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

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



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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, Vincent and Sutton (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 (Dixon, Parmenter, Sutton and Vincent (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. Against the gloomy international outlook of mid 1982, 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.

introduces some linearization errors, but in the current context, they are not likely to be large enough to distort the qualitative results emerging. For a discussion of linearization errors in ORANI see Dixon et al. (1982, chapters 2 and 5) and Rimmer (1981).<sup>1</sup>

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1. Rimmer, R. (1981), "Elimination of Linearization Errors which Arise in the Solution of a General Equilibrium Model Using Johansen's Approximation", IMPACT Preliminary Working Paper, No. OP-53, August 1981.

a generalization of equation (2):

$$U.C. = \left[ \sum_{j \in S.C.} \sum_{k \in I.C.} S_{\ell}^{\ell} \eta_{\ell, t_j} \cdot t_j \right] + \left[ \sum_{j \in S.C.} \sum_{k \in I.C.} S_{\ell}^{\ell} \eta_{\ell, t_j} \right] t, \quad (3)$$

where S.C. stands for the set of selected commodities;  $t_j$  are the year-by-year changes in tariff rates on the selected commodities and  $t$  is the year-by-year across-the-board tariff rate changes on all other commodities. Suppose "D" industries are selected for special protection. It is now possible to constrain aggregate employment in the import competing sector to remain unchanged by setting the R.H.S. of equation (1) equal to minus the R.H.S. of equation (3). However it is not possible to solve for  $t_j$  and  $t$  just yet as there are  $(b + 1)$  unknowns with only 1 equation so far. The additional required equations come from the constraint of fixing selected industry outputs:

$$z_{\ell} = \left[ \eta_{z_{\ell}, \Delta B} \cdot \Delta B \right] + \left[ \sum_{j \in S.C.} \eta_{z_{\ell}, t_j} \cdot t_j \right] + \left[ \sum_{j \notin S.C.} \eta_{z_{\ell}, t_j} \right] t \quad (\ell = 1, \dots, b), \quad (4)$$

where  $z_{\ell}$  is the percentage change in output of selected industry  $\ell$ ;  $\eta_{z_{\ell}, \Delta B}$  is the elasticity of industry  $\ell$ 's output with respect to a change in the balance of trade and  $\eta_{z_{\ell}, t_j}$  is the elasticity of industry  $\ell$ 's output with respect to a change in the  $j$ th commodity's tariff rate. By setting  $z_{\ell}$  in equation (4) to zero as required by the constraint, it is now possible to solve for  $t_j$  and  $t$  as there are  $(b + 1)$  unknowns with  $(b + 1)$  equations. The solutions to the  $t_j$ 's and  $t$  are given in the first column of Table 5.1. Note that in this method the various elasticities are treated as constants. This

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 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 now 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 their suppliers is assumed to be small compared with the indirect effect of the additional foreign exchange earnings of the resources boom<sup>2</sup> (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 (Dixon et al. (1982)) 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

industry  $\ell$ , which is an import competing industry, as a fraction of all the man hours in the import competing sector;  $\eta_{u_{\ell}, \Delta B}$  is the elasticity of employment in the industry  $\ell$  with respect to a change in the balance of trade and  $\Delta B$  is the change in the balance of trade caused 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:

$$u_{I.C.} = \left[ \sum_{\ell \in I.C.} S_{\ell} \eta_{u_{\ell}, t} \right] t, \quad (2)$$

where  $\eta_{u_{\ell}, t, j}$  is the elasticity of employment in industry  $\ell$  with respect to a change in the tariff rate on the  $j$ th commodity and  $t$  is the annual across-the-board tariff cut. It is now possible to compute  $t$ , such that aggregate employment in the import competing sector remains unchanged, by setting the R.H.S. of equation (1) equal to minus the R.H.S. of equation (2) and solving for  $t$ . The solution is a 1.53 per cent annual across-the-board tariff cut.

The computation of the year-by-year tariff rate changes for section 3 is slightly more complicated as there are additional constraints; namely, that the outputs of selected industries in the TCF sector and the motor vehicles and parts industry 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.

The year-by-year effect of the resources boom on aggregate employment in the import competing sector is again given by equation (1), and the effect of the tariff rate changes is simply



TABLE A.2. : COMMODITIES FOR WHICH EXPORT DEMANDS ARE DETERMINED  
ENDOGENOUSLY, AND THE RECIPROCALLS 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

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<sup>3</sup> has been used 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. Section 3 contains an analysis of the effects of an additional constraint, namely that the outputs 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 industry and parts of the textile, clothing and footwear (TCF) sector. Brief concluding remarks are contained in section 4 and the technical details of the ORANI simulations are given in the Appendix.

Table A.1 continued . . . .

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

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

(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.2.

(b) J is the set of industries for which investment is endogenous. The set  $j \in J$ , 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 2.2.

