65	Structural metal	0.61	0.01	0.05	A	A
66	Sheet metal products	0.44	0.00	-0.10	A	D
67	Metal products n.e.c.	0.05	-0.02	-0.57	D	D
68	Motor vehicles, parts	-0.62	-0.13	0.62	C	B
69	Ship & boat building	0.33	-0.00	-0.02	D	D
70	Locomotives	-0.14	0.01	0.05	B	B
71	Aircraft building	0.39	0.01	0.11	A	A
72	Scientific equipment	0.72	0.00	-0.00	A	D
73	Electronic equipmentt	0.40	-0.03	-1.05	D	D
74	Household appliances	1.08	-0.01	-0.53	D	D
75	Electrical machinery	0.07	0.00	-0.26	A	D
76	Agricultural machinery	-2.73	0.06	0.34	B	B
77	Construction equipment	-0.56	0.02	0.02	B	B
78	Other machinery	-0.17	0.00	-0.10	B	C
79	Leather products	-0.50	-0.06	0.21	C	B
80	Rubber products	0.01	-0.03	-0.63	D	D
81	Plastic products	0.10	-0.02	-0.41	D	D
82	Signs, writing equipment	0.27	-0.00	-0.19	D	D
83	Other manufacturing	0.50	-0.00	-0.23	D	D
84	Electricity	0.20	0.01	0.09	A	A
85	Gas	0.61	0.00	0.05	A	A
86	Water, Sewerage	0.03	0.01	0.06	A	A
87	Residential building	0.80	0.01	0.10	A	A
88	Building n.e.c.	0.86	0.00	0.05	A	A
89	Wholesale trade	0.19	0.01	0.13	A	A
90	Retail trade	0.86	0.01	0.11	A	A
91	Motor vehicle repair	0.72	0.01	0.08	A	A
92	Other repairs	0.47	0.01	0.20	A	A
93	Road transport	-0.10	0.01	0.11	B	B
94	Railway transport	-0.54	0.02	0.18	B	B

Table 2.3 (continued)

95	Water transport	-0.39	0.01	0.11	B	B
96	Air transport	0.64	0.01	0.14	A	A
97	Communication	0.29	0.01	0.09	A	A
98	Banking	0.30	0.01	0.08	A	A
99	Finance & life insurance	0.51	0.01	0.08	A	A
100	Other insurance	0.48	0.01	0.10	A	A
101	Investment, real estate	0.31	0.01	0.07	A	A
102	Other business services	0.24	0.01	0.09	A	A
103	Ownership of dwellings	0.00	0.00	0.00	A	A
104	Public administration	0.76	0.01	0.10	A	A
105	Defence	0.79	0.01	0.09	A	A
106	Health	0.94	0.01	0.11	A	A
107	Education, libraries	0.82	0.01	0.10	A	A
108	Welfare services	0.67	0.01	0.11	A	A
109	Entertainment	0.77	0.01	0.13	A	A
110	Restaurants, hotels	0.70	0.01	0.08	A	A
111	Personal services	0.83	0.01	0.11	A	A

(a) All projections are in percentage deviations from the value which the variable would have assumed in the absence of the shock shown at the head of the respective column.

(b) The quadrants are depicted in Figure 2.2.

affected by the resources boom, especially exporters. However, the size of the tariff reform, while being sufficiently large to constrain aggregate employment in the import competing sector, is not large enough to fully cancel the negative effects of the resources boom on the export or export-related industries. Hence the responses of these industries lie in the shaded region of quadrant B.[8]

Finally, there are the problem industries which experience contractions in output on account of both the resources boom and the tariff reform, i.e., industries whose responses would lie in quadrant C of Figure 2.2. Apart from industries 50 and 55 which barely qualify for inclusion in quadrant C, these fall into two groups. The first comprises substantial segments of the TCF sector, and the leather products industry, which sells almost exclusively to this sector. The TCF sector faces stiff import competition and, relative to manufacturing as a whole, is labour-intensive. The second group consists of the motor vehicles and parts industry, which also is very vulnerable to import competition. According to ORANI a one per cent decrease in the import price relative to the domestic price leads, at a given level of total demand for motor vehicles and parts, to an increase of about 2.4 per cent in import volume and a decline of about one per cent in the demand for the product of the local industry.

