A REGIONAL PERSPECTIVE ON TARIFFS: THE WESTERN AUSTRALIAN EXPERIENCE[1]

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ABSTRACT There is a widespread concern that tariffs have differential impacts across the Australian States and Territories. Public policy has tended to focus on the effects of tariff reductions on those regions where jobs will be lost. For a benefiting State, the gains will depend on its structural differences from the other States, and in particular the extent of its export orientation. This paper provides some measures of structural difference between Western Australia (WA) and the other States and provides two estimates of the impacts of tariffs on the WA economy. In the paper the burden of tariffs on WA (a major exporting State) is examined using a method previously employed by Clements and Sjaastad for Australia. The extent to which the benefits of a tariff reduction program are received by WA and how they are distributed are also investigated using a computable general equilibrium model of the State economy. It was found that substantial benefits accrue to the WA economy while the major industry sectors which benefit are mining, transport, wholesale and retail trade and entertainment, agriculture forestry and fishing, and finance and business services.

1. INTRODUCTION

The categorisation of Australian States as sunbelt/rustbelt is a popular journalistic device to add regional tension to what would otherwise be dry economic stories. Although imported from the USA, the device has proved useful in the Australian context because it summarises some features of Australian economic development experience. For a long period, the sunbelt economic axis of Western Australia (WA), Northern Territory, and Queensland has grown faster than the rustbelt States of Victoria, South Australia and Tasmania (Australian Bureau of Statistics, 1997). This has led commentators to lump the sunbelters together, especially when discussing Commonwealth government policies. Unfortunately, there are substantial differences between the economic structures of these sunbelt States - differences that mean substantially

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different impacts of Commonwealth policies in each of the sunbelt States, and differences to which too little attention is paid. The aim in this paper is to partially remedy this situation by assessing quantitatively the costs of the Commonwealth industry protection policy on the export-oriented economy of Western Australia.

Detailed, recent estimates of the costs of protection to WA are scarce, with most focus upon the employment impacts of tariff reductions. The Industry Commission (1997a, 1997b) has estimated the regional employment effects of a number of tariff reduction scenarios for the automotive industry and the textiles, clothing and footwear industries. The Industry Commission has found that WA is the State most adversely affected by protection because of the outward orientation of the State's production and trade structure. The objective of this paper is to measure the costs which are imposed on the WA economy from import tariff protection, in both output and employment terms. These estimates give order-of-magnitude assessments of the likely economic benefits that would flow to the economy from dismantling the existing protection structure.

This study uses the Clements-Sjaastad methodology (Clements and Sjaastad, 1984) to estimate the distribution of the burden of protection from one group of economic agents to another. In a concise manner, it provides estimates of the magnitude of the burden of protection imposed on WA exporters as a whole. Such estimates, however, do not include efficiency losses arising from the tariff-induced misallocation of resources. To capture such inefficiencies as well as to tack down the impact of Australian tariff at WA industry levels, the paper also uses a multi-sectoral computable general equilibrium model of the WA economy. Particular attention is paid to quantifying the effects on the WA minerals sector, State's major exporting sector. These estimates are based on national estimates of the effects of a tariff removal program. As will be obvious, differences in methodologies and their application to two different protection structures render the two sets of estimates of the costs of protection not comparable.

2. PREVIOUS STUDIES

By the end of the Federation's first decade, Australian government policy was firmly protectionist. From this time until the 1970s the trend was to increase protection, with the exception of a brief period in the mid-1930s when protection declined. As a result, at the beginning of the 1970s Australia, along with New Zealand, had the highest levels of manufacturing tariffs in the industrialised world (Anderson and Garnaut, 1987, p. 6). However, since then the general protectionist trend has been reversed. The clearest signal of this change was in 1973 when all tariffs were cut by 25 per cent.

The first extensive attempt at quantitative estimation of the cost of the Australian system of tariff protection was made in 1927 by the Brigden Committee. Brigden's Report (Brigden, 1929) clearly saw the deleterious effects of tariffs, especially their geographic and industry impacts, and stated (p. 4):

The tariff falls with the greatest weight on the export industries. The value

> *of their land and fixed capital is reduced, and the expansion of their production is retarded. They are limited to the use of land which can carry the costs imposed.*

The States which naturally depend more than others upon the export industries feel the burden, not only upon their individuals and industries, but upon the State finances. Taxable capacity in the export industries has been decreased and production has been retarded without equivalent benefit (in those States) from the incomes protected by the tariff. The tariff has therefore borne unequally on the different States.

Despite recognition of this burden, the Committee accepted that tariffs were necessary if Australia was to employ (in manufacturing industry) a growing urban population at acceptable standards of living in a country with comparative advantage in land- and capital-intensive industries. This is an intellectually respectable argument (Quiggin, 1996, p. 131) later given formal support in the Stolper-Samuelson Theorem (Stolper and Samuelson, 1941).

The Brigden Committee focused on estimating the "excess cost" associated with the tariff. This was the excess of the value of protected output over the value of equivalent imports both measured at prevailing exchange rates and prices. It was estimated to be £36 million for 1926-27. This amounted to about 4.2 per cent of GDP in that year.

Vernon (1965) made estimates of the burden of protection which are directly comparable with Brigden's but preferred to label the estimate the "subsidy equivalent" of the tariff since this is closer to what it really is. However, Vernon too was well aware of the shortcomings of the method (see Vernon 1965, Chapter 13 in Vol. 1, pp.354-360 and Appendix L(iv) in Vol 2, pp.1073-1080). Most importantly, Vernon was concerned about what the subsidy equivalent method did not measure:

> *Without protection, the whole nature of the economy, the distribution of resources and the level of national income would have been very different, and it is impossible to estimate what the price level would have been. ... Nor does the estimate measure the real cost resulting from any so-called "misallocation of resources" (Vernon, 1965, Vol. ,2 p.1073).*

It has been argued by Corden (1996, p. 143) that the section of the Vernon Report dealing with the measurement of the burden of protection was probably the most influential, especially the appendix where the effective protection rates as well as subsidy equivalents were calculated. This section, with its emphasis on a rational economic approach and the necessity to calculate effective rates, had a great impact on the Tariff Board. This change of approach produced a real contrast between the Tariff Board Reports of the 1960s, which Corden (1996, p.144) labelled as "empty of serious economic analysis", and the careful and much more intellectually rigorous reports of the Tariff Board's successor, the Industries Assistance Commission, in the 1970s. In any event, Vernon estimated the subsidy equivalent of the tariffs on manufactured products was approximately £500 million for 1961-62. This amounted to about 6.4 per cent of GDP in that year.

Both Brigden's and Vernon's estimates are essentially partial equilibrium estimates and it is useful at this point to undertake a crude estimation of the deadweight loss associated with the existence of tariff protection using another partial equilibrium method suggested by Harberger (1964) as follows:

$$\text{The deadweight loss of the tariff} = \frac{1}{2}(\varepsilon + \eta)\, t^2,$$

where ε is the elasticity of demand, η is the elasticity of supply, and t is the tariff rate. It can be assumed, as has been done by Quiggin (1996, p. 134), that in Australia, the supply and demand elasticities are both one half, manufacturing makes up about 20 per cent of output, and the average manufacturing tariff is 40 per cent. Accordingly,

$$\text{The deadweight loss} = \frac{1}{2} \times \left(\frac{1}{2} + \frac{1}{2}\right).2 \times .4^2 \approx 1.6 \text{ per cent of GDP.}$$

This figure provides an order-of-magnitude comparison for other estimates and also draws attention to two important influences of the average tariff rate on the size of the estimate. The deadweight loss increases with the square of the tariff rate so that, in general, low rates are to be preferred to high rates. However, the loss also increases with the variance of the average rate. As a consequence, the more variable tariff rates become, the higher the deadweight loss. In Australia this led to a long campaign by Corden (1958) for uniform tariff rates. In the present analysis this implies that the Harberger method would result in an underestimate of the Australian deadweight loss, given the wide disparities between the highest and lowest rates.

The Western Australian Treasury (1981) estimated how the benefits of Commonwealth industry policy were spread among the States, using a partial equilibrium analysis. Using Industries Assistance Commission data, estimates of the net subsidy equivalent of protection policy were provided. This was a partial measure of the effects of protection and clearly showed that WA did not receive much protective assistance. Similar to Brigden and Vernon, the measure employed by the WA Treasury is fraught with defects. For instance, it does not include the loss due to distortions in the pattern of consumption, treats as a cost the income redistributed from consumers and overstates the extent of production that is protected because it fails to allow for the effects of the devaluation that would be necessary to restore equilibrium.