(c) For the ORANI simulations reported:

$$\begin{aligned} g \text{ (the number of commodities)} &= 115, \\ h \text{ (the number of industries)} &= 113, \\ M \text{ (the number of occupations)} &= 9, \text{ and} \\ J^* \text{ (the number of industries} \\ &\text{for which investment is} \\ &\text{endogenous)} &= 101. \end{aligned}$$

TABLE A.1 : THE EXOGENOUS VARIABLES IN THE ORANI SIMULATIONS

Variable	Subscript Range	Number	Description
$p_{(12)}^m$	$i=1, \dots, g.$	$g$	C.i.f. foreign currency import prices
$t_{(12,0)}$ , $v_{(12,0)}$	$i=1, \dots, g.$	$2g$	Tariff terms
$t_{(is,jk)}$ , $v_{(is,jk)}$	$i=1, \dots, g,$ $s, k=1, 2,$ $j=1, \dots, h.$	$8g$	Ad valorem and specific sales-tax terms
$t_{(is,3)}$ , $v_{(is,3)}$	$i=1, \dots, g,$ $s=1, 2.$	$4g$	Ad valorem and specific sales-tax terms
$v_{(11,4)}$	$i \in G.$ } (a)	$g$	Selection of specific export-tax terms and complementary selection of export volumes
$x_{(11)}^{(4)}$	$i \notin G.$ }		
$t_{(11,4)}$	$i=1, \dots, g.$	$g$	Ad valorem export tax terms
$a$ 's (excluding $a(j)$ )	subscript ranges can be read from Table 23.2, Dixon et al. (1982)	$4g^2h + 5g^2 + 7gh + Mh$ $+ 8h + 3g + \sum_{j=1}^h N(j)$	Technological change and changes in household preferences
$k_j(0)$	$j=1, \dots, h.$	$h$	Current capital stocks
AB		1	The balance of trade
$F_R$		1	The ratio of real private investment expenditure to real household consumption expenditure
$n_j$	$j=1, \dots, h.$	$h$	Use of agricultural land in each industry
$f_{(g+1,1)}^{(1)}$	$m=1, \dots, M.$	1	
$f_{(g+1,1)}^{(1)}$	$j=1, \dots, h.$	$h$	
$f_{(g+1,1,m)}^{(1)}$	$m=1, \dots, M,$ $j=1, \dots, h.$	$Mh$	Wage shift variables

.... continued

## 2. ACROSS-THE-BOARD 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.<sup>4</sup> It is this additional employment demand generated by the resources boom within the import competing sector that creates some scope for general tariff reform. The overall level of employment in the sector as a whole can be stabilized by timing the tariff reform to occur concurrently with the effects of the resources boom. This is not to say that the additional jobs in the import competing sector induced by the resources boom would be lost to the economy. Rather the reduction of tariff levels in the import competing sector would simply redistribute these jobs towards the relatively more efficient export and non-traded goods sectors.

Above we have noted that Johns (1981) estimates the additional net foreign exchange earnings from the resources boom to flow at an annual rate equivalent to about five per cent of GNP by the end of the eighties. In this paper we have worked on a slightly more optimistic estimate of just under six (i.e., 5.83) per cent. In terms of the pre-mining boom economy, this is equivalent to creating the scope to run an annual deficit in the balance of trade of 0.35 billion Australian dollars (at 1974-75 prices).

The projections reported in this paper are to be interpreted as the year-by-year effects on the domestic economy as a result of the respective tariff reforms and of the additional foreign exchange earnings of the resources boom.<sup>5</sup> They are designed to capture structural impacts;

i.e., they refer to the additional pressures exerted in year  $t$  (as a result of the respective tariff reforms and the resources boom) over those existing in year  $(t-1)$ , where years  $t$  and  $(t-1)$  are typical years of the resources boom/tariff reform epoch. To compute the total effects over the decade projected, one simply accumulates the year-by-year effects in a compound fashion for ten years.<sup>6</sup>

Our projection method consists essentially of viewing the decade ahead as a series of short runs. Within each of these, the capital stocks of all industries are assumed to remain unresponsive to the shocks under consideration. Notionally (though strictly speaking, not in the model itself<sup>7</sup>) each short run period begins with a clean slate; i.e., the adjustments in capital required by last period's shocks are treated as if they take place instantaneously at the interface of two short run periods. We therefore focus on additional pressures in each period on the implicit assumption that last period's shocks have been accommodated. Although the ORANI short-run is estimated to be about two years (Cooper and McLaren (1980)), to simplify presentation all results have been expressed as the equivalent annual rates.

These simulations have been made on the slack labour market assumption; namely, that wage costs move in line with the consumer price index, so that in a typical year 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 the respective tariff reforms and/or the resources boom. In the opinion of the director of the Bureau of Labour Market Research :

#### APPENDIX : TECHNICAL DETAILS OF THE ORANI SIMULATIONS

This appendix contains : (i) a list of the exogenous variables in the ORANI simulations together with the endogenous export commodities and the reciprocals of their export demand elasticities; and (ii) an explanation of the estimation procedure for the year-by-year tariff rate changes.

##### List of Exogenous Variables

Table A.1 contains a list of the exogenous variables in the ORANI simulations.

Table A.2 contains a list of the commodities for which export demands are determined endogenously, and the reciprocals of their export demand elasticities.