2.2 Tariff reform and the resources boom when employment levels in the TCF sector and the motor vehicles and parts industry are not allowed to fall

The annual tariff package with exemptions is given in column 2 of Table 2.1. In an appropriate index of the average tariff rate the weight on the exempt TCF and MV sectors is 66 per cent and the weight on the

non-exempt sectors is 34 per cent.[9] Using these weights the implicit cut in the average tariff in our package with exemptions is 4.42 per cent compared with the 0.58 per cent cut in the across-the-board package. On this basis we would expect the magnitude of the results in column 3 of Table 2.2 to be about 7½ times greater than those in column 2. For all but the employment results this proves to be an accurate expectation.

To explain the employment results, in the first two columns of Table 2.4 we have set out the elasticities of employment, in the import competing sector, in the TCF and MV industries alone, and in the economy as a whole, with respect to a uniform tariff change on the exempt commodities, and a uniform tariff change on the non-exempt commodities. In the first package, a 0.58 per cent tariff reduction on all sectors is imposed. In the second package there is a 15.83 per cent reduction in tariffs on the non-exempt sectors and an average 1.31 per cent increase in tariffs on the exempt sectors. (See Table 2.1. The 1.31 per cent average increase for the exempt sectors in the second package is calculated using the weights in appendix Table A.1.) the net employment outcomes under the two packages are reproduced in columns 3 and 4 of Table 2.4.

The tariff changes in the second package for the exempt (t_E = 1.31 per cent) and non-exempt (t_{NE} = -15.83 per cent) sectors can be thought of as the appropriate settings for these two instruments in achieving the two targets of a 0.02 per cent reduction in employment in the import competing sector as a whole and a 0.63 per cent increase in employment in the exempt sectors. These are the employment changes required to offset the effects of the resources boom shock.[10] The crucial parameters in solving this problem are the employment elasticities from the first two rows of Table 2.4.

TABLE 2.4 : EMPLOYMENT RESPONSES UNDER AN ACROSS-THE-BOARD TARIFF CUT AND A TARIFF PACKAGE WITH EXEMPTIONS

Employment in:	Elasticity of Employment Variable with respect to:		Net Short-Run Effect on Employment Variable[b] Under:	
	Average[a] tariff on TCF and MV	Average tariff non exempt commodities	Across-the-board tariff cut: $t_E = -0.58$ $t_{NE} = -0.58$	Tariff package with exemptions: $t_E = 1.31$ $t_{NE} = -15.83$
Import Competing Sector[c]	0.0307	0.0038	-0.02	-0.02
TCF and MV Sector[c]	0.2114	-0.0223	-0.10	0.63
Total Economy	-0.0074	-0.0095	0.01	0.14

(a) Average tariff changes were computed to reflect the relative weights assigned to commodities in the trade liberalization index set out in appendix Table A.1.

(b) Computed as the sum of each elasticity multiplied by the respective t_E and t_{NE} shocks.

(c) Calculated by weighting the employment responses in CRANI of industries in this sector according to the number of man hours employed in each industry. These weights were computed from data obtained in Tulpulé, Mannion and Strzelecki (1981).

The 2-instrument, 2-target problem may be written formally as:

(1) $$u_{IC} = .0307\ t_E + .0038\ t_{NE} \ ,$$

(2) $$u_E = .2114\ t_E - .0223\ t_{NE} \ ,$$

where u_{IC} and u_E are the percentage changes in employment in import competing and in the exempt industries, and t_{NE} and t_E are the uniform percentage tariff change on the non-exempt commodities and the average tariff change on the products of the seven exempt industries respectively. Solution of (1) and (2) for t_E and t_{NE} with u_{IC} set to -0.02 and u_E set to 0.63 gives a tariff cut in the non-exempt sector of -15.83 per cent and an average tariff increase in the exempt sector of 1.31 per cent. This solution is depicted in Figure 2.3.

The trade-off between t_E and t_{NE} in achieving the import competing employment target has a slope of:

(3) $$\left.\frac{t_{NE}}{t_E}\right|_{u_{IC}\ \text{const}} = -\frac{.0307}{.0038} = -8.08 \ ,$$

while the trade-off between these instruments in securing the employment target for the exempt industries is:

(4) $$\left.\frac{t_{NE}}{t_E}\right|_{u_E\ \text{const}} = \frac{.2114}{.0223} = 9.48.$$

