International Trade and the Australian Labour Market

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> '[The Harvester judgment] was based on the wages paid in sheltered industries. The adjustments of wages to prices have protected the basic wage-earners from the costs of the tariff, and have kept the [wage] standard itself closely related to the favourable wage paying capacities of protected industries. This development is not without danger; at some time it will be necessary to review the principles of the Australian wage standard, and ... the circumstances of the unsheltered industries should not be ignored.
>
> [However,] the unsheltered [rural] industries also have different degrees of efficiency...We reject any suggestion that wages should be reduced to the amount payable on marginal farms, and we do not suggest reduction at all. But when the wage standard is in effect determined by the sheltered industries there is a possibility of it being pushed too high, and this danger will remain with us unless the wage standard is directly related to the economic capacities of the export industries' (*Report of the Brigden Committee of Enquiry into the Australian Tariff*, 1929, p. 121).

1. Introduction

As the Australian economy becomes more closely tied with the fast-growing, but low-wage, countries of North and East Asia, several commentators have warned of important emerging changes in the labour market. In particular, the rapid growth of manufactured imports from these countries is said to imply that unskilled workers in this sector of the Australian economy face the prospect of either high unemployment or, if the centralised wage-setting system is liberalised, large reductions in their real wages. Gregory, Anstie and Klug (1991), for instance, find that the relatively high wages received by Australian textile, clothing and footwear workers (compared with their US counterparts) can be largely explained by the centralised wage-setting system, in combination with the very high rates of protection from imports that have been given to these industries. A clear implication from this study is that as protection is reduced and the labour market becomes less regulated, the wages paid in these industries will come under increased downward pressure. The decline in manufacturing employment, which has been especially severe since the early 1980s, is apparently largely due to these competitive effects.

The flavour of the issues can be gauged from Figure 1, which shows Australian imports of footwear from China. These imports have taken off spectacularly, more than trebling in value and volume in the three years from 1989/90. During this time, the effective rate of protection received by the footwear industry fell from 111 per cent to 67 per cent (Industry Commission 1993, p. 433). As Figure 2 shows, employment in the industry fell by 30 per cent over this period, compared with 13 per cent for the manufacturing sector as a whole.[1] This would appear to be a textbook example of what

1. This relative performance does not appear to be due to any excessive cyclical sensitivity during the recent recession. In the previous recession (between June 1982 and June 1983) employment in the footwear industry and manufacturing generally each fell by about 10 per cent. However, there was no surge in footwear imports from low-wage countries during this time, possibly because the effective rate of protection received by that industry was increased.