##### 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 remains 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 :

$$u^{I.C.} = \left[ \sum_{\ell \in I.C.} S_{\ell} \eta_{\ell} \right] \cdot \Delta B \quad (1)$$

where  $I.C.$  stands for the set of industries in the import competing sector;  $u^{I.C.}$  is the percentage change in aggregate employment in the import competing sector;  $S_{\ell}$  is the number of man hours in

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"The review of recent labour market conditions in three 'development' States has concluded, somewhat implicitly, that with selective and effective intervention of different agencies the markets can adjust to, and accommodate the labour pressures emerging from resource developments." (Fisher (1981, p. 21)).

Given the current conditions of unemployment in Australia, slack labour markets would appear to be the appropriate assumption to make.

The 'as if' value of the balance of trade is exogenous in these simulations. It is set to a deficit of \$A0.35 (1974-75) billion, which (as explained above) is loosely based on estimates by Johns (1981). Thus the component of GDP affected by the respective tariff reforms and/or resources boom in these simulations 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.

The nominal exchange rate is exogenous and has been set to zero change. Changes in the domestic price level are therefore to be interpreted as changes in domestic prices relative to world prices. ORANI does not claim to be able to 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 by a change in the domestic price level. Thus we could have set the CPI exogenously and allowed the nominal exchange rate to vary endogenously without affecting any of the results reported. To put the point slightly differently, only

the 'real' exchange rate matters in ORANI. The percentage change in the real exchange rate is by definition the percentage change in the nominal exchange rate minus the percentage change in the CPI<sup>8</sup>. The relative sizes of these latter two components of the real exchange rate are the subject of macroeconomic modelling and are not determined in ORANI.

The size of the across-the-board tariff cut that, given the conditions created by the resources boom, would keep aggregate employment in the import competing sector unchanged, was estimated as 1.53 per cent for a typical year of the 1980's resources boom.<sup>9</sup> The accrued effect at the end of the projected resources boom is approximately a 14 per cent across-the-board tariff cut. The projected year-by-year effects of this across-the-board tariff cut and of the resources boom on selected macroeconomic variables are given in Table 2.1.

The first thing to note in Table 2.1 is that the annual effect of the across-the-board tariff reform on aggregate employment in the import competing sector is equal and opposite to the annual effect of the resources boom, reflecting the constraint built into the simulations.

The resources boom, in a typical year, is projected to cause a real increase in consumption and investment. Some of this increase in demand is met by local production; aggregate employment, both economy-wide and in the import competing sector, is projected to increase marginally. The increase in demand causes a rise in the price level and as wage costs are assumed to be fully indexed to consumer prices, there is a subsequent flow-on into wages and back into prices, etc.. The end result is that the consumer price index grows 2.27 per cent per annum faster than it would

### NOTES

1. The authors are very grateful to Brian R. Parmenter who initially suggested the ORANI experiments here reported, and to John Sutton who carried out the computations. Brian Parmenter, John Sutton, Tony Lawson and Ron Tiliack participated in the preliminary clarification of ideas. All views and errors are the responsibility of the authors only.
2. This assumption is especially reasonable if the additional mining machinery required to meet the resources boom is imported.
3. For the simulations reported here the ORANI 78 version (Dixon et al., 1982) of the model was used, incorporating detailed information from the 1974-75 National Input-Output Tables, with the nominal tariff rates updated using 1977-78 data supplied by the Industries Assistance Commission.
4. See Table 2.1. Industries 21, 24, 28, 29, 31-46, 48-50, 52-55, 57, 58, 62, 65-69 and 71-83 constitute the import competing sector in this study. This list differs only slightly from that adopted by Dixon et al. (1982, pp. 300-303) who include also industries 16, 47, 56 and 96. For a key to the industry numbers refer to Table 2.2.
5. As stated above, the direct effects of the resources boom on the mining industry itself and their suppliers is assumed to be small compared with the indirect effect of the additional foreign exchange earnings generated, and only the indirect effects of the resources boom have been modelled.
6. A preferred alternative simulation methodology for long-run simulations is the 'snapshot' approach in which a single future year is projected on the assumption that the initial shock introduces disturbances into rates of return which are subsequently eliminated by the growth of some industries and the (relative or absolute) decline of others. Operational versions of this methodology are currently available only for a small ORANI prototype (Dixon, Parmenter and Rimmer (1981)). For a fuller discussion of the projection methodology adopted in the current paper, and of the alternatives, see Dixon, Parmenter and Sutton (1978).
7. In these simulations we ignore the second-order effects which would be induced by updating the initial conditions to reflect changes in the relative sizes of industries and in import, cost, and sales shares. For a general treatment of the likely magnitude of such approximation errors, see Dixon et al. (1982, pp. 204-244).
8. Strictly speaking, the percentage change in world prices should be added. The maintained assumption in this paper is that the Australian mining boom does not generate, nor is generated by, world inflation.
9. See Appendix for technical details.
10. Again note that the direct effects of the resources boom have not been modelled.

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 as an economic strategy -- witness the success of Sovereign Hill at Ballarat -- it does not seem to offer much as national industrial development policy.