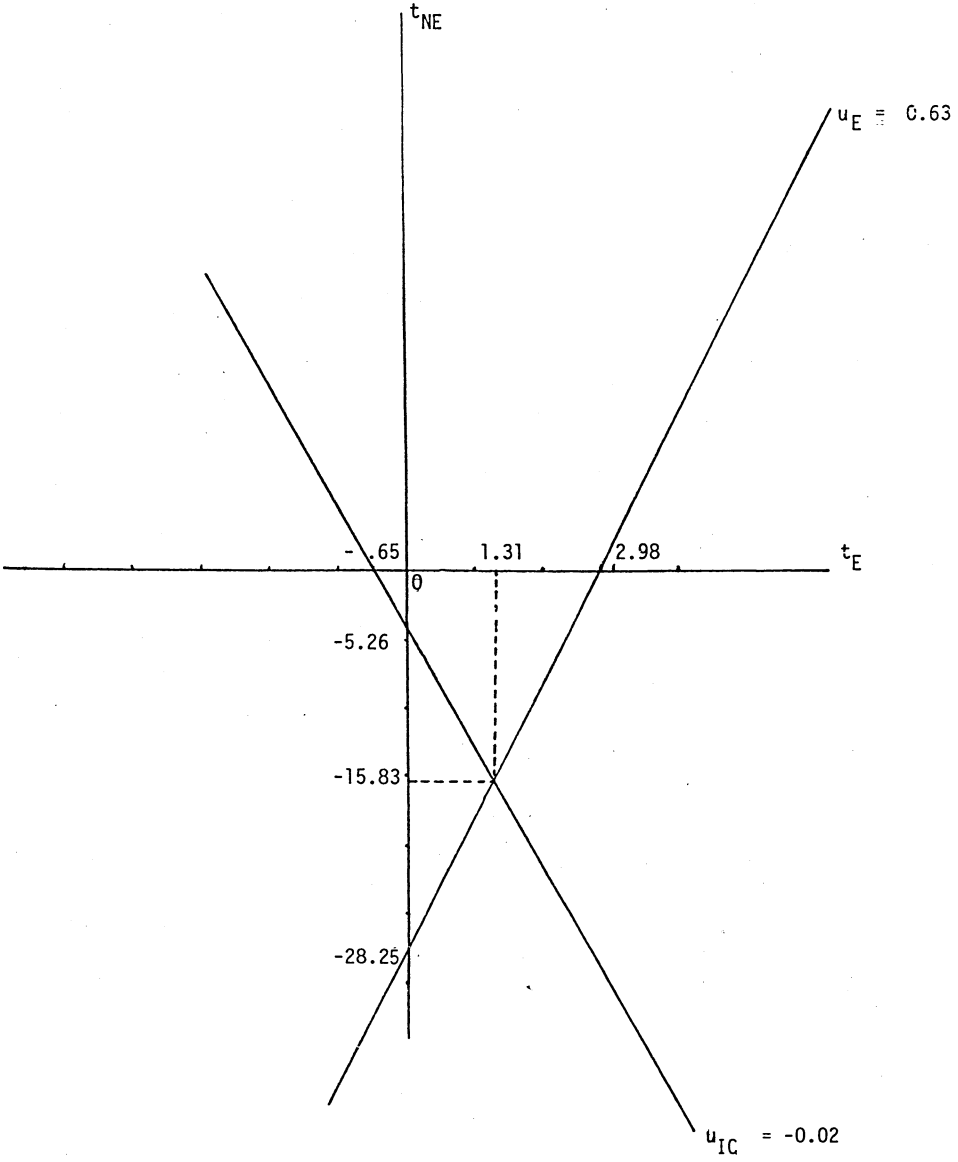

FIGURE 2.3: Trade-offs between the Two Tariff Instruments in Achieving the Two Targets in the Tariff Package with Exemptions

The trade-off (3) between the tariff instruments in maintaining a given change in employment in import competing indicates that to make up for a cut of one per cent in the average tariff on the exempt commodities, the uniform tariff elsewhere must be increased by 8.08 per cent. To understand this trade-off we must understand the elasticities in the first row of Table 2.4. There we see that a one per cent increase in average tariff levels on TCF and MV products is much more effective in creating employment within the import competing sector than is a one per cent increase in the tariffs on all remaining items within this sector. There are four features of the ORANI model and data base principally responsible for this:

(i) 27 per cent of import-competing employment is in the TCF and MV sectors.

(ii) High average tariff levels on TCF and MV products mean that a one per cent tariff change represents a relatively large change in the price of the domestic product relative to imports.

(iii) The substitution elasticities between domestic and imported goods in the ORANI parameter file are much higher for the TCF and MV sectors than for the rest of import competing.