Figure 1: Imports of Footwear from China

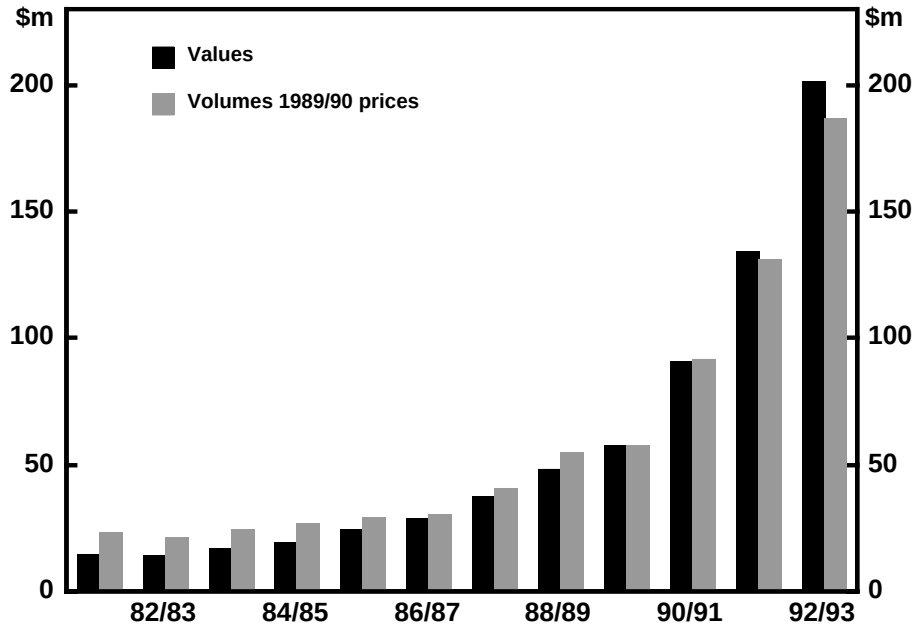
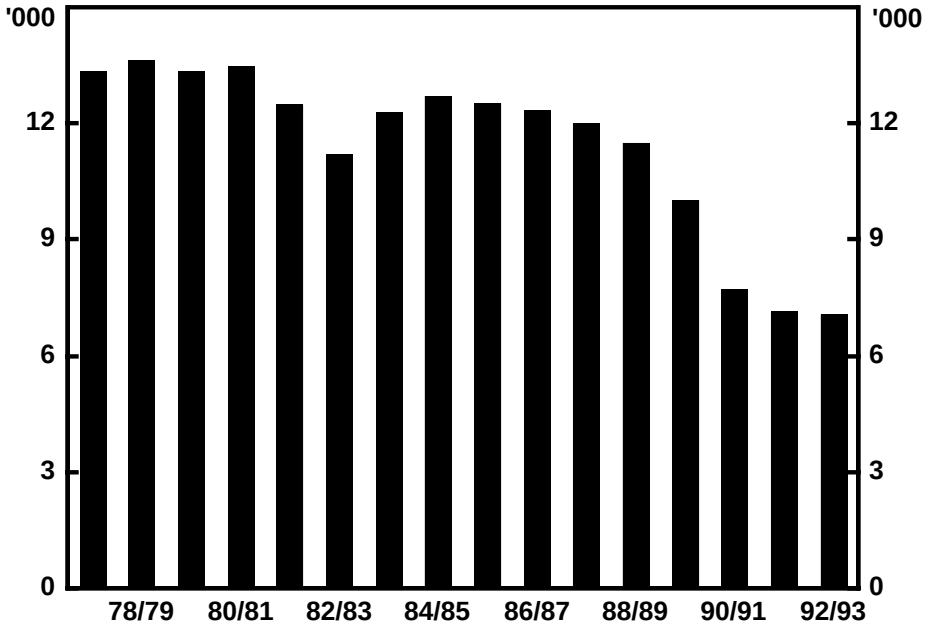


Figure 2: Employment in the Footwear Industry



happens when a hitherto protected industry is opened to international competition.

Of course, the footwear industry might be just a special case, and our purpose in this paper is to examine the impact of trade liberalisation on the entire manufacturing sector. We confine our analysis to manufacturing because over 90 per cent of merchandise imports are manufactured goods. While this sector accounts for only about 15 per cent of the economy, the changes brought to it by internationalisation are still important, as their effects on structural unemployment generally could be disproportionately large. Moreover, internationalisation can have large indirect effects on the entire labour market through, for example, the adoption of technologies that economise on the use of unskilled labour.

In Section 2 we present a brief history of the link between international trade and the labour market in Australia and review evidence on this question from other countries. In Section 3 we describe how the traded sector of the economy has expanded, in particular imports from low-wage countries. We also analyse the recent very rapid growth of elaborately transformed manufactured exports and examine why despite this expansion, employment in the industries that produce these exports has actually fallen. In Section 4 we review the mechanisms through which trade can affect prices and wages, and whether trade has had any effect on the relative wages of skilled and unskilled labour. We find no evidence of any such effect. In Section 5 we decompose the change in manufacturing employment into the effects of trade, domestic demand and productivity improvements. We find that imports from low-wage countries have directly decreased employment in only the Clothing and Footwear industry, and that by far the biggest source of employment loss in manufacturing has been productivity improvements (given the level of demand). In Section 6 we review some recently suggested channels through which one source of productivity improvement, technological progress, can affect wages and employment, and how this is linked to international trade. Finally, in Section 7 we summarise our results and address the implications of trade liberalisation for the future course of labour-market policy.