TABLE 2.1 : PROJECTED YEAR-BY-YEAR EFFECTS ON SELECTED  
MACROECONOMIC VARIABLES OF THE 1980'S  
RESOURCES BOOM AND AN ACROSS-THE-BOARD  
TARIFF REFORM(a)

Macroeconomic Variable	Annual Effect of the Resources Boom (In a Typical Year ABT = -\$40.35 (1974-75) Billion) (b)	Annual Effect of a Year-by-Year Across-the-board Tariff Cut of 1.53 %
Consumer Price Index	2.27	-0.13
Aggregate Imports (foreign exchange)	1.79	0.11
Aggregate Exports (foreign exchange)	-1.90	0.11
Aggregate Real Investment	0.98	0.01
Aggregate Real Consumption	0.98	0.01
Aggregate Employment (persons)	0.39	0.01
Aggregate Employment in the Import Competing Sector	0.09	-0.09

(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 \$40.35 (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.

otherwise have done. The export and import competing sectors are sensitive, due to international competition, to this rise in the domestic price level. The net additional foreign exchange made available by the resources boom is absorbed by the combination of an annual 1.90 per cent fall in aggregate exports and an annual 1.79 per cent increase in aggregate imports (both measured relative to their levels in the absence of the minerals boom).

The across-the-board tariff reform, of a 1.53 per cent cut in a typical year, is projected to cause the consumer price index to rise at a rate which is 0.13 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 0.11 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 an annual 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 year-by-year effects on industry outputs of the resources boom and the respective tariff reform policies are depicted in Figure 2.1.

#### 4. CONCLUDING REMARKS

Broadly speaking the 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 TCF sector and the motor vehicle and parts industry is not politically acceptable and 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 therefore less amenable to the accommodation of future pressures for



rate changes and the resources boom, or a net increase in output. This is 10 fewer than with the across-the-board tariff reform discussed in section 2. The reason is that the greater magnitude of the tariff rate changes has more than cancelled the positive effects of the resources boom for these 10 industries.

Again the export and export related industries are only partially compensated for the effects of the resources boom by the tariff rate changes; i.e., no export or export related industry output responses would lie in the unshaded area of quadrant B.<sup>10</sup> Note that the outputs of the industries in the TCF sector and the motor vehicles and parts industry which experienced a net contraction under the resources boom and the across-the-board tariff reform of section 2, do not change. By construction, their annual output responses to the tariff rate changes are equal and opposite to the effects on them of the resources boom. In terms of Figure 2.1, these industries would now lie along the broken line in quadrant B.

One consequence of giving increased protection to selected industries in the TCF sector and the motor vehicles and parts industry is that two additional industries become problems. The outputs of the pulp, paper industry and the other machinery industry are not only projected to decrease because of the resources boom but they are now also projected to decrease because of the selective package of tariff rate changes. The change in direction of output response for these industries is the consequence of activity contractions, due to the selective package of tariff rate changes, in a significant number of industries to which they sell.

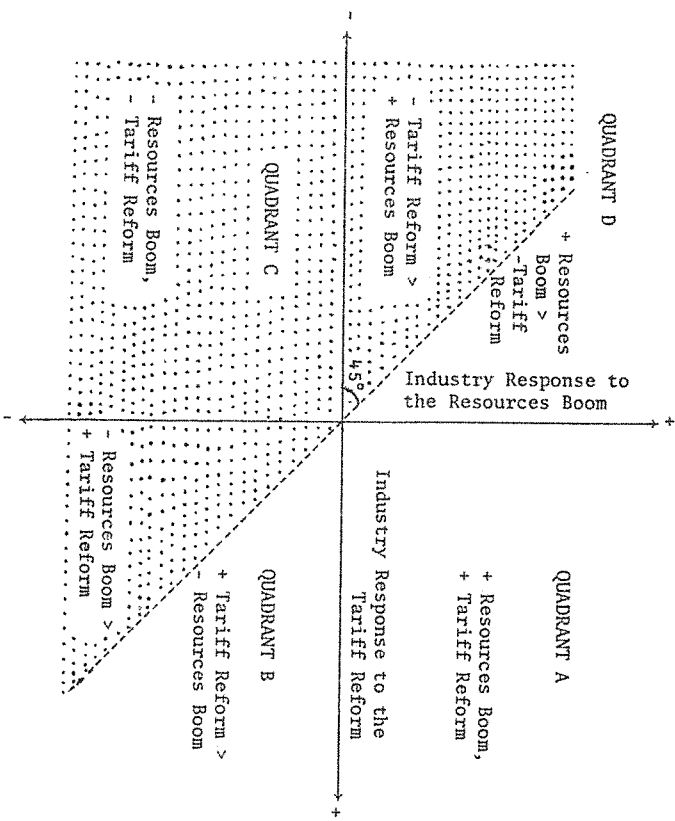


FIGURE 2.1 : POSSIBLE COMBINATIONS OF YEAR-BY-YEAR EFFECTS ON INDUSTRY OUTPUTS OF THE 1980'S RESOURCES BOOM AND THE RESPECTIVE TARIFF REFORM POLICIES

The outputs of industries lying in quadrant A are stimulated by both the resources boom and the respective tariff reform. Industries in quadrants B and D are stimulated by one, but harmed by the other, of these influences. Those located in the unshaded regions of quadrants B and D experience a net increase in output, while industries in the shaded regions experience a net decrease in output. Finally, industries in quadrant C suffer output contractions originating from both the resources boom and the respective tariff reform.