The first general equilibrium estimate of the cost of protection was made by Evans (1972). Using a general equilibrium model of the Australian economy he found that abolishing tariffs had minimal impact on the growth of GDP. This was a surprising conclusion given the Harberger result presented above. However, Dixon and Butlin (1977) argue that Evans' result was not unexpected, given a number of data and technical construction problems in the model. However, Evans' work provided a stimulus to further model building, which eventually led to the construction of ORANI (Dixon *et al*, 1982), the most

Table 1. The Impact of Removing Protection

	Time Period	Calibrated Shock[1]	Real GDP	CPI	Aggregate Employment[2]	Aggregate Exports
			Percent Change			
Powell (1977)	SR	-100		-5.0	-0.2	7.4
Dixon *et al* (1977)	SR	-100		-7.0	0.6	9.6
Dixon *et al* (1982)	SR	-100		-8.8	0.8	10.1
Higgs (1986)	SR	-100	.7	-9.3	1.1	10.4
Higgs (1989)	SR	-100	.3	-5.8	0.4	3.6
ABARE (1988)	SR	-100	-.1	-7.2	-0.3	4.2
Industry Assistance Commission (1989)	LR	-100	1.1	-3.8	0.1	8.6
Industry Commission (1991), May 1988 Program	LR		0.2	-.9		2.4
Industry Commission (1991), March 1991 Program	LR		0.4	-1.8	.1	4.7
Business Council of Australia (1993)	LR		0.9			
Business Council of Australia (1994)	LR		0.7			
EPAC: Filmer and Dao (1994)	LR		0.8	0.4		
EPAC: Dao and Jowett (1994), Existing reforms	LR		0.7			
EPAC: Dao and Jowett (1994) 1994 New reforms	LR		0.8			
Industry Commission (1996a), New tariff reductions from 1996 to 2000 levels	LR		0.1	0.1	0.3	0.7

Note: [1] Since the ORANI model is linear in percentage changes, the effects of the original shocks in the first seven studies, except Higgs (1989) and Industries Assistance Commission (1989), are scaled (i.e., calibrated) to represent the effects of the complete removal of protection, thereby facilitating the comparison.

[2] Between -.05 to .05 per cent.

widely used and accepted general equilibrium model of the Australian economy. Other models followed ORANI. These included the influential Access Economics Murphy-Murphy Model (see e.g., Murphy and Brooker, 1994) as

well as the MONASH Model (Adams *et al*, 1994). In the period since then a number of simulation experiments either directly modelling the effects of tariff abolition, or in a form where such estimates could be calculated, were undertaken. The major experiments are summarized in Table 1.

The first six experiments were undertaken for the short-run, where capital was fixed and labour adjusted. The latter results dealt with a longer run in which capital also adjusted. The shadowed results were produced with the Access Economics-Murphy model and the remainder with a version of ORANI.

The impact of tariff abolition on real GDP is not available for the first three studies. However, employment changes are equally of interest. Powell's 1977 study shows a small decline in employment, a result of farmers being fixed in supply in the short-run. Otherwise only the 1988 ABARE study shows a decline in employment. In all other studies, abolition of tariffs provides for positive employment growth in the short run. In the long-run results, the Industries Assistance Commission's 1989 study, which examined tariff removal and removal of subsidies to agriculture, shows a substantial 1.1 per cent increase in real GDP, a marginal gain in employment, and a very strong effect on exports. The Industry Commission's studies of the Hawke Government's two tariff reduction programs show much smaller gains in real GDP, but this would be expected given that the high rates remained for only PMV and TCF industries. The Business Council of Australia and first Economic Policy Advisory Council (EPAC) studies show the benefits of broad programs of microeconomic reform, and it is hard to identify the exact impact of tariff reform apart from other microeconomic reforms. The last two EPAC results, however, attempt to separately identify the benefits from existing reforms and the benefits from further reforms. The 1996 Industry Commission study shows only a very modest gain in real GDP from the most recent statement on tariff reform.

3. THE STRUCTURE OF THE WA ECONOMY

Western Australia is different from the other States of Australia and these differences generate many of its economic challenges. Geographically, it is the largest State and the one most removed from the power centres of the eastern seaboard. More importantly, its economic structure and historical development path contrast sharply with other States. This has particular importance for the effects of tariffs where their impact on WA is driven by the State's distinct production and trade structures. In this section, the economic structure of the WA economy is examined, along with how WA differs from that of the rest of Australia.

Broad Differences Between WA and the Rest of Australia

In Figure 1, the economy is divided into nine broad industry sectors and then each sector's share of GSP in WA is compared with that sector's share of GSP in the rest of Australia, not including WA.

The clearest positive difference is the mining sector where the industry has a significantly larger share of economic activity in WA than it does in the rest of Australia, and that share has grown rapidly from around 11 per cent of WA's

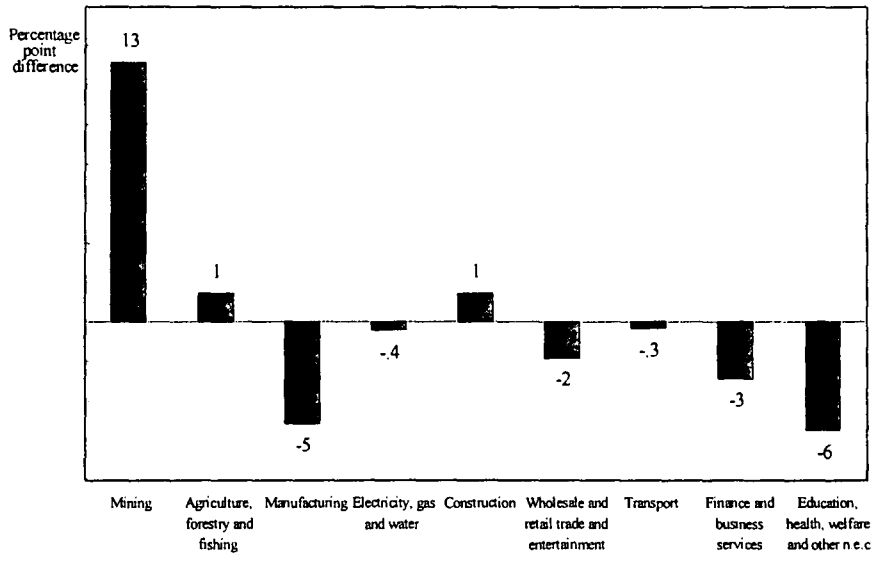

Figure 1. Differences in Sectoral Output Shares,W.A. and the Rest of Australia

Note: A positive difference implies that the sector's share in WA's GSP is larger than its share in the rest of Australia's GDP. The data are averages over the six years ending 1995/96.

Source: Australian Bureau of Statistics (1997).

GSP in 1984/85 to about 18 per cent of GSP in 1995/96 (Australian Bureau of Statistics, 1997, Table 14). While the mining orientation of WA may be well known, the size of the difference may be surprising. Similarly, the slightly higher importance of "Agriculture, forestry and fishing" and the smaller importance of manufacturing in WA is also expected. The other sectors reflect more subtle differences. Construction is relatively larger because of the effect continuing high resource investment has on this sector. The smaller shares of activity of "Wholesale and retail trade and entertainment", "Finance and business services", and "Education, health, welfare and other n.e.c." possibly reflect Perth's "branch office" status for Australian-based operations of businesses and the predilection of the national government to centre its operations along the eastern seaboard.

Put succinctly, WA has developed along an extractive industry-based path, with a small manufacturing sector and small representation of head-office type functions. It is worth noting that the larger mining sector and smaller manufacturing sector have made the WA economy much more globally-oriented than the rest of Australia.

This picture is confirmed if the share of exports in State economic activity is examined. During the 1990s, exports accounted for approximately 40 per cent of Western Australia's GSP at market prices, compared to about 14 per cent of the rest of Australian (excluding WA) GDP (Ahammad, 1998). This disparity,

largely due to the dominance of the minerals sector in WA, has significant implications for industry policy in Australia. Western Australia's economy is outward-oriented and highly dependent on export markets for prosperity. More importantly, it is more exposed to the effects of changes in costs than other States. For example, wage rises will result in a squeeze on exporters' profits and, in turn, this will impact on the volume of exports. One of the well-known effects of tariffs in Australia has been to stimulate wage rises in the protected sectors and these changes flow-through into the export sectors.