2. The Issues

The issues of trade and labour-market policy have been at the centre of the debates about Australia's economic development for around 100 years. In 1906, Prime Minister Alfred Deakin successfully secured Labor Party support for his protectionist trade policies by offering to link this protection with 'fair and reasonable' wages in manufacturing industries. This 'New Protection' policy was effected in the *Excise Tariff Act* of that year. Although, two years later, this law was found to be unconstitutional, the principles behind it were affirmed in Justice Higgins' Harvester judgment of 1907 which formed the basis of Australia's ongoing system of centralised wage determination. The Harvester judgment was predicated on the idea that wages should reflect the living costs of a worker with a wife and three children. Higgins maintained that no industry should receive protection from imports unless it had the capacity to pay this 'basic wage' and, most significantly, the judgment was based on wages then being paid in protected manufacturing industries in and around Melbourne (Brigden *et al.* 1929).

This formula for determining wages was soon criticised by many economists who argued that industry wages should be based on corresponding levels of productivity

(Copland 1924),[2] and by those who saw some shortcomings with the wage *cum* tariff policy (Shann 1930): high levels of protection enabled manufacturing firms to pass wage increases on to consumers in the form of higher prices, which led to still higher wages through the centralised wage-setting arrangements, which led to demands for higher levels of protection, and so on.[3] Exporters, however, could not pass on these higher costs to their customers.

Beginning with the Brigden Committee Report of 1929, a number of official enquiries have considered the nexus between wages and tariffs. While recognising the costs of protection, the Brigden Committee concluded that the protection of Australian manufacturing was, in net terms, beneficial for two reasons: tariffs increased Australia's terms of trade and, more importantly, the growing population could only be employed (at sufficiently high real wages) if manufacturing industries were protected, given that the rural industries had low labour intensity.[4] This rationale formed the basis of manufacturing policy over the following forty years, with the additional element that in the 20 years or so after World War II, the growing population was largely created by rapid immigration, and these migrants were predominantly employed in manufacturing.[5]

The Vernon Committee Report of 1965, in its comprehensive review of the Australian economy and policy making, endorsed the Brigden Committee's conclusions, adding that labour-saving technological improvements in agriculture added further to the need for a growing manufacturing sector. It did, however, concede that in the absence of protection, the wage share of output would probably have been lower because so too would have been the exchange rate. This conclusion was not obviously correct, as the static depreciating effects of removing protection might have been offset by dynamic efficiency gains in the traded sector of the economy (i.e. faster productivity growth) which would have appreciated the exchange rate. In any case, with memories of the Depression still fresh, post-war policy making was conducted with a policy of full employment firmly in mind. With rapid economic growth leading to low unemployment and rising living standards, questions of microeconomic efficiency, in either product or labour markets, were not of immediate concern.[6] However, by the late 1960s, the Tariff

2. Copland's argument against centralised wage setting (which at the time he wrote meant the indexation of wages to consumer prices) was not that real wages became misaligned with productivity on average, but that this system impeded the adjustment of real wages to (what are now known as) real shocks:

   > 'The general result is that in years of rapidly rising prices, wages lagged behind when the productivity of industry might have justified higher rates, but in the period of depression wages are relatively higher than before, and the readjustment is slow. This shows the rigidity of the arbitration system and the difficulties that arise through the regulation of industrial costs on so artificial a standard' (Copland 1924, p. 47).

3. This was noted as early as 1927 by the Tariff Board in a section of its annual report appositely titled 'The Abuse of Protection' (Brigden *et al.* 1929, pp. 165-168).