Table 3.3 continued ....

Industry Number	Industry	Percentage Changes in	
		Annual Effect of the Resources Boom (In a Typical Year $\Delta BT = -\$A0.35$ (1974-75) Billion)	Industry Outputs the Year-by-Year Tariff Rate Changes Listed in the First Column of Table 3.1
+ Resources Boom < - Tariff Reform			
21	Margarine, oils and fats	0.06	-0.33
24	Confectionery	0.25	-0.37
28	Alcoholic drinks n.e.c.	0.12	-0.70
41	Plywood, veneers	0.57	-0.79
52	Pharmaceuticals	0.23	-0.56
67	Metal products n.e.c.	0.10	-0.71
73	Electronic equipment	0.47	-1.02
75	Electrical machinery	0.09	-0.35
80	Rubber products	0.08	-0.61
81	Plastic products	0.25	-0.49

\* The quadrants are depicted in Figure 2.1.

Industry Number	Industry	Percentage Changes in	
		Industry Outputs	Annual Effect of the Resources Boom (In a Typical Year APT = -\$A0.35 (1974-75) Billion)
	<u>QUADRANT C</u>		
	- Resources Boom, - Tariff Reform		
44	Pulp, Paper	-0.11	-0.22
50	Industrial chemicals	-1.09	-1.02
55	Chemical products n.e.c.	-0.45	-0.80
78	Other machinery	-0.16	-0.12
79	Leather products	-0.56	-0.05
	<u>QUADRANT D</u>		
	+ Resources Boom > - Tariff Reform		
7	Other farming import competing Forestry	0.10	-0.00
10	Milk products	0.55	-0.09
19	Fruit and vegetable products	0.04	-0.02
20	Tobacco	0.31	-0.11
29	Wool and worsted yarns	0.58	-0.07
33	Textile floor coverings	0.14	-0.11
35	Sawmill products	1.11	-0.73
40	Joinery and wood products	0.11	-0.02
42	Furniture, mattresses	0.80	-0.12
43	Fibreboard	1.55	-0.07
45	Paper products n.e.c.	0.21	-0.01
46	Commercial printing	0.27	-0.24
48	Paints, varnishes	0.41	-0.10
51	Glass	0.26	-0.09
57	Non-metallic mineral products	0.15	-0.15
62	Sheet metal products	0.37	-0.10
66	Ship and boat building	0.71	-0.20
69	Scientific equipment	0.49	-0.03
72	Household appliances	0.88	-0.01
74	Signs, writing equipment	1.28	-0.83
82	Other manufacturing	0.42	-0.30
83	Gas	0.63	-0.33
85		0.67	-0.01

. . . . continued

The year-by-year industry output responses from the across-board tariff reform and the resources boom are listed in Table 2.2, in the format of Figure 2.1.

It can be seen from Table 2.2 that 75 out of 111 industries experience a net stimulation of output as a result of the combined resources boom/tariff reform (these are the industries that would be in the unshaded portion of Figure 2.1). The majority of these industries belong to the non-trading sector of the economy and therefore, while benefitting from the increase in the overall size of the economy caused by the resources boom, they are insignificantly affected by the across-board tariff reform.

No industry output responses lie in the unshaded region of quadrant B. This is because the size of the tariff reform policy, 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 output responses of these industries lie in the shaded region of quadrant B. The export industries are sensitive, due to international competition, to changes in domestic costs. As the resource boom causes a rise in the domestic consumer price index their outputs, and therefore the outputs of the export related industries, are projected to decrease. Some relief is offered by the tariff reform policy, as this is projected as lowering domestic prices; however because of the modest size of the tariff reform, this amounts to only partial compensation.

Because the direct effects of the resources boom on the mining

TABLE 2.2 : PROJECTED YEAR-BY-YEAR EFFECTS ON INDUSTRY OUTPUTS OF THE 1980'S RESOURCES BOOM AND AN ACROSS-THE-BOARD TARIFF REFORM