The broad category "mining" obscures some fundamental differences between the Western Australian industry and that in the rest of Australia, and hence the impact that protection policy has on the development of the industry. Mining in WA is predominantly metalliferous with gold, iron ore, bauxite/alumina, nickel, and mineral sands comprising the largest shares. In the other States of Australia coal dominates mining even though there is significant production of lead, zinc, and gold and minor amounts of other minerals. Coal has limited prospects for further processing. Thus insufficient attention is given to protection policies which would hinder the growth of downstream processing of minerals, even though there is significant downstream processing of alumina. In WA, with its metalliferous orientation, there are significant opportunities for value-adding minerals including gold (refining, gold coins, storage), iron ore (concentrating, pelletising, HBI manufacture, pig iron, steel, steel shapes), bauxite (alumina, high grade alumina, fused alumina, ceramics, aluminium, aluminium products), nickel, and mineral sands (synthetic rutile, titanium dioxide, titanium metal, titanium metal products). This has meant there is much larger scope for articulation of mineral industry linkages in WA compared with other States of Australia.

The gas and petroleum industries are relatively more important in WA than in the rest of Australia, but aside from the issue of size, the nature of the gas industry in WA is significantly different from that in other States. WA's gas industry supplies the local market and has a very substantial export component in the form of LNG. The entire gas industry in the rest of Australia is domestically oriented.

Value-adding activities are especially affected by tariffs. Because processing location is determined on an international basis, value-adding activities are very sensitive to costs. Accordingly, the cost-push associated with tariffs could make the economics of undertaking certain value-adding activities unattractive.

Another difference lies in the exploration side of the industry. Western Australia has a large share of exploration activity in Australia. To the extent that tariffs act as a disincentive to explore, they limit the size of the WA minerals sector.

While the general global orientation of WA economic activity means that Commonwealth protection policy impacts more severely on WA than on other States, the mining industry is especially severely impacted because it is WA's largest exporter.

4. INCIDENCE OF THE BURDEN OF PROTECTION

The answer to the question of who pays for protection is not straightforward. Because importers are able to pass on to their customers most of the higher prices resulting from tariffs,[2] a shift upward in general living costs will result. Wage-earners will be expected to push for higher wages to compensate for their increased cost of living. Through wage rises, the effects of the initial price rise will become even more widespread. Moreover there are many other items linked to the cost of living, such as pensions and welfare payments, which require either the allocation of revenues from protective tariffs and/or an increase in taxation for their levels to be increased. The effect on the exchange rate is likely to be upwards as imports are restricted. So what started as an unambiguously good thing for the import-competing sector is offset to some extent by rises in its costs and a rise in the exchange rate. These have deleterious effects on other sectors of the economy. For the export sector, however, the news is only bad. It has a rise in its costs and a fall in the Australian-dollar value of its exports because of the rising exchange rate. These feedback and flow-on effects make estimation of who pays for the tariff a complex process. This also highlights the importance of making estimates of how the effects of protection are distributed across the Australian and Western Australian communities.

The purpose in this section is to adapt the methodology of Clements and Sjaastad (1984) so a "transfer matrix" for WA economy can be constructed and show, in a simple and concise manner, the distribution of the burden of tariff protection in terms of transfers of income from one group to another. This methodology has also been used by Choi and Cumming (1986), Choi (1988) and Marais (1992) to provide estimates of the distribution of the burden of protection. The transfer matrix approach does not deal with the loss in national output caused by using domestic resources in protected industrial sectors where their productivity is lower than their use in unprotected sectors -- the so-called "deadweight losses" from protection. Nor does it deal with the inefficiencies of government in the form of excessive administration and compliance costs. It deals only with the transfers themselves. Thus, the initial revenues from tariffs nominally paid by consumers of imports, are transferred to the government as customs duty. It is assumed that the government will transfer them back to taxpayers as reductions in taxes and/or in the form of valuable services provided by government. The extra revenue accruing to producers of import-competing goods similarly is a transfer from consumers of these goods. In turn, part of this transfer will accrue to wage-earners in the import-competing sector, although this is not shown directly in the transfer matrix. The function of the transfer matrix is to set out the net results of these transfers. The transfer matrix for the whole of Australia is constructed first and the matrix for WA is derived from it.

Clements and Sjaastad (1984) and Choi (1988) have documented the mathematical derivation of the transfer matrix. We employ their formulae to estimate various cells of an Australian transfer matrix for 1995/96. However, to

[2] Assuming a competitive market structure.

make this section somewhat self-contained, an intuitive account of the matrix follows.

4.1 The Shift Coefficient

It is convenient to divide goods and services into importables, exportables, and home goods. Importables are goods which are either imported or import substitutes produced in Australia and compete with imports. Examples include large passenger jet aircraft, consumer electronic equipment, and cars. Similarly, exportables are goods which are exported or which could be exported. Examples include iron ore and beef. Home goods, by their nature, do not face import competition and are difficult to export. Examples include haircuts, gardening services, and electricity. For the most part home goods consist of services with wages forming a large part of their costs of production.

If a tariff of 10 per cent is imposed on all imports this will allow the price of all importables to rise by 10 per cent. Because of the way the Australian labour market works, some of this increase will flow into the costs of home goods and exportables via general wage and tax increases induced by the rise in the price of importables. Assuming that the government, recognising the deleterious effects of import tariffs on exporters, decides to give exporters a uniform 10 per cent subsidy, increasing the price received by the producers of exportables (both those sold overseas and those sold locally) by 10 per cent. By similar reasoning to that above, some of this will flow into the costs and prices of home goods via wages and tax changes. Since wages and taxes form a large part of the costs of the home goods sector, to a first approximation it can be said that simultaneous imposition of export subsidies and import taxes at a rate of 10 per cent, will also cause the price of home goods to rise by 10 per cent.

Following from above, if the tariff imposed was, say, 20 per cent while the export subsidy remained at 10 per cent, intuition would indicate that the rise in the price of home goods would be some average of the tariff and the subsidy rates. What determines whether tariffs or subsidies have more weight in this calculation? It is the extent to which there are substitution possibilities (in both supply and demand) between home goods and importables, and between home goods and exportables. If importables are close substitutes for home goods then a great deal of weight in calculating the rise in price of home goods will be given to tariffs, while if exportables are close substitutes for home goods then a great deal of weight will be given to the export subsidy. If we call the weight for the tariff when calculating the rise in the price of home goods ω, then the weight given the subsidy must be $1 - \omega$.

This fraction ω is important since it determines how much of an increase in tariffs is passed on to the export sector in the form of higher costs, i.e. as an implicit tax. For this reason ω is called the "shift coefficient". Clearly, the burden of the tariff cannot fall on the importables sector for it is the beneficiary of the tariff. If ω is zero this implies that exportables and home goods are such close substitutes that there are really only two types of goods -- a composite home good/exportable good and importables. The burden of the rise in tariffs will therefore be shared between the home goods sector and the exportables

sector. On the other hand, if ω is 1 then home goods and importables are such close substitutes that there now are really only two goods -- a composite home good/importable good and exportables. The entire burden of the tariff must now fall on the exportables sector. Since either extreme is unlikely, one central question of this paper is how much of the burden falls on the exportables sector.

The reasoning above can also be applied to an export subsidy. The burden of such a subsidy will be shared between home goods and importables depending on the degree of substitutability of the three classes of goods. It is only a small step then to extend the analysis to talk about the distribution of the burden of the *net tariff* or *net protection*, the excess of import tariffs over export subsidies. As before, this will depend on ω, which measures the weight of net protection in the rise in price of home goods. If ω is zero as before, the burden of net protection falls on both exportables and home goods, while if ω is 1 the burden falls entirely on exportables. Hence, ω can be viewed as the fraction of net protection that is transformed into an implicit tax on exportables. The focus on ω emphasises that, at least, part of the burden of the tariff falls on exporters. However, it is also of interest to examine the effects of the tariff in terms of transfers between a number of other sectors in the economy, as well as to the exportables sector.