4. This is also Samuelson's (1981) interpretation of the Brigden report, based on Heckscher-Ohlin trade theory. Manger (1981) disputes this interpretation contending instead that underlying the report was a Ricardian trade model. More interesting than this doctrinal debate was the dubious factual basis of the Brigden recommendations. Even by the early 1920s over half of the workforce was employed in service industries, and this fraction was growing fast (ABS 1988, p. 675). It appears that the need to maintain a large manufacturing sector to employ the growing population was exaggerated.

5. From 1947 to 1966, 69 per cent of the increase in the manufacturing employment came from immigration, compared with 49 per cent in the rest of the labour force (Norman 1971, p. 19).

6. In the 20 years from 1949/50, real consumer wages rose by nearly 70 per cent (Foster and Stewart 1991, pp. 176, 210).

Board (later the Industries Assistance Commission/Industry Commission) became more prominent in the protection debate, emphasising that the economy-wide effects of protecting particular industries were usually negative.[7] Although this view was for many years deeply unpopular, it now appears that the Industry Commission has won both the intellectual and political debates, and policy makers are now firmly committed to an open trading regime.

The first major review of the wage setting system after Vernon was by the Hancock Committee, which reported in 1985. For a variety of reasons it concluded strongly in favour of retaining centralised wage setting, but also said that 'an argument might be advanced for wage restraint as a corollary of a policy of reducing levels of protection' (p. 179, para 4.63). This statement was probably motivated by a perceived need for wage settlements to ensure 'international competitiveness' at a macroeconomic level, in the event of an opening of the economy to international trade. With inflation currently, and prospectively, at very low levels, the current debate has shifted to microeconomic issues, especially the responsiveness of relative wages to the pressures arising from freer trade and increased internationalisation generally.

Concerns about internationalisation have not been unique to Australia. Harris (1993) examines the implications of 'globalisation' in his Presidential Address to the Canadian Economics Association. He identifies the three most important causes of globalisation to be the reduction in trade and investment barriers since World War II, the rapid growth of the developing country economies and their impact on global productive capacity, and technological changes in transport and communication. He concludes that traditional international economics, which identifies national economies as conceptually useful separate units of study, may be becoming obsolete.

In the United States, discussion of these issues has been largely motivated by the slow growth of real wages over the past two decades, with average real hourly compensation (which includes fringe benefits) rising by only 5 per cent between 1973 and 1991. Moreover, there has been a sharp rise in the inequality of earnings: between December 1979 and December 1992, the earnings of white-collar workers grew by 10.9 per cent more than those of blue-collar workers (Lawrence and Slaughter 1993, p. 162). Murphy and Welch (1991) attribute these developments primarily to the decline of manufacturing employment, associated with the large increase in the United States' trade deficit in the 1980s. They claim this decline reduced the relative demand for low-skilled workers, hence the fall in their relative wages. In a widely quoted study, Borjas, Freeman and Katz (1992) calculate the quantities of skilled and unskilled labour embodied in the American trade deficit. Since the United States tends to import goods with large quantities of embodied unskilled labour, they argue that international trade has added to that country's supply of unskilled labour and thus depressed wages paid to unskilled workers.[8]

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7. Some academic economists, especially Max Corden, were also influential critics of Australian protection policies. See, for example, Corden (1966).

8. Some recent anecdotal evidence suggests that such effects need not be restricted to unskilled labour. In its edition of 1 November 1993, the newspaper *Computerworld* reports that the consulting rates for computer programmers in the United States have decreased from US$400-450 to $US225-280 per day because of competition from programmers in countries like India and the former Soviet Union, with one consultant programmer suggesting an appropriate policy response might be for the US government to place tariffs on foreign services performed for US firms!