(iv) The input-output linkages represented by the demands made by the TCF and MV sectors on the rest of the import competing sector are stronger than the reverse linkages.

When tariffs on TCF and MV products are increased, Australian customers will readily substitute the domestic product for imports (feature (iii)). This switching will cause a relatively large increase in demand for, and production of, the domestically produced goods. In these short-run simulations, capital stocks are taken as fixed. Thus this expansion in output in the TCF and MV sectors will occur via an increase in sectoral employment. Due to their high weight in employment within import competing (feature (i)), this expansion in the TCF and MV sectors will have a significant effect on employment in import competing as a whole. Finally, the position of the rest of the import competing sector as suppliers to the TCF and MV means that an increase in TCF and MV tariffs will in general increase demand for other import competing products (feature (iv)), even though the tariff increase has caused their production costs to rise. On the other hand, a tariff increase in the rest of import competing represents a production cost increase to TCF and MV industries which, because of their vulnerability to import competition, they are relatively poorly placed to pass on. Thus any tendency for tariffs on the rest of import competing products to stimulate employment demand within this sub-sector will be offset by employment losses in TCF and MV. The net effect of these four features is to produce the elasticities in row one of Table 2.4.

Trade-off (4) indicates that when the tariff on exempt commodities is increased by one per cent it is necessary to increase the tariff on the non-exempt commodities by 9.48 per cent if the percentage change in employment in the TCF and MV industries is to be held at any given level. To understand this we must understand the elasticities in the second row of

Table 2.4. As the TCF and MV sectors are sensitive to import competition (feature (iii)) the relatively large change in the price of their product relative to imports caused by a one per cent rise in their tariffs (feature (ii)) will generate a significant rise in the level of employment in these sectors. A large increase in the tariffs on the non-exempt commodities (9.48 per cent) is required to generate production cost increases in the TCF and MV sectors sufficient to cancel the employment benefit to them of the increase in their own tariffs.

So far we have discussed the elasticities in the first two rows of Table 2.4 and have rationalized the sizes of the tariff changes involved in the package with exemptions. We now turn our attention to the elasticities of economy-wide employment in the third row of Table 2.4, thus completing our explanation of the employment results.

A one per cent increase in the TCF and MV tariffs has roughly the same detrimental effect on economy-wide employment as a one per cent increase in the tariffs on the rest of import competing. Due to the rise that they generate in the domestic price level, increases in the TCF and MV tariffs are bad for employment in the export sector. Given the maintenance of real wages, the flow-on to production costs is sufficiently bad for employment in the export and export-related sectors to more than cancel the employment generating effects of the tariff increase in the import-competing sector. The net elasticity is small and negative (-.0074). Whilst an increase in the tariffs in the rest of import competing also generates domestic price level increases, these are relatively small (see feature (ii) above). Even small increases in costs, however, generate employment losses in those industries which are highly vulnerable to international

competition; in particular, in TCF, MV and exporting. On the other hand, tariff increases on the non-exempt commodities favour employment in the non-exempt import competing industries. The net effect again is a small negative elasticity (-.0095). These elasticities multiplied by the tariff shocks in the package with exemptions produce an increase in aggregate employment of 0.14 per cent.

The short-run industry output responses to the annual tariff package with exemptions are given in column 3 of Table 2.3 above. It can be seen from Table 2.3 that 69 out of 111 industries experience a net increase in output. Again the export and export-related industries are only partially compensated by the tariff rate changes for the effects of the resources boom ; i.e., no export or export-related industry output response would lie in the unshaded area of quadrant B of Figure 2.2.[11] Note that the outputs of the industries in the TCF and MV sector which experienced a net contraction under the resources boom and the across-the-board tariff reform of subsection 2.1, do not change under the second resources-boom|tariff-reform package. The tariff in the second package were chosen to give effects on activity in the TCF and MV industries exactly offsetting the effects of the resources boom. In terms of Figure 2.2, these industries would now lie along the broken line in quadrant B.

3. CONCLUDING REMARKS

Broadly speaking the balance of payments effects of a resources boom will be an increase in the size of the domestic economy with an acceleration in domestic inflation and/or an appreciation of the nominal exchange rate. In spite of the problems for several import competing industries posed by the boom, its net effect will be to the advantage of the import competing sector as a whole, but to the disadvantage of the export sector. Therefore there are two strong arguments in favour of timing a tariff reform to coincide with the resources boom:

- firstly, in order to exploit the opportunity provided by the expanding economy to accommodate more easily the necessary structural changes in the import competing sector associated with tariff reform; and

- secondly, to soften the deleterious impact of the resources boom on the cost/price situation faced by the traditional export sector.