4.2 Transfer Matrix

The effects of tariffs and other distorting government policies directed at imports (such as quantitative restrictions) is to produce a set of domestic prices of goods and services that is different from that which would exist in the absence of the policies. All of these trade barriers can be converted into tariff equivalents. We can therefore represent them by referring to a uniform tariff equivalent of 't^*'. It can be demonstrated that the set of distorted prices caused by t^* could be replicated by a combination of an import tariff and an explicit export tax, where the rates depend only on the uniform tariff equivalent t^* and the shift coefficient ω. With these concepts in mind it is possible to form expressions for the transfers of the burden of protection among groups in the community. We identify five broad, overlapping groups: exporters, import-competing firms, consumers, taxpayers and the (Commonwealth) government.

The Australian transfer matrix for 1995/96 is presented in Table 2. Starting at row 1, there are transfers from exporters as they are taxed on their entire production. This is because, as noted previously, the effect of tariffs is unambiguously bad for them. Part of these transfers are made directly to consumers who pay less for exportables and the remainder goes to the government in the form of tax revenue. Column 1 reveals that import-competing firms gain as they receive an implicit subsidy on their entire production. All of this gain comes at the expense of consumers who are paying more for import-substitutes, whose prices rise due to protection. The government collects all the revenue ensuing from protection policy (column 4). If the government is assumed to have no reason to alter its existing budgetary situation it can essentially transfer this additional revenue back to taxpayers by way of cutting other forms of existing taxes. This is represented by column 3 (and, also by row

Table 2. Protection-Induced Transfers in Australia, 1995/96 [1,2]

To → / From ↓	Import-Competing Firms (1)	Consumers (2)	Taxpayers (3)	Government (4)	Total (5)
1. Exporters	0	.04	0	.41	.46
2. Consumers	.15	-	0	.18	.33
3. Government	0	0	.59	-	.59
4. Total	.15	.04	.59	.59	-
5. Exporters	0	200	0	2,000	2,200
6. Consumers	750	-	0	900	1,650
7. Government	0	0	2,900	-	2,900
8. Total	750	200	2,900	2,900	-

Notes: [1] For technical details on the construction of this matrix, see Clements and Sjaastad (1984) and Choi (1988). Estimation of the cells in the matrix requires data on GDP, production, consumption, exports, imports, tariffs, export subsidies, and a value for the *shift parameter* ω. Data for GDP, production, consumption, exports and imports are taken from Australian Bureau of Statistics (1996a and 1997). We use the Industry Commission's (1996b, p.149) estimate of nominal rate of assistance to manufacturing of 5 percent. For export subsidies, we use a ball-park estimate of 1 percent which is approximately equal to the ratio of the export assistance provided under the major schemes of $970 million in 1995/96 (Productivity Commission, 1996, p.125) to the value of total exports of $75,306 million (Australian Bureau of Statistics, 1997, p.24). A value of .7 for ω estimated in Clements and Sjaastad (1984) for Australia is used.

[2] Rounding errors may persist.

Source: Authors' calculation based on Clements and Sjaastad (1984) methodology.

3). Rows 4 and 8 of the table give estimates of total-transfer gains secured by each group. Subtracting the entry in the final column from the corresponding entry in rows 4 and 8 gives an estimate of net transfer to the group under consideration.

In 1995/96, as can be seen from Table 2, the gain of import-competing firms was approximately equal to .15 per cent of GDP (row 4 and column 1) or $750 million (row 8 and column 1) while exporters incurred a loss equivalent to almost .5 per cent of GDP (row 1 and column 5) or $2,200 million (row 5 and column 5). If we combine consumers with taxpayers into the category consumers-*cum*-taxpayers, then they enjoy a net gain equal to approximately .04 + .59 - .33 ≈ .3 per cent of GDP or $1,500 million. Because government neither gains nor loses, this net gain for consumers-*cum*-taxpayers implies that exporters' loss far exceeds the gain enjoyed by the import-competing firms.

4.3 Results for WA

To construct the transfer matrix for WA involves a simple approach of apportioning the rows of the national table.[3] We apply WA's shares in national exports, consumption and government expenditure of about 25, 10 and 10 per cent respectively to apportion the corresponding rows of the national table, and express the entries in dollars. This gives the estimates of transfers from WA to the four groups of transfer recipients at the national level, represented by the four columns. Part of these transfer-receipts, of course, stays in WA while the remainder accrues to the rest of Australia. We again employ some simple apportioning rules to decompose the national transfer-receipts into WA and the other States. This involves partitioning each new column derived above into WA and the rest of Australia. We consider first the non-zero transfer-receipts by consumers and government from the WA exporters (row 1). Since WA accounts for approximately 10 per cent of the national consumption expenditure, it is assumed that only about 10 per cent of the total transfer-receipts by the national consumers from WA exporters accrues to the WA consumers. The Commonwealth government, however, collects the whole amount of tax revenue paid by WA exporters. Next, the non-zero transfer-payments to import-competing firms and government by the WA consumers (row 2). Given that WA is about 10 per cent of the national economy, it is assumed that only about 10 per cent of the total payments made by the WA consumers to all import-competing firms goes to the WA firms producing import substitutes. As in the case of tax revenue collected from the WA exporters, the Commonwealth government collects the entire tariff revenue paid by the WA consumers. The Commonwealth government also collects similar revenue from exporters and consumers from the rest of Australia. It was estimated that the total revenue collected by the Commonwealth government from WA and other States was approximately $2,900 (Table 2). Given that WA is one-tenth of the national economy, it is assumed that 10 per cent of the revenue collected at the national level is transferred back to the WA taxpayers. Adjusting for all these, the transfer matrix for WA is obtained and presented in Table 3.

In 1995/96 the total loss of income for WA exporters was approximately $585 million, of which approximately $5 million was transferred to WA consumers, $50 million to consumers in the rest of Australia while the remaining $530 million went to the Commonwealth government in the form of tax revenue (see row 1 of Table 3). The Commonwealth government collected approximately $530 + $90 = $620 million from WA exporters and consumers as tax revenue, while it transferred back to the WA taxpayers approximately $280 million in the form of lower rates on other taxes (see column 8 of Table 3). The remaining

[3] We use various shares of WA in the national economy to derive a transfer matrix for the State from the national matrix. The resulting WA matrix would therefore be sensitive to those shares and the underlying assumptions. Since our intension is to present order-of-magnitude estimates of various transfers, we have not reported any sensitivity analysis in this paper.

Table 3. Protection-Induced Transfers from W.A., 1995/96
($ million)

To → / From ↓	Import-Competing Firms		Consumers		Taxpayers		Government		Total	
	WA (1)	ROA (2)	WA (3)	ROA (4)	WA (5)	ROA (6)	WA (7)	ROA (8)	WA (9)	ROA (10)
1. Exporters	0	0	5	50	0	0	0	530	5	580
2. Consumers	5	70	-	-	0	0	0	90	5	160
3. Government	0	0	0	0	280	340	-	-	280	340
4. Total	5	70	5	50	280	340	-	620	-	-

Notes: [1] Numbers are rounded.

[2] ROA denotes the rest of Australia.

Source: Authors' calculation.

$340 million is transferred to taxpayers in the rest of Australia. On balance, WA is a net loser; its exporters and consumers lose a total amount of approximately $585 + $165 = $750 million and gain only $5 + $5 + $280 = $290 million. The net cost of approximately half a billion dollars amounts to approximately $250 per capita per annum.

5. SIMULATING THE EFFECTS OF REMOVING PROTECTION

This section simulates the benefits for the WA economy from tariff reductions, using a computable general equilibrium (CGE) model. Because tariffs are imposed at the national level, their implications are usually studied within a national framework, and national CGE models such as ORANI (Dixon *et al*, 1982) or its descendant MONASH (Adams *et al*, 1994) are often used in Australia for such studies. However, State economies, given the wide variance in their structures, are not likely to be affected uniformly by tariffs. As discussed in Section 3, the economic structure of WA is markedly different from that of the rest of the Australia due to its export orientation and the substantial role of the minerals and energy sector. This section uses a methodology to estimate the effects of tariff reductions on the WA economy by first starting with national estimates to ensure consistency between the national and State results. The approach is to (i) take the national results of the tariff reductions for Australia, drawn from the Industry Commission (1991); and (ii) use them as inputs into a CGE model for the WA economy, called WAM.