Industry Number	Industry	Percentage Changes in	
		Industry Outputs	Annual Effect of the Resources Boom (In a Typical Year $\Delta BT = -\$A0.35$ (1974-75) Billion)
QUADRANT A			
+ Resources Boom, + Tariff Reform			
7	Other farming import competing	0.10	0.00
10	Forestry	0.55	0.01
15	Crude oil	0.04	0.01
16	Non-metallic minerals n.e.c.	0.33	0.02
23	Bread, cakes	0.14	0.00
27	Beer and malt	0.57	0.00
40	Sawmill products	0.11	0.02
47	Newspapers and books	0.28	0.02
53	Soap and detergents	1.16	0.01
54	Cosmetics, toiletry	1.08	0.00
56	Oil and coal products	0.17	0.01
58	Clay products	0.09	0.03
59	Cement	0.87	0.00
62	Non-metallic mineral products	0.37	0.01
65	Structural metal	0.77	0.00
70	Locomotives	0.06	0.01
71	Aircraft building	0.46	0.02
72	Scientific equipment	0.88	0.00
84	Electricity	0.32	0.01
86	Water, sewerage	0.17	0.01
87	Residential building	0.98	0.01
89	Wholesale trade	0.41	0.01
90	Retail trade	1.07	0.01
91	Motor vehicle repair	0.97	0.02
92	Other repairs	0.72	0.02
93	Road transport	0.13	0.01
96	Air transport	0.82	0.02
97	Communication	0.44	0.01
98	Banking	0.49	0.00
99	Finance and life insurance	0.68	0.01
100	Other insurance	0.66	0.01
101	Investment, real estate	0.44	0.00
102	Other business services	0.39	0.01
103	Ownership of dwelling	0.00	0.00
104	Public administration	0.94	0.01
105	Defence	0.96	0.01
106	Health	1.16	0.01
107	Education, libraries	1.00	0.01
108	Welfare services	0.88	0.01
109	Entertainment	0.96	0.01
110	Restaurants, hotels	0.88	0.01
111	Personal services	1.03	0.01

.... continued

Table 3.3 continued ....

Industry Number	Industry	Percentage Changes in	
		Industry Outputs	Annual Effect of the Resources Boom (In a Typical Year $\Delta BT = -\$A0.35$ (1974-75) Billion)
105	Defence	0.96	0.07
106	Health	1.16	0.08
107	Education, libraries	1.00	0.07
108	Welfare services	0.88	0.08
109	Entertainment	0.96	0.11
110	Restaurants, hotels	0.88	0.06
111	Personal services	1.03	0.08
QUADRANT B			
- Resources Boom + Tariff Reform			
1	Pastoral zone	-0.53	0.11
2	Wheat/sheep zone	-0.29	0.06
3	High rainfall zone	-0.65	0.14
4	Northern beef	-0.96	0.20
5	Milk cattle	-0.32	0.06
6	Other farming export	-0.81	0.17
8	Poultry	-0.48	0.10
9	Services to agriculture	-0.18	0.09
11	Fishing	-0.10	0.05
12	Iron	-0.66	0.15
13	Other metallic minerals	-1.77	0.39
14	Coal	-2.00	0.41
17	Services to mining	-1.25	0.32
18	Meat products	-1.18	0.24
22	Flour and cereal products	-3.17	0.72
25	Food products n.e.c.	-1.24	0.28
30	Prepared fibres	-1.79	0.45
49	Chemical fertilizers	-0.39	0.10
63	Basic iron and steel	-3.59	0.89
64	Other basic metals	-2.75	0.59
76	Agricultural machinery	-2.65	0.44
77	Construction equipment	-0.74	0.12
94	Railway transport	-0.38	0.18
95	Water transport	-0.41	0.13
- Resources Boom + Tariff Reform			
31	Man-made fibres, yarn	-1.52	1.52
32	Cotton, silk, flax	-1.21	1.21
36	Textile products n.e.c.	-0.25	0.25
37	Knitting mills	-0.97	0.97
38	Clothing	-0.03	0.03
39	Footwear	-1.78	1.78
68	Motor vehicles, parts	-0.70	0.70

.... continued

TABLE 3.3 : PROJECTED YEAR-BY-YEAR EFFECTS ON INDUSTRY OUTPUTS  
OF THE 1980'S RESOURCES BOOM AND THE TARIFF  
PACKAGE WHEN OUTPUTS IN THE TCF SECTOR AND THE  
MOTOR VEHICLES AND PARTS INDUSTRY ARE NOT ALLOWED  
TO FALL

Industry Number	Industry	Percentage Changes in	
		Industry Outputs	Annual Effect of the Resources Boom (In a Typical Year ABT = -\$40.35 (1974-75) Billion)
QUADRANT A *			
+ Resources Boom, + Tariff Regime			
15	Crude oil	0.04	0.06
16	Non-metallic minerals n.e.c.	0.33	0.03
23	Bread, cakes	0.14	0.00
26	Soft drinks, cordials	0.53	0.01
27	Beer and malt	0.57	0.03
34	Textile finishing	0.14	0.08
47	Newspapers and books	0.28	0.10
53	Soap and detergents	1.16	0.09
54	Cosmetics, toiletry	1.08	0.00
56	Oil and coal products	0.17	0.06
58	Clay products	0.09	0.05
59	Cement	0.87	0.05
60	Ready-mixed concrete	1.04	0.04
61	Concrete products	1.03	0.04
65	Structural metal	0.77	0.02
70	Locomotives	0.06	0.02
71	Aircraft building	0.46	0.12
84	Electricity	0.32	0.08
86	Water, sewerage	0.17	0.04
87	Residential building	0.98	0.07
88	Building n.e.c.	1.08	0.02
89	Wholesale trade	0.41	0.11
90	Retail trade	1.07	0.09
91	Motor vehicle repair	0.97	0.03
92	Other repairs	0.72	0.17
93	Road transport	0.13	0.09
96	Air transport	0.82	0.10
97	Communication	0.44	0.07
98	Banking	0.49	0.05
99	Finance and life insurance	0.68	0.05
100	Other insurance	0.66	0.07
101	Investment, real estate	0.44	0.06
102	Other business services	0.39	0.08
103	Ownership of dwelling	0.00	0.00
104	Public administration	0.94	0.07

.... continued

Table 2.2 continued ....