If the economically inevitable scaling-down of some prominent industries in the textile, clothing and footwear sector and the motor vehicle and parts industry is not politically acceptable and additional protection is given to them, then these industries may be insulated for the moment, but only at the expense of other industries. The consequences of such a policy, however, will be to make the specially protected sector even less internationally efficient and probably less amenable to the accommodation of future pressures for structural change. Thus although it may be

possible to insulate these industries temporarily, this approach could only be implemented year by year throughout the course of a resources boom at steadily escalating cost. The end result would be the creation of a highly fossilized sector of industry unknown in comparable countries except in technological museums. Whereas such a policy in the small might be linked to tourism -- witness the success of the Sovereign Hill gold mining museum at Ballarat -- it does not seem to offer much as a strategy for national industrial development.

Finally we repeat that the case for tariff reform is essentially independent of the structural changes occuring in the economy. However, if in the policy debate on tariff reform timing is a central issue, then our analyses provides a method for accessing the scope for tariff reform (or lack of it) created by structural pressures occuring elsewhere in the economy.

APPENDIX : TECHNICAL DETAILS OF THE ORANI SIMULATION

The simulations reported in this paper were computed using the ORANI model with the 1974/75 data base[12] and the 1980/81 nominal tariff rates given in Table A.1. A list of the exogenous variables in the ORANI simulations is contained in Table A.2. The endogenous export commodities and the reciprocals of their export demand elasticities are reported in Table A.3. Wages were fully indexed to the ORANI consumer price index in all simulations. To ensure that the domestic price of crude oil followed that of the imported price the elasticity of substitution between domestic and foreign oil was set at 100.0. All other elasticities assumed the values listed in Table 29.2 of DPSV (1982).

Commodity Weights for the Trade Liberalization Index

Following Dixon, Parmenter and Powell (1983), we measure the average tariff (i.e., the level of deviation from free trade) by:

$$(A1) \qquad T = \sum_{j=1}^{115} V_j T_j \ ,$$

where V_j is the weight given to protection of commodity j and T_j is the tariff rate on j. We require the V_js to sum to one.

In assigning values for the V_js, we require indicators of the extent to which trade is restricted per percentage point of each tariff. A suitable indicator for the j^{th} tariff can be obtained from the ORANI model by examining the projected effect on the imports of all commodities of a one percentage point decrease in the tariff on commodity j. Thus, we set the V_js according to :

TABLE A.1 : COMMODITY WEIGHTS FOR TRADE LIBERALIZATION INDEX AND 1980/81 NOMINAL TARIFFS

ORANI Commodity Number	Commodity	Weight for Trade Liberalization Index [a]	1980/81 Nominal Tariff Rate [b]
18	Meat Products	.0000	.35
19	Milk Products	.0005	1.76
20	Fruit & Veg Products	.0043	10.21
21	Margarine, Oils & Fats	.0054	10.05
22	Flour & Cereal Prods	.0001	1.99
23	Bread, Cakes, Biscuits	.0003	2.60
24	Confectionery	.0027	14.60
25	Food Products n.e.c.	.0010	3.79
26	Soft Drinks, Cordials	.0001	5.19
27	Beer and Malt	.0000	13.61
28	Alcoholic Drinks n.e.c.	.0019	11.13
29	Tobacco	.0011	17.57
30	Prepared Fibres	.0000	.35
31	Man-Made Fibres, Yarn	.0149	46.67
32	Cotton, Silk, Flax	.0206	33.20
33	Wool & Worsted Yarns	.0005	35.54
34	Textile Finishing	.0000	56.93
35	Textile Floor Covers	.0076	26.23
36	Textile Products n.e.c.	.0054	13.74
37	Knitting Mills	.0444	53.81
38	Clothing	.0605	68.65
39	Footwear	.0638	56.63
40	Sawmill Products	.0057	5.16
41	Plywood, Veneers	.0036	20.16
42	Joinery & Wood Prods	.0033	12.14
43	Furniture, Mattresses	.0032	14.02
44	Pulp, Paper	.0024	7.01
45	Fibreboard	.0022	19.28
46	Paper Products n.e.c.	.0023	12.88
47	Newspapers, Books	.0020	2.11
48	Commercial Printing	.0051	21.54
49	Chemical Fertilizers	.0002	1.10
50	Industrial Chemicals	.0188	11.63
51	Paints, Varnishes	.0017	12.99
52	Pharmaceuticals	.0037	5.18
53	Soap & Detergents	.0007	10.67
54	Cosmetics, Toiletry	.0009	16.83
55	Chemical Prod n.e.c.	.0078	13.75
56	Oil & Coal Products	.0026	5.93
57	Glass	.0014	5.75
58	Clay Products	.0016	4.48