The Commission uses the ORANI model to simulate the effects of reductions in manufacturing tariffs as proposed in the March 1991 *Industry Policy Statement*. According to the *Statement*, the average tariff on imports into Australia will be reduced from 5.5 per cent to just over 2 per cent, which represents a reduction in average tariff of more than 60 per cent relative to the

"end point" of the May 1988 *Economic Statement* (Industry Commission, 1991, p.12).[4, 5].

The Western Australian Model (WAM) is a single-region, multi-sectoral CGE model of the WA economy. The theoretical structure of the model is of ORANI type. The model is fully documented in Clements *et al* (1996) and Ye (1998). An overview of the model, its main features and assumptions follows: As a CGE model, WAM captures the linkages among WA industries in some detail. It incorporates explicitly the decisions made by producers and consumers, embodies relevant government policies and recognises the constraints the economy confronts, such as the limited supplies of primary factors of production. At the core of WAM are (i) input demands by industries and their commodity supplies; (ii) demands for commodities by households and government; and (iii) the external sector comprising imports into and exports from WA. WAM has 42 sectors (synonymously called 'industries' in this paper), each of which produces a single commodity using materials, labour and capital as inputs so as to minimise costs subject to a nested production technology. Producers face competitive markets. The production structure is based on the assumption of constant returns to scale and that each of the material inputs is separable from the others, as well as from primary inputs. Substitution takes place between the two primary factors, labour and capital. WAM considers consumers who own primary factors, and a consolidated government which collects revenue and spends on current consumption. Household consumption demand is based on the assumption of preference independence and utility maximisation. All goods are distinguished according to their source of supply, WA and non-WA. WAM consists of four main building blocks:

- Equations describing the final demands for consumption, investment and government expenditure; and equations describing industrial demands for intermediate inputs and primary factors.
- Zero profit equations which ensure that revenue equals costs, as implied by

[4] As the level and composition of imports undergoes changes almost every year, this comparison of the average tariffs (estimated by the Industry Commission using the actual import flows in 1989-89 as the base) is only illustrative and must not be viewed as a precise comparison between the two underlying tariff programs. The "end point" of a reform program represents the position once the program has been fully implemented. For the May 1988 program, it refers to 1 July 1992 for tariffs generally, 1 January 1992 for tariffs on private motor vehicles (PMV), and 1 July 1995 for the textiles, clothing and footwear (TCF). For the March 1991 program, it corresponds to 1 July 1996 for tariffs generally, and the year 2000 for the PMV and TCF industries.

[5] It is to be noted that the Commission's study simulates the effects of the reductions only in manufacturing tariffs, and therefore our simulations will not be able to capture the impact of reducing tariffs on agricultural commodities as proposed in the March 1991 *Industry Policy Statement*. However, during the period under consideration only a handful of agricultural commodities including sugar, tobacco, certain vegetable and dairy products enjoyed protective tariffs and even these were modest. In our opinion, our simulation results would not therefore be distorted in any significant way by not including agricultural tariffs.

competitive markets.

- Market clearing-conditions for domestically produced goods and primary factors.
- Miscellaneous definitional equations for prices, revenue from taxation, gross state product, total consumption and total trade.

The version of the model employed in this paper uses the same database including the 42-sector WA input-output table for 1989/90 as used by Ahammad and Clements (1999).

Central to our simulation methodology is the choice of a set of appropriate WAM variables through which the ORANI results are transmitted. Our choice is based on the following rationale: The direct effect of reductions in tariffs is to make imports cheaper which, in turn, switches demand away from domestically-produced import substitutes towards imports. This results in a contraction in the previously-protected industries and initially reduces demand for factors of production, particularly labour, placing downward pressures on nominal wages. Lower prices of imported materials and capital equipment, together with reduced wages, provide the unprotected industries with cost advantages. In particular, export industries expand as their international competitiveness improves. Therefore, the appropriate variables for linking WAM with ORANI are industry outputs or input prices that determine each industry's cost advantages. We call these the "transmission" or "shock" variables.

We classify the 42 WAM industries into "national" and "local" categories. A national industry is one whose output is traded Australia-wide, while all others are local. Columns 1 to 3 of Table 4 give the details. As can be seen, 22 WAM industries are regarded as national while the remaining 20 industries are local. The national industries comprise both protected and unprotected industries, and together they account for about 40 per cent of the value of total output of all WA industries.

For national industries, we choose output as the transmission variable. We assume that WA's share in total Australian production remains fixed so that if the tariff reforms result in a 1 per cent increase in the Australian output of agriculture, for example, then output of agriculture in WA increases by 1 per cent as well. To construct the whole set of output shocks, we map the ORANI national industries into WAM industries and columns 4 and 5 of Table 4 present the results. Using WAM notation (see Clements *et al*, 1996), the log-change in output of national industry j, y_j, is set exogenously equal to the corresponding growth rate in Table 4 (divided by 100 to convert percent-change to log-change). For example, as the clothing and footwear industry contracts by 4.7 per cent, we set y_j = - .047 for that industry. We assume that the national industries adjust their capital stock endogenously and that this does not affect the stock of capital available to the local industries.

For the local industries, we choose the wage rate as the shock variable. The activity level of such industries is viewed as determined mainly by the local factors in WA. These are mainly services industries and largely labour-intensive. When in the short run they are unable to change capital stocks, these industries

Table 4. Industry Classification and Output Shock

WAM Industry/Sector[1]			ORANI Industry[2]	Output Shock (%)[3]
Number	Name	Share in Total Output (%)		
(1)	(2)	(3)	(4)	(5)
	National Protected			
11.	Clothing and footwear	.2	Clothing and footwear	-4.7
14.	Chemical, petroleum, coal products	2.3	Chemical, petroleum, coal products	-.3
17.	Fabricated metal products	1.8	Fabricated metal products	-.5
18.	Transport equipment	.9	Motor vehicles etc	-11.6
19.	Other machinery and equipment	1.6	Other machinery and equipment	-.2
20.	Miscellaneous manufacturing	.7	Miscellaneous manufacturing	-2.3
36.	Defence	.6	Public administration and defence	.0
Total		8.2		-1.9
	National Unprotected			
1.	Agriculture	4.1	Agriculture	1.3
3.	Forestry and logging	.1	Forestry, fishing and hunting	1.4
4.	Fishing and hunting	.3	Forestry, fishing and hunting	1.4
5.	Metallic minerals	9.2	Metallic minerals	6.5
6.	Coal, oil and gas	.9	Oil, gas and brown coal	1.2
7.	Minerals n.e.c.	.7	Minerals n.e.c.	.4
8.	Services to mining n.e.c.	1.1	Services to mining n.e.c.	3.2
9.	Food, beverages, tobacco	3.8	Food, beverages, tobacco	1.7
10.	Textiles .	4	Cotton ginning etc.	.8
12.	Wood, wood products, furniture	1.2	Wood, wood products, furniture	.0
13.	Paper, printing, publishing	1.4	Paper, printing, publishing	.0
15.	Non-metallic mineral products	1.2	Non-metallic mineral products	.5
16.	Basic metal products	3.0	Basic metal products	2.6
29.	Air transport	.8	Transport and communication	.8
30.	Services to transport	1.1	Transport and communication	.8
Total		29.3		3.0
	Local			
2.	Services to agriculture	.2	n.a.	n.a.
21.	Electricity and gas	2.2	n.a.	n.a.
22.	Water, sewerage, drainage	.8	n.a.	n.a.
23.	Construction	14.4	n.a.	n.a.
24.	Wholesale trade	5.4	n.a.	n.a.
25.	Retail trade	7.2	n.a.	n.a.
26.	Road transport	1.9	n.a.	n.a.
27.	Railway, transport n.e.c.	.5	n.a.	n.a.
28.	Water transport	.4	n.a.	n.a.
31.	Communication	1.5	n.a.	n.a.
32.	Finance, investment	2.4	n.a.	n.a.
33.	Insurance etc.	.8	n.a.	n.a.
34.	Business services n.e.c.	7.1	n.a.	n.a.
35.	Public administration	3.4	n.a.	n.a.
37.	Health 4.2	n.a.	n.a.	
38.	Education, library etc.	3.2	n.a.	n.a.
39.	Welfare etc.	2.2	n.a.	n.a.
40.	Entertainment etc.	1.8	n.a.	n.a.
41.	Restaurants, hotels, clubs	2.3	n.a.	n.a.
42.	Personal services	.7	n.a.	n.a.
Total		62.5		n.a.
Total		100		.7

Notes: [1] Numbers in the first column correspond to the order in which WAM industries are usually arranged.