Industry Number	Industry	Percentage Changes in	
		Industry Outputs	Annual Effect of the Resources Boom (In a Typical Year ABT = -\$40.35 (1974-75) Billion)
QUADRANT B			
- Resources Boom > + Tariff Regime			
1	Pastrol zone	-0.53	0.03
2	Wheat/sheep zone	-0.29	0.02
3	High rainfall zone	-0.65	0.04
4	Northern beef	-0.96	0.05
5	Milk cattle	-0.32	0.02
6	Other farming export	-0.81	0.05
8	Poultry	-0.48	0.03
9	Services to agriculture	-0.18	0.02
11	Fishing	-0.10	0.01
12	Iron	-0.66	0.04
13	Other metallic minerals	-1.77	0.10
14	Coal	-2.00	0.11
17	Services to mining	-1.25	0.08
18	Meat products	-1.18	0.07
22	Flour and cereal products	-3.17	0.18
25	Food products n.e.c.	-1.24	0.07
30	Prepared fibres	-1.79	0.01
36	Textile products n.e.c.	-0.25	0.00
44	Pulp, paper	-0.11	0.00
49	Chemical fertilizers	-0.39	0.03
65	Basic iron and steel	-3.59	0.21
64	Other basic metals	-2.75	0.15
76	Agricultural machinery	-2.65	0.16
77	Construction equipment	-0.74	0.06
78	Other machinery	-0.16	0.00
79	Railway transport	-0.38	0.04
95	Water transport	-0.41	0.03
QUADRANT C			
- Resources Boom, - Tariff Regime			
31	Man-made fibres, yarn	-1.52	-0.29
32	Cotton, silk, flax	-1.21	-0.29
37	Knitting mills	-0.97	-0.28
38	Clothing	-0.03	-0.10
39	Footwear	-1.78	-0.46
50	Industrial chemicals	-1.09	-0.06
55	Chemical products n.e.c.	-0.45	-0.03
68	Motor vehicles, parts	-0.70	-0.40
79	Leather products	-0.56	-0.18

.... continued

Table 2.2 continued ....

Industry Number	Industry	Percentage Changes in Industry Outputs	
		Annual Effect of the Resources Boom (In a Typical Year ABI = -\$A0.35 (1974-75) Billion)	Annual Effect of a Year-by-Year Across-the-board Tariff Cut of 1.53 %
<u>QUADRANT D</u>			
+ Resources Boom > - Tariff Reform			
19	Milk products	0.04	-0.00
20	Fruit and vegetable products	0.31	-0.00
21	Margarine, oils and fats	0.06	-0.01
24	Confectionery	0.25	-0.02
26	Soft drinks, cordials	0.53	-0.00
28	Alcoholic drinks n.e.c.	0.12	-0.04
29	Tobacco	0.58	-0.00
33	Wool and worsted yarns	0.14	-0.09
34	Textile finishing	0.14	-0.06
35	Textile floor coverings	1.11	-0.04
41	Plywood, veneers	0.57	-0.05
42	Joinery and wood products	0.80	-0.01
43	Furniture, mattresses	1.55	-0.01
45	Fibreboard	0.21	-0.00
46	Paper products n.e.c.	0.27	-0.01
48	Commercial printing	0.41	-0.01
51	Paints, varnishes	0.26	-0.04
52	Pharmaceuticals	0.23	-0.02
57	Glass	0.15	-0.01
60	Ready-mixed concrete	1.04	-0.00
61	Concrete products	1.03	-0.00
66	Sheet metal products	0.71	-0.02
67	Metal products n.e.c.	0.10	-0.07
69	Ship and boat building	0.49	-0.01
73	Electronic equipment	0.47	-0.05
74	Household appliances	1.28	-0.06
75	Electrical machinery	0.09	-0.00
80	Rubber products	0.08	-0.07
81	Plastic products	0.25	-0.05
82	Signs, writing equipment	0.42	-0.02
83	Other manufacturing	0.63	-0.01
85	Gas	0.67	-0.01
88	Building n.e.c.	1.08	-0.00

\* The quadrants are depicted in Figure 2.1.

of the domestic economy. Growth rates of aggregate real investment and consumption are projected to increase. Some of this increased growth in consumption is met by an acceleration of aggregate imports. However, the rate of growth of aggregate economy-wide employment is also projected to increase. Again note that the effect of the tariff changes on employment in the import competing sector is equal and opposite to the effect of the resources boom, thus constraining the net change induced in the overall employment level in the import competing sector to be zero.