TABLE A.1 (continued)

ORANI Commodity Number	Commodity	Weight for Trade Liberalization Index[a]	1980/81 Nominal Tariff Rate[b]
59	Cement	.0000	2.45
60	Ready-Mixed Concrete	.0000	0.00
61	Concrete Products	.0000	6.65
62	Non-Metal Min. Prods	.0019	11.05
63	Basic Iron & Steel	.0149	9.18
64	Other Basic Metals	.0011	5.45
65	Structural Metal	.0020	19.02
66	Sheet Metal Products	.0044	25.56
67	Metal Products n.e.c.	.0397	18.77
68	Motor Vehicles, Parts	.4527	48.76
69	Ship & Boat Building	.0016	8.64
70	Locomotives	.0006	25.77
71	Aircraft Building	.0002	1.22
72	Scientific Equipment	.0025	10.64
73	Electronic Equipment	.0459	22.20
74	Household Appliances	.0313	21.83
75	Electrical Machinery	.0187	11.23
76	Agricultural Machinery	.0033	14.00
77	Construction Equipment	.0061	24.64
78	Other Machinery	.0262	16.46
79	Leather Products	.0012	9.29
80	Rubber Products	.0108	28.58
81	Plastic Products	.0211	22.54
82	Signs, Writing Equipment	.0016	16.93
83	Other Manufacturing	.0075	17.96

(a) These weights are calculated from equation (A4).

(b) Quantitative restrictions are expressed in terms of tariff equivalents.

$$(A2) \qquad V_j = \frac{(\sum_i \eta_{ij} M_i)/T_j}{\sum_\ell \sum_i (\eta_i M_i)/T_\ell} ,$$

where η_{ij} is the elasticity of the volume of imports of commodity i with respect to the tariff on commodity j. The η_{ij} were computed from the ORANI model in neo-classical short-run mode with aggregate employment and the balance of trade set exogenously. Thus the V_js reflect the trade destroying potential of a one percentage point increase in each of the tariffs. The M_i are base-period import volumes expressed in 1974/75 dollars.

Note that (A1) and (A2) imply that

$$(A3) \qquad t = \sum_i W_i t_i ,$$

$$\text{where (A4)} \qquad W_i = \sum_k \eta_{ki} M_k / \sum_j \sum_k \eta_{kj} M_k ,$$

and t and t_i are percentage changes in T and T_i. Formula (A3) was used in our computations. The numerical values of the non-zero weights W_i are shown in Table A.1.

The Estimation Procedure for the Year-by-Year Tariff Rate Changes

The size of the year-by-year across-the-board tariff reform in section 2, subject to the constraint that aggregate employment in the import competing sector remain unchanged, was computed as follows.

The first equation required gives the effects on aggregate employment in the import competing sector of the exogenous change in the balance of trade:

$$(A5) \qquad u_{IC} = \left[\sum_{\ell \in IC} S_\ell \, \eta_{u_\ell, \Delta B}\right] \cdot \Delta B \ ,$$

where IC stands for the set of industries in the import competing sector; u_{IC} is the percentage change in aggregate employment in the import competing sector; S_ℓ is the number of man hours in industry ℓ (obtained from Tulpulé et al. (1981)) expressed as a fraction of all man hours in the import competing sector; $\eta_{u_\ell, \Delta B}$ is the semi-elasticity of employment in industry ℓ with respect to the change (in dollars) in the balance of trade under the closure of the ORANI model described in Table A.2., and ΔB (a negative number) is the 'as-if' deterioration in the balance of trade which could be financed by the new export income generated by the resources boom in a typical year. Once the effect of the resources boom on aggregate employment in the import competing sector is known, it is then necessary to compute the effects of the year-by-year across the board tariff cut:

$$(A6) \qquad u_{IC} = \left[\sum_j \sum_{\ell \in IC} S_\ell \, \eta_{u_\ell, t_j}\right] \cdot t \ ,$$

where η_{u_ℓ, t_j} is the elasticity of employment in industry ℓ with respect to a change in the tariff rate on the j^{th} commodity (under the closure of Table A.2) and t is the annual across-the-board tariff change. It is now possible to compute t, such that aggregate employment in the import competing sector remains unchanged, by setting the RHS of equation (A5) equal to minus the RHS of equation (A6) and solving for t. The solution is a 0.58 per cent annual across-the-board tariff cut.