[2] The classification of the ORANI industries is from the Industry Commission (1991).

[3] Totals in column 5 are output-share-weighted averages of the components.

Sources: WAM database and Industry Commission (1991).

change their activity levels by adjusting employment. Therefore, for a given change in demand for its output resulting from the tariff reductions, the output response of a local industry depends on how the policy change impacts upon the wage rate. According to the projections by the Industry Commission (1991), the wage rate would fall by 1 per cent due to the tariff reductions in question. We assume that WA wages would fall also by 1 per cent. We, therefore, set exogenously the pre-tax nominal wage variable in WAM, $\overline{p}^{rl}$, equal to -.01. In reality, the benefits from the reduced wage rate will flow to both national and local industries. But for the national industries, such benefits are already incorporated in the output shocks considered above.

Given the way the shocks are implemented, we can decompose the total effects of the tariff reductions into three components as follows:

(i) The effects of the contraction of the protected national industries. The rates of contraction of these industries are given by the output shocks in column 5 corresponding to the top panel of Table 4. According to the WAM database, these output shocks represent about 2 per cent reduction in the output of the protected industries or $.02 \times 8.2 \approx .2$ per cent fall in WA's total output.

(ii) The effects of the expansion of the unprotected national (mainly, exporting) industries. The rates at which these industries would expand are given by the output shocks in column 5 corresponding to the "National Unprotected" industries in Table 4. These shocks represent about 3 per cent growth in the unprotected national industries or $.03 \times 29.3 \approx .9$ per cent growth in WA's total output.

(iii) The effects of the fall in wages by 1 per cent in the non-tradeable industries, when none of the national (both protected and unprotected) industries changes its production level. According to the WAM database, the wage bill comprises about 32 per cent of the total cost of production of these industries in the base year.

In all simulations, we assume that exchange rate, production technologies, government expenditure (real) and tax rates remain unchanged. WA is treated as a price taker for its imports and its export demand schedules are near horizontal[6,7,8].

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[6] The way the tariff effects are simulated leads to a significant rise in the price of Transport equipment and hence the CPI. We solve this problem by restricting the price of Transport equipment from going up.

[7] Recall that the March 1991 Program is spread over the period from January 1992 to the year 2000. The ORANI results represent the responses of the economy approximately 5 to 10 years after the 1991 program has been fully implemented (Industry Commission, 1991, p. 60). Loosely speaking, the same timeframe will apply to the WAM simulated results.

[8] This average refers to the period from June 1992 to June 1996. This period is chosen to avoid the effects of the recession in the early 1990s.

5.1 Macroeconomic Effects

In Table 5 the simulated results for the key macroeconomic variables for WA are presented. Columns 2 through 4 correspond to the above decomposition. Together these three columns give the effects on the WA economy of reductions in manufacturing tariffs, as given in column 5.

As the final column of the table shows, the WA economy benefits substantially from the tariff reforms:

GSP grows by approximately 1.3 per cent per annum or approximately half a billion dollars (in 1989/90 prices).

The aggregate value of exports grows by about 2.7 per cent per annum -- twice the growth rate of GSP. Had the 1991 program of tariff reform not taken place, the WA exporting industries would have been denied a gain of approximately $340 million in export revenue. The import bill of the State goes up too (by $170m). As imports get cheaper and the overall economy expands, aggregate imports also go up to meet the increased demands for material inputs and final consumption. The balance of trade position of the State, however, improves by approximately $340m - $170m = $170 million.

The tariff cuts cause the protected industries to contract and unprotected tradeable industries to expand. The contraction of the protected industries results in a loss of GSP and consumption (column 2 of Table 5). However, the expansion of the unprotected tradeable industries, which are predominantly export industries, by far offsets these losses (columns 2 and 3). Comparing columns 3 and 5 of the table, we can ascertain that most of the benefits from tariff cuts flow from the expansion of non-protected exporting industries.

To make clearer the differential regional impact of tariffs, Table 6 presents for both the national and WA economies the key macroeconomic effects of tariff reductions according to the March 1991 program. The effects of tariff cuts on WA are significantly different from those for Australia. The percentage increase in WA's GSP is approximately three times that of the national economy with similar results for household consumption. Hence, the WA economy gains a lot more from the tariff reductions than the national average.

5.2 Sectoral Effects

Table 7 presents the effects of the tariff reductions on the output of nine broad industries. As can be seen from column 5 of the table:

The WA minerals sector expands the most - by about 4 per cent per annum. This is expected because the sector is highly export oriented, and tariffs penalise sectors more the higher the degree of export-orientation. Therefore, the Minerals sector, relieved of the implicit tax due to the reductions in tariffs, expands significantly.

All services sectors gain from reductions in tariffs. Particularly noteworthy is the 1.7 per cent growth in Transport services which comprises road, railways, water and air.

Table 5. Macroeconomic Effects of Tariff Reductions on the W.A. Economy

Variable	Due to			Total Effects
	Contraction in Protected Industries	Expansion in Unprotected Industries	Fall in Wages	[(2)+(3) +(4)]
(1)	(2)	(3)	(4)	(5)
Gross state product	-.3	1.2	.4	1.3
Private consumption	-.3	1.1	.4	1.2
Consumer price index	-.0	0.3	-.2	.0
Total imports	-.3	1.5	.2	1.4
Total exports	.3	2.0	.4	2.7
Gross state product	-90	430	130	470
Private consumption	-60	260	80	280
Consumer price index	-.0	0.3	-.2	.0
Total imports	-40	180	30	170
Total exports	30	260	50	340

Notes: [1] The percentage changes are relative to 1989/90 (the base year) levels.

[2] The CPI = 100 in 1989/90 (the base year); all other variables in terms of changes in levels are expressed in $ million.

Source: WAM simulations.

Table 6. Macroeconomic Effects on Australia and W.A. of Tariff Reductions (Percent Change)

Variable (1)	Australia (2)	WA (3)
Gross domestic product	.4	1.3
Private consumption	-	1.2

Note: Between -.05 to .05 per cent.

Sources: For the Australian projections, Industry Commission (1991); and Table 5 of this paper for the WA results.

5.3 Employment Effects

The WAM simulations are carried out with the capital stock in each local industry held fixed. As a result, the employment effects are probably overestimated. This is because, in percentage terms, employment has to change much more than output when capital remains fixed. In reality, however, both capital and labour would adjust, so that the employment effects would be less than what our model simulates. At present, however, WAM is unable to

Table 7. Effects of Tariff Reductions on the Output of W.A. Industries (Percent Change)

Sector/ Industry	Due to			Total Effects [(2)+(3) +(4)]
	Contraction in Protected Industries	Expansion in Unprotected Industries	Fall in Wages	
(1)	(2)	(3)	(4)	(5)
Minerals (mining plus mineral processing)	-.04	4.02	.00	3.98
Agriculture, forestry and fishing	-.00	1.31	.00	1.31
Manufacturing (excluding mineral processing)	-1.23	.56	.00	-.66
Electricity, gas and water	-.03	.27	.35	.59
Construction	-.05	.19	.31	.46
Wholesale and retail trade and entertainment	-.21	.81	.72	1.32
Transport	-.13	1.36	.47	1.70
Finance and business services	-.09	.80	60	1.31
Education, health, welfare and other n.e.c.	-.12	.49	.38	.75
Total	-.23	1.23	.33	1.33

Notes: [1] The percentage changes are relative to 1989/90 (the base year) levels.

[2] Table A2 in Ahammad and Greig (1998) provides more detailed results and the composition of the broad industries.