These studies, especially the latter, have been criticised as being flawed in that they do not properly test for the effects of trade on wages. In particular, standard trade theory suggests that factor prices are determined by product prices, not the quantities of goods that are being traded (or the quantities of the factors that are implicitly traded). For a country like the United States, theory suggests that a fall in the relative wage of unskilled labour should be accompanied by a rise in the price of manufactured exports relative to manufactured import prices, but this ratio fell over the 1980s (Bhagwati and Dehejia 1993, p. 21). An alternative explanation for the evolution of wages is that technological change, biased against unskilled labour, has reduced the demand for unskilled labour and therefore its wage. Krugman and Lawrence (1993) and Bound and Johnson (1992) come to this conclusion. Andersen and Dittus (1994), in a study of how trade with Eastern Europe has affected Western European labour markets, find that the trade effects on employment have been small compared with the effects of domestic developments. In contrast to the United States, in Europe, the effects have been felt in employment rather than wages, which probably reflects the relative inability of European real wages to adjust to real shocks.[9]

3. Internationalisation, Low-Wage Imports and Exports

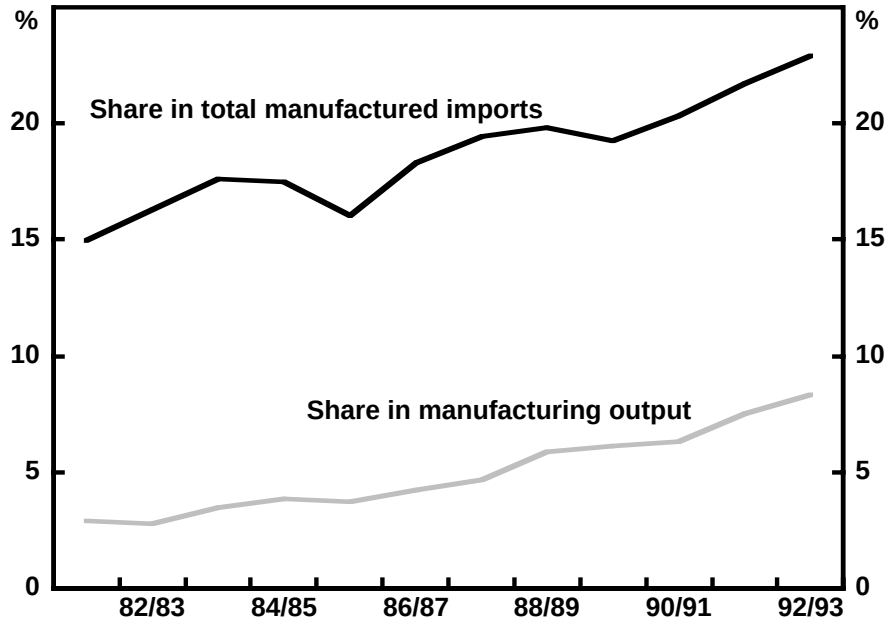
In this section, we describe the increased openness of the Australian economy; summarise the source and composition of manufactured imports, especially from low-wage countries; and analyse the growth of elaborately transformed manufactured exports. Australia's increased trade with low-wage countries is conveniently summarised in Figure 3. (Low-wage countries are defined to be the non-OECD countries, plus Greece, Portugal and Turkey, minus Singapore, Hong Kong and Israel.)[10] As a proportion of the total, imports from these countries increased from 15 per cent in 1981/82 to about 23 per cent in 1992/93. As a proportion of real manufacturing output (i.e. value added in manufacturing), they more than doubled, from 3 per cent to 8 per cent.[11]

9. Layard, Nickell and Jackman (1991, p. 58) estimate that real wage rigidity in the United States is smaller than in most of the countries of the European Union (where labour-market performance has generally been poor) but larger than in the EFTA countries (where labour-market performance, at least until recently, has generally been good).

10. This definition is consistent with the classification adopted by the World Bank in its 1993 *World Development Report*, Table 1, p. 239. A contentious issue is how to classify Taiwan, which is excluded from World Bank statistics, but is an important trading partner for Australia. According to the Summers and Heston (1991) database, Taiwan appears to be a borderline case, having moved from being unambiguously a low-wage country a decade ago to having a per capita GDP about the same as, say, Portugal. In the remainder of the paper we treat Taiwan as a low-wage country on the assumption that its manufacturing workers are relatively poorly paid.