A superficial comparison of Tables 2.1 and 3.2 tends to give the impression that a higher rate of growth of investment and consumption would be possible if the special TCF-motor vehicles package detailed in Table 3.1 were adopted. Such a conclusion would be spurious since Table 3.2 requires that the industries within the import competing sector which do not receive special terms must adjust to a virtual abolition of their tariff protection over the ten year period. It is not clear that such a rate of adjustment could, or would, be sustained, especially since the TCF sector and the motor vehicles and parts industry would be receiving steadily escalating protection. From a practical viewpoint, therefore, it can be argued that the provision of special terms for the TCF sector and the motor vehicles and parts industry would effectively remove the scope for tariff reform created by the resources boom.

The year-by-year industry output responses to the tariff package/resources boom are given in Table 3.3.

It can be seen from Table 3.3 that 65 out of 111 industries experience either an increase in output each year from both the tariff

TABLE 3.2 : PROJECTED YEAR-BY-YEAR EFFECTS ON SELECTED  
MACROECONOMIC VARIABLES OF THE 1980'S  
RESOURCES BOOM AND OF THE TARIFF PACKAGE  
WHEN OUTPUTS IN THE TCF SECTOR AND THE  
MOTOR VEHICLES AND PARTS INDUSTRY ARE NOT  
ALLOWED TO FALL\*

Macroeconomic Variable	Annual Effect of the Year-by-Year Tariff Rate Changes Listed in the First Column of Table 3.1	Annual Effect of the Resources Boom (In a Typical Year ABT = -\$40.35 (1974-75) Billion)
Consumer Price Index	-0.42	2.27
Aggregate Imports (foreign currency)	0.44	1.79
Aggregate Exports (foreign currency)	0.43	-1.90
Aggregate Real Investment	0.07	0.98
Aggregate Real Consumption	0.07	0.98
Aggregate Employment (persons)	0.10	0.39
Aggregate Employment in the Import Competing Sector	-0.09	0.09

\* All projections are in percentage changes per annum.

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.

There are of course problem industries which experience a contraction in output, not only because of the resources boom but also because of the across-the-board tariff reform policy, i.e., industries whose output responses would lie in quadrant C. These fall into two groups. The first contains industries which, relative to manufacturing as a whole, are labour intensive. This group includes substantial segments of the TCF sector, as can be seen in Table 2.2. The second contains the motor vehicles and parts industry where there is a particularly high substitution elasticity of 5.0 between the domestic and imported products. This substitution technology together with the low base period import share in the motor vehicle and parts market (in 1974/5 this was 29 per cent) means that a one per cent decrease in the import price relative to the domestic price leads, at a given level of total demand for the products of this industry, to an increase of 1.45 per cent in import volume and a decline of 1.45 per cent in the demand for the product of the local industry.

3. TARIFF REFORM AND THE RESOURCES BOOM, WHEN OUTPUTS IN THE TCF SECTOR AND THE MOTOR VEHICLES AND PARTS INDUSTRY ARE NOT ALLOWED TO FALL

The resources boom will exert pressure towards scaling down some prominent activities in the TCF sector and the motor vehicles and parts industry. If such scaling down is not politically acceptable, then a seeming alternative is to increase protection in these industries. Tariff reform on the other commodities is still possible of course. If the constraint on the extent of the tariff reform is to be one, as before, of no change in the aggregate employment level of the import competing sector as a whole, then, when certain industries are exempted from structural adjustment, a much larger cut in the tariffs on the commodities produced by the non-exempted industries would be required than in the case considered above where the tariff cut was a uniform 1.53 per cent across-the-board. In fact the tariff reform on the other commodities required is at a rate of 18.16 per cent per year over the life of the boom (see Table 3.1). Over the decade of the projected boom, this is equivalent to cutting tariff levels on the non-exempted industries by about 86 per cent. The year-by-year increase in protection required by the industries in the TCF sector and the motor vehicles and parts industry are also listed in Table 3.1, while the projected year-by-year effects on selected macro-economic variables of the tariff package/resources boom are given in Table 3.2.

The tariff rate changes are projected to cause the consumer price index to grow 0.42 per cent per annum slower than it would otherwise do. This increases the rate of growth of aggregate exports and of the size

TABLE 3.1 : TWO RESOURCES BOOM-TARIFF REFORM PACKAGES\*

Commodity	Annual Percentage Change in the Ad Valorem Nominal Tariff Equivalent of Protection when the Outputs of the First Seven Industries Listed	
	Are Not Allowed to Fall	Are Allowed to Fall
Man-made fibres, yarn	5.48	-1.53
Cotton, silk, flax	3.68	-1.53
Textile products n.e.c.	2.89	-1.53
Knitting mills	3.54	-1.53
Clothing	0.20	-1.53
Footwear	2.85	-1.53
Motor vehicles, parts	0.69	-1.53
All other commodities	-18.16	-1.53

\* The numbers in the first 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 output levels in the first seven industries listed are not depressed as a result of the resources boom. The second column satisfies (a) but not (b). The technical details of how these percentage changes were calculated are given in the Appendix.