Source: WAM simulations.

incorporate this sort of supply response. We, therefore, adopt an alternative approach to estimate the overall employment impact of tariff cuts. We employ the following relationship between the growth in employment (ℓ), GSP (y) and real wages (w - p), estimated by Ahammad and Clements (1999):

$$\ell = .5\, y - .4\, (w - p). \qquad (1)$$

The coefficient of the variable y measures the GSP elasticity of labour demand and implies that there would be a .5 per cent growth in employment if GSP grew by one per cent. Likewise, the coefficient of $(w - p)$ measures the wage elasticity of labour demand and implies that a 1 per cent rise in real wage would lead to a .4 per cent reduction in employment. From Table 5, we have

$$y = 1.3, \text{ and } p = 0. \qquad (2)$$

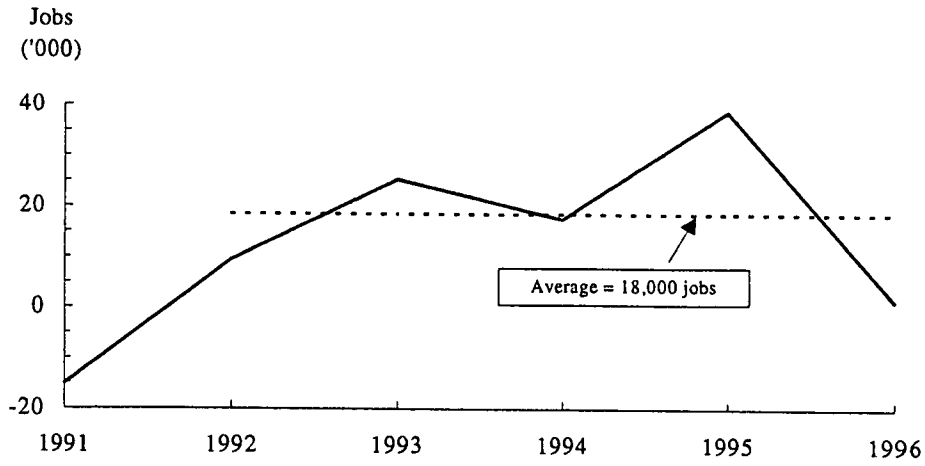

Figure 2. Growth in Employment in W.A., 1991-1996
Source: Australian Bureau of Statistics (1996b).

Also recall that by construction of the shocks above, w = -1. Substituting these values into equation (1), we estimate ℓ = 1.1. In other words, the tariff reductions generate a 1.1 per cent growth in employment, or nearly 7,000 additional jobs per annum in WA. We use this projection of aggregate employment to scale the WAM results for sectoral employment.

These additional jobs of 7,000 seem to be substantial when compared with the 18,000 new jobs created each year in WA on average during 1992 - 1996; see Figure 2.[8]

Figure 3 gives the sectoral distribution of these 7,000 new jobs:

More than 2,000 jobs, or about one-third of the total, are located in Wholesale and retail trade and entertainment sector, followed by the Finance and business services sector.

The Minerals sector, typically not a big employer, generates about 13 per cent of the additional jobs associated with the tariff cuts.

More than 60 per cent of the total new jobs are located in the above three sectors.

Note from Figure 3 that employment in Manufacturing (excluding mineral processing) expands up by about 400 jobs. This is particularly interesting because it is a widely held view that reductions in tariffs lead to losses in manufacturing jobs. To investigate this issue further, we decompose Manufacturing employment into the protected and unprotected components and the results are given in Table 8. It is revealed that when the tariff reductions force the protected sector to contract, this leads to approximately 1,100 job losses economy-wide (Column 2 of Table 8). Manufacturing loses approximately 380

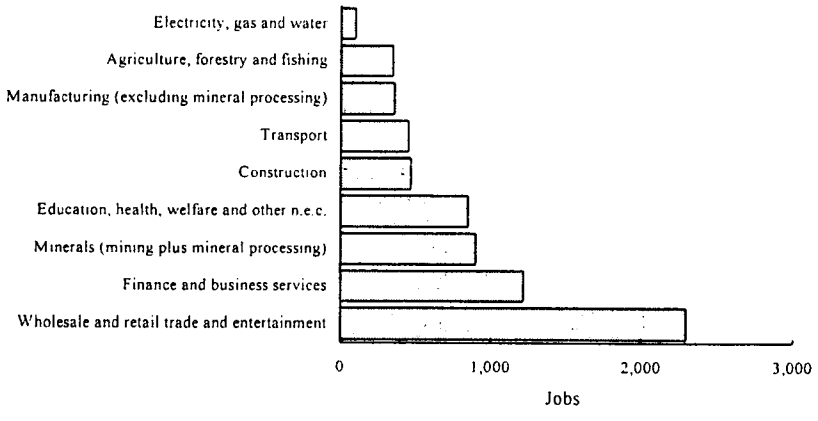

Figure 3. Employment Effects of Tariff Reductions on W.A. Industries.

Source: WAM simulations.

jobs, with the highly protected Transport equipment industry accounting for 330 of those job losses. Nevertheless, this is only part of the tariff-job nexus. As can be seen, the reductions in tariffs also induce substantial growth in the unprotected industries leading to about 4,680 + 3,420 = 8,100 additional jobs, with about 370 +370 = 740 new jobs located in Manufacturing (columns 3 and 4 of Table 8). On balance, Manufacturing generates about 740 – 380 = 360 additional jobs (column 5). What is more interesting is that, of these additional manufacturing jobs that result from the tariff reductions, about 115 are located in the protected industries (column 5). These industries lose about 360 jobs immediately after the tariff reductions (column 2) but generate about 275 + 200 = 475 new jobs indirectly due to growth in unprotected industries following the tariff reform (columns 3 and 4).

Maintaining *status quo* of the manufacturing protection is very expensive because:

- for each job "supported" in the protected WA manufacturing sector, the WA economy loses nearly (7,000 + 360) ÷ 360 ≈ 20 potential new jobs;
- even the protected manufacturing industries, on average, forgo (275 + 200) ÷ 360 ≈ 1.3 new jobs for each job protected by tariffs; and
- in terms of lost GSP, each protected job costs the economy $470m ÷ 360 ≈ $1 million per annum.

Table 8. Further Decomposition of the Employment Effects in W.A. of Tariff Reductions (Additional Jobs)

Sector/ Industry	Due to			Total Effects [(2)+(3) +(4)]
	Contraction in Protected Industries	Expansion in Unprotected Industries	Fall in Wages	
(1)	(2)	(3)	(4)	(5)
Manufacturing[1]				
Protected Manufacturing[2]				
Transport equipment	-330	-5	30	-305
Other	-30	280	170	420
Total	-360	275	200	115
Unprotected Manufacturing	-20	95	170	245
Total Manufacturing	-380	370	370	360
Non-manufacturing[3]	-720	4,310	3,050	6,640
All industries	-1,100	4,680	3,420	7,000

Notes: [1] Manufacturing excludes mineral processing.

[2] Protected manufacturing includes Clothing and footwear, Fabricated metal products, Transport equipment, Other machinery and equipment and Miscellaneous manufacturing. Unprotected manufacturing comprises all other manufacturing.

[3] Non-manufacturing includes all industries of Figure 3 except Manufacturing.

Source: WAM simulations.

6. SUMMARY AND CONCLUSIONS

The Western Australian economy is significantly different from the economies of the other Australian States -- even from Queensland, the only other comparable State. The major source of the difference is the role of WA's mining industry and the consequent global outlook it provides for the State. Protection policy imposes a major burden on WA, which hampers expansion of its economy and its export sector in particular. In such a case, development of estimates of these regional costs is important. In this paper estimates of these costs on the WA economy are provided.

Using the Clements-Sjaastad methodology, the transfers of the burden of protection in terms of taxes and subsidies are estimated. It was found that on balance WA is a substantial net loser. In 1995/96, Western Australian:

- exporters were taxed a total amount of approximately $585 million;
- consumers lost $90 million to the Commonwealth in the form of tax revenue and $75 million of subsidies paid to import-competing firms; and
- economy as a whole incurred a net loss of about half a billion dollars. This amounts to about $250 per capita per annum.

A different methodology is used to estimate the effects on the size and structure of the WA economy of full implementation of the reductions in

manufacturing tariffs proposed in the Labor Government's March 1991 *Industry Policy Statement*. This would have reduced the average tariff from 5.5 per cent in 1988 to just over 2 per cent in 1996 -- a reduction of about 60 per cent. A study by the Industry Commission (1991) used the ORANI model to provide estimates of the national effects of the tariff reductions. These national effects were then used with a model of the WA economy, WAM, to produce estimates of how the tariff reductions would impact on WA. The macroeconomic results of the tariff reductions for WA are:

- GSP grows by about 1.3 per cent per annum or approximately half a billion dollars (in 1989/90 prices) compared with the Industry Commission's estimates of 0.4 per cent (or $1.5 billion) increase in national GDP.
- The aggregate value of exports grows by about 2.7 per cent per annum -- twice the growth rate of GSP. Had the 1991 program of tariff reform not taken place, the WA exporting industries would have been denied an annual gain of about $340 million in export revenue.