11. Since manufacturing imports include value added from other sectors, the simple ratio of imports to manufacturing output is difficult to interpret. To account for this, we multiply the value of imports, in each industry, by the ratio of value added to final expenditure in Australia (i.e. we assume it is the same in Australia as the rest of the world). For manufacturing as a whole, the ratio is 0.36. See Appendix C for details.

Figure 3: Share of Manufactured Imports from Low-Wage Countries



3.1 Internationalisation

There are several ways to show the increased integration of the Australian economy with the rest of the world. The most simple is the increased relative size of the traded sector. Figure 4 shows exports and imports of goods and services as a fraction of GDP over the past two decades. Clearly, both the import and export shares of GDP have been trending up, with some acceleration evident since the mid 1980s. The greater volatility of the import share reflects cyclical influences.

Figure 5 shows import penetration (the ratio of imports to value added, in real terms) of manufactured goods at the 2-digit Australian Standard Industrial Classification (ASIC) level, where we have adjusted the import data for value-added effects in the manner described in Appendix C.[12] Import penetration has increased in all industries, leading to an overall increase in manufacturing import penetration from 26.5 per cent in 1981/82 to 41.5 per cent in 1992/93. Of particular note is the doubling of import penetration in Clothing and Footwear, Chemicals, and Other Machinery and Equipment (computers, agricultural machinery, household appliances etc.). The increase in Clothing and Footwear is of special significance since, as we show below, most of these imports have come from low-wage countries. Large increases also occurred in Textiles and Miscellaneous Manufactures (sporting goods etc.). Figure 6 shows the corresponding

12. Except that we further disaggregate Chemical, Petroleum and Coal Products into Chemicals and Chemical Products, and Petroleum Products, as the volatility of oil prices makes Petroleum Products an atypical manufacturing industry.

Figure 4: Exports and Imports Ratio to GDP
(average 1989/90 prices)

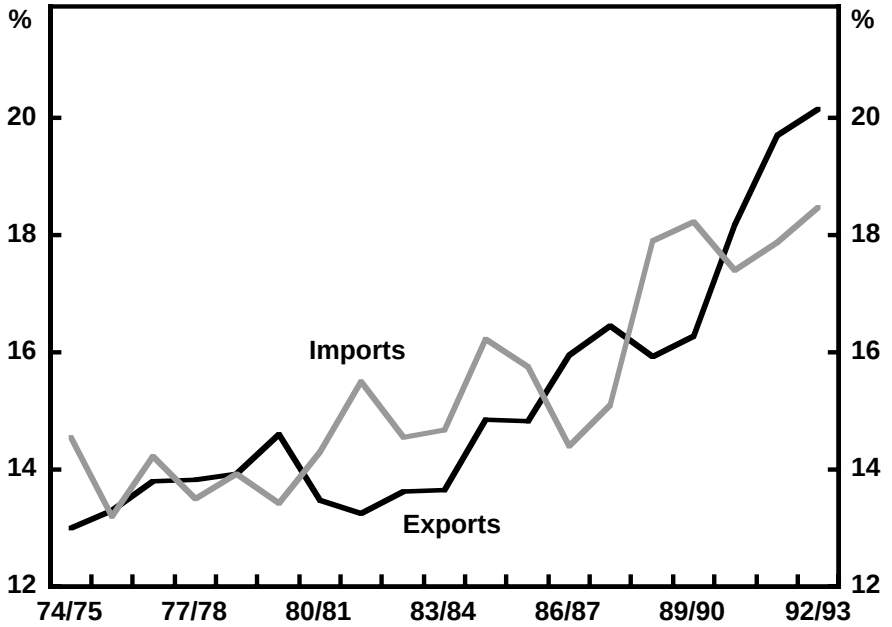


Figure 5: Import Penetration
(average 1989/90 prices)