The computation of the year-by-year tariff rate changes for

TABLE A.2 : THE EXOGENOUS VARIABLES IN THE ORANI SIMULATIONS

Variable	Subscript Range	Number	Description
$p^m_{(i2)}$	i=1,...,g.	g	C.i.f. foreign currency import prices
t(i2,0), v(i2,0)	i=1,...,g.	2g	Tariff terms
t(is,jk), v(is,jk)	i=1,...,g, s,k=1,2, j=1,...,h.	8g	Ad valorem and specific sales-tax terms
t(is,3), v(is,3)	i=1,...,g, s=1,2.	4g	
v(i1,4)	$i \in G$. [(a)]	g	Selection of specific export-tax terms and complementary selection of export volumes
$x^{(4)}_{(i1)}$	$i \notin G$. [(a)]		
t(i1,4)	i=1,...,g.	g	Ad valorem export tax terms
a's (excluding a(j))	subscript ranges can be read from Table 23.2	$4g^2h + 5g^2 + 7gh + Mh + 8h + 3g + \sum_{j=1}^{h} N(j)$	Technological change and changes in household preferences
$k_j(0)$	j=1,...,h.	h	Current capital stocks
ΔB		1	The balance of trade
f_R		1	The ratio of real private investment expenditure to real household consumption expenditure
n_j	j=1,...,h.	h	Use of agricultural land in each industry
$f^{(1)}_{(g+1,1)}$		1	Wage shift variables
$f^{(1)}_{(g+1,1,m)}$	m=1,...,M.	M	
$f^{(1)}_{(g+1,1)j}$	j=1,...,h.	h	
$f^{(1)}_{(g+1,1,m)j}$	m=1,...,M, j=1,...,h.	Mh	

.... continued

Table A.2 continued ....

Variable	Subscript Range	Number	Description
$f^{(5)}_{(is)}$	i=1,...,g, s=1,2.	2g	"Other" demand shift terms
$f^{(2)}_{j}$	$j \notin J$. (b)	h-J*	Exogenous investment
$f^{e}_{(i1)}$	i=1,...,g.	g	Shifts in foreign export demands
$f^{(1)}_{g+2,j}$	j=1,...,h.	h	Shifts in the price of "other cost" tickets
q		1	Number of households
ϕ		1	The exchange rate, \$A per \$US, say

$$\text{Total} = 4g^2h + 5g^2 + 15gh + 2Mh + 13h + 15g + M + \sum_{j=1}^{h} N(j) + 5\text{-}J^* = 6{,}244{,}004 \quad \text{(c)}$$

(a) G is the set of commodities for which export demands are determined endogenously. The set G, together with the reciprocals of the export demand elasticities, is listed in Table A.3.

(b) J is the set of industries for which investment is endogenous. The set $j \notin J$, for which investment is exogenous, consists of industries 17, 84, 85, 86, 103, 104, 105, 106, 107, 108, 112 and 113. Industries 112 and 113 are respectively business expenses and non-competing imports, which are both accounting dump industries. For a key to the other industry numbers refer to Table 2.3.

(c) For the ORANI simulations reported;

g (the number of commodities) = 115,

h (the number of industries) = 113,

M (the number of occupations) = 9, and

J*(the number of industries for which investment is endogenous) = 101.

TABLE A.3. : COMMODITIES FOR WHICH EXPORT DEMANDS ARE DETERMINED ENDOGENOUSLY, AND THE RECIPROCALS OF THEIR EXPORT DEMAND ELASTICITIES

Commodity Number	Commodity	Reciprocal of the Export Demand Elasticity
A1	Wool	0.77
A3	Wheat	0.08
A4	Barley	0.05
A5	Other cereal grains	0.05
12	Iron	0.10
13	Other metallic minerals	0.13
14	Coal	0.05
18	Meat products	0.10
22	Flour and cereal products	0.05
25	Food products n.e.c.	0.05
30	Prepared fibres	0.38
63	Basic iron and steel	0.05
64	Other basic metals	0.10

section 3 is slightly more complicated as there are additional constraints; namely, that the employment levels of selected industries in the TCF and MV sector are to be unchanged. The instruments to enforce these constraints, and the constraint of unchanged aggregate employment in the import competing sector as a whole, are tariff rate changes on imported commodities of the type produced by the selected industries, and an across-the-board tariff rate change on all other commodities.