The import bill of the State increases too (by about $170m). As imports get cheaper and the overall economy expands, aggregate imports also go up to meet the increased demands for material inputs and final consumption. The balance of trade position of the State, however, improves by about $340m - $170m = $170 million.

Estimates are made of the sectoral impacts of the tariff cuts. The effects are largely as expected with the WA minerals sector expanding the most -- by about 4 per cent per annum. All service sectors also gained from the reduction in tariffs with an extra 1.7 per cent per annum growth in WA Transport services. Employment impact estimates were also made. In summary these showed that nearly 7,000 additional jobs per annum in WA were created with about one third in the Wholesale and retail trade and entertainment sector, around 1,200 were in Finance and business services sector while Minerals had less than 1,000 of the additional jobs. Finally, estimates of the cost of protecting each job in the protected sector were made. It was found that for each job supported in the protected WA manufacturing sector the WA economy lost about 20 potential new jobs elsewhere and, in terms of lost GSP, each protected job cost the State economy about $1 million per annum.

REFERENCES

Adams, P.D., Dixon, P.B., McDonald, D., Meagher, G.A. and Parmenter, B.R. (1994) Forecasts for the Australian economy using the MONASH model. *International Journal of Forecasting*, 10, pp.181-189.

Ahammad, H. (1998) The economics of the WA minerals sector: an overview of ERC research. Discussion Paper No. 98.13. Department of Economics, The University of Western Australia.

Ahammad, H. and Clements, K.W. (1999) What does minerals growth mean to Western Australia? *Resources Policy,* 25, pp.1-14.

Ahammad, H. and Greig, R. (1998) Looking backward versus looking westward: a regional perspective on tariffs. Discussion Paper No. 98.21. Department of Economics, The University of Western Australia.

Anderson, K. and R. Garnaut (1987) *Australian Protectionism: Extent, Causes and Effects.* Allen & Unwin: Sydney.

ABARE (Australian Bureau of Agricultural and Resource Economics) (1988) *Primary Industry Assistance in an Economy-Wide Context.* Discussion Paper No. 88.1.

Australian Bureau of Statistics (1996a) *Australian National Accounts: Input-Output Tables 1992-93.* Catalogue No. 5209.0.

Australian Bureau of Statistics (1996b) *Labour Force, Australia.* Catalogue No. 6202.0.

Australian Bureau of Statistics (1997) *Australian National Accounts: State Accounts, 1995/96.* Catalogue No. 5220.0.

Brigden, J.B., Copland, D.B. Dyason, E.C. Giblin, L.F. and Wickens, C.H. (1929) *The Australian Tariff: An Economic Enquiry* [Committee on Economic Effects of the Tariff]. (2nd ed.) Melbourne University Press: Melbourne in association with Macmillan.

Business Council of Australia (1993) *Australia 2010: Creating the Future Australia.*

Business Council of Australia (1994) *Investing in Australia's Future: Achieving the Australia 2010 Vision.*

Choi, K. (1988) *Essays in Economic Aspects of Protection.* Master of Economics Thesis. Perth, WA: The University of Western Australia.

Choi, K. and Cumming, T.A (1986) Who pays for protection in Australia? *Economic Record,* 62, pp. 490-496.

Clements, K.W., Ahammad, H. and Qiang, Ye (1996) New mining and mineral-processing projects in Western Australia: effects on employment and the macroeconomy. *Resources Policy,* 22, pp.293-346.

Clements, K.W. and Sjaastad, L.A. (1984) *How Protection Taxes Exporters.* Thames Essay No. 39. Trade Policy Research Centre: London.

Corden, W.M. (1958) Import restrictions and tariffs: a new look at Australian policy. *Economic Record,* 34, pp. 331-346. Reprinted in W.M. Corden (1997) *The Road to Reform: Essays on Australian Economic Policy.* Addison Wesley Longman: South Melbourne.

Corden, W.M. (1996) Protection and liberalisation in Australia and abroad (The Joseph Fisher Lecture in Commerce given at the University of Adelaide on 6 September, 1995), *Australian Economic Review,* 29, pp.141-154.

Dao, D. and Jowett, T. (1994) *Economic Effects of Microeconomic Reform: Supplementary Paper.* Working Paper. Canberra: Economic Policy Advisory Council.

Dixon, P.B. and Butlin, M.W. (1977) Notes on the Evans model of protection. *Economic Record,* 53, pp.337-349.

Dixon, P.B., Parmenter, B.R., Ryland, G.J. and Sutton, J. (1977) *ORANI, A General Equilibrium Model of the Australian Economy: Current Specification and Illustrations of Use For Policy Analysis.* First Progress Report of the IMPACT Project, Vol. 2. AGPS: Canberra.

Dixon, P.B., Parmenter, B.R., Sutton, J. and Vincent, D.P. (1982) *ORANI: A Multisectoral Model of the Australian Economy.* North-Holland:

Amsterdam/New York/Oxford.
Evans, H.D. (1972) *A General Equilibrium Analysis of Protection: The Effects of Protection in Australia*. North-Holland: Amsterdam.
Filmer, R. and D. Dao (1994) *Economic Effects of Microeconomic Reform*. EPAC Background Paper No. 38. AGPS: Canberra.
Harberger, A.C. (1964) Taxation, resource allocation and welfare. In *The Role of Direct and Indirect Taxes in the Federal Revenue System*. Princeton University Press: Princeton, NJ.
Higgs, P.J. (1986) *Adaptation and Survival in Australian Agriculture*. Oxford University Press: Melbourne.
Higgs, P.J. (1989) The taxation of Australian agriculture through assistance to Australian manufacturing. In A.B. Stoeckel, D. Vincent and S. Cuthbertson (eds) *Macroeconomic Consequences of Farm Support Policies*. Duke University Press Durham, NC.
Industries Assistance Commission (1989) *Annual Report 1988-89*. AGPS: Canberra.
Industry Commission (1991) *Changes to Manufacturing Industry Assistance: March 1991*. Information Paper. AGPS: Canberra.
Industry Commission (1996a) *Reform and the Distribution of Income: An Economy-wide Approach*. Staff Information Paper. Industry Commission: Melbourne.
Industry Commission (1996b) *Annual Report 1995-96*. AGPS: Canberra.
Industry Commission (1997a) *The Automotive Industry*. 2 Vols. AGPS: Canberra.
Industry Commission (1997b) *The Textiles, Clothing and Footwear Industries*. 2 Vols. AGPS: Canberra.
Industry Commission (1998) *Microeconomic Reforms in Australia: A Compendium From the 1970s to 1997*. Research Paper. AGPS: Canberra.
Marais, T. (1992) The cost of protection to Western Australia. Discussion Paper 92.27. Perth, WA: Department of Economics, The University of Western Australia.
Murphy, C. and Brooker, R. (1994) Murphy model and the microeconomic reform. In C. Hargreaves (ed.) *A Comparison of Economy-Wide Models of Australia*. Commission Paper No. 2, Economic Policy Advisory Commission, AGPS: Canberra.
Powell, A.A. (1977) *The IMPACT Project: An Overview, March 1977*. First Progress Report of the IMPACT Project. Vol. 1. Canberra: AGPS.
Productivity Commission (1996) *Stocktake of Progress in Microeconomic Reform*. AGPS: Canberra.
Quiggin, J. (1996) *Great Expectations: Microeconomic Reform and Australia*. St Leonards, Allen & Unwin: NSW.
Stolper, W.F. and Samuelson, P.A. (1941) Protection and real wages. *Review of Economic Studies*, 9, pp.58-72.
Vernon, J. *et al.* (1965) *Report of a Committee of Economic Enquiry*. Commonwealth of Australia Canberra.
Western Australian Treasury (1981) Cross-subsidies between States arising from

the distribution of Commonwealth assistance to industries. Chapter 8 in R.L. Mathews (ed.) *Regional Disparities and Economic Development.* Centre For Federal Financial Relations, Australian National University: Canberra.

Ye Qiang (1998). *The Economic Significance of the New Minerals Projects in Western Australia.* PhD Thesis, Economic Research Centre, Department of Economics, The University of Western Australia.