To compute the values of the instruments to enforce the above constraints the following method was used. First the closure of the ORANI model, shown in Table A.2, was changed such that the employment levels of the selected industries were exogenous and their respective tariffs endogenous. Under this closure the constraint that the employment levels of selected industries are to be unchanged is easily enforced by simply setting these variables exogenously and allowing the model to compute the appropriate changes in their tariffs. The year-by-year effects of the resources boom and the across-the-board tariff rate changes in all non-exempted commodities on aggregate employment is given by:

$$(A7) \qquad u_{IC} = \left[\sum_{\ell \in IC} S_\ell \, {}^{\eta}u_{\ell,\Delta B}\right].\Delta B + \left[\sum_{j \notin E} \sum_{\ell \in IC} S_\ell \, {}^{\eta}u_{\ell,t_j}\right].t_{NE} \ ,$$

where E stands for the set of selected exempt commodities; ${}^{\eta}u_{\ell,\Delta B}$ and ${}^{\eta}u_{\ell,t_j}$ are now computed under the closure with the outputs of the exempt industries exogenous; the t_{NE} is the across-the-board tariff rate change on all non-exempt commodities. By setting u_{IC} in equation (A7) to zero as required by the constraint, it is possible to solve for t_{NE}. The solution is a 15.83

per cent annual across-the-board tariff cut in all non-exempt commodities. The tariff rate changes on the exempt commodities can now be computed by running an ORANI simulation (using the closure just described) with the outputs of the exempt industries set to zero change, a 15.83 per cent across-the-board tariff cut in all non-exempt commodities and a change in the balance of trade of -0.35 $billion (1974/5 prices). This method produced the tariff rate changes listed in Table 2.1. The results presented in Tables 2.2 and 2.3 were computed by an ORANI simulation with the closure shown in Table A.2 with the tariff rate changes in Table 2.1 and $\Delta B = -0.35$ as the exogenous shocks.

NOTES

1. We are grateful for helpful comments on an earlier draft by an anonymous referee.

2. This assumption is especially reasonable if the additional mining machinery required to meet the resources boom is imported.

3. Industries of the TCF sector involved are 31, 32, 36-39 (see Table 2.3). These are the parts of the TCF sector that contract due to the indirect effects of the mining boom.

4. See Table 2.2. In this study the import competing sector is defined as all of manufacturing less those industries whose exports are modelled endogenously in ORANI or whose commodities have an import share less than 0.01 in the data base. Industries 19-21, 23, 24, 28, 29, 31-33, 35-59, 62, 65-83 satisfied the above criteria for inclusion in the import competing sector. For a key to industry numbers refer to Table 2.3.

5. This represents 5.83 per cent of projected GNP at the end of the 'eighties and therefore is roughly equivalent to Johns' (1981) estimate of about 5 per cent.

6. The ORANI short-run is defined as a period during which industry-specific capital stocks can be regarded as exogenous. Its calendar equivalent has been estimated to be about 2 years (Cooper (1983)).

7. Note that in a short-run simulation the percentage change in output (z_j) in industry j is proportional to the percentage change (u_j) in employment, i.e.,

$$z_j = S_{Lj}\, u_j ,$$

where S_{Lj} is the share of wages in value added.

8. Because the direct effects of the resources boom on the mining industries and their suppliers have not been modelled, the output responses of these industries reflect only the indirect effects. Of course, had the direct effects been modelled the major participating industries would have experienced a net increase in output due to the resources boom. However as the direct effects would induce increases in demand, thus generating a higher rate of domestic inflation than would otherwise have been the case, the net effect of the resources boom on the other industries in the export and export related sectors would be even more negative.

9. The index reflects the importance of the commodity-specific tariff rates in restricting aggregate trade. The index weights and a description of how they were computed are contained in the appendix Table A.1.

10. The simplifications involved in this way of viewing the problem are that we have substituted a weighted average of industry employments as a scalar target for the vector target of seven exempt industry employments actually simulated by ORANI; and we have substituted a scalar instrument (namely, the weighted average percentage tariff rate change for these seven industries) for the vector of seven rates actually used as instruments in the ORANI computations. Nevertheless, the essential mechanisms are preserved.

11. Again note that the direct effects of the resources boom have not been modelled.

12. Australian Bureau of Statistics (1981).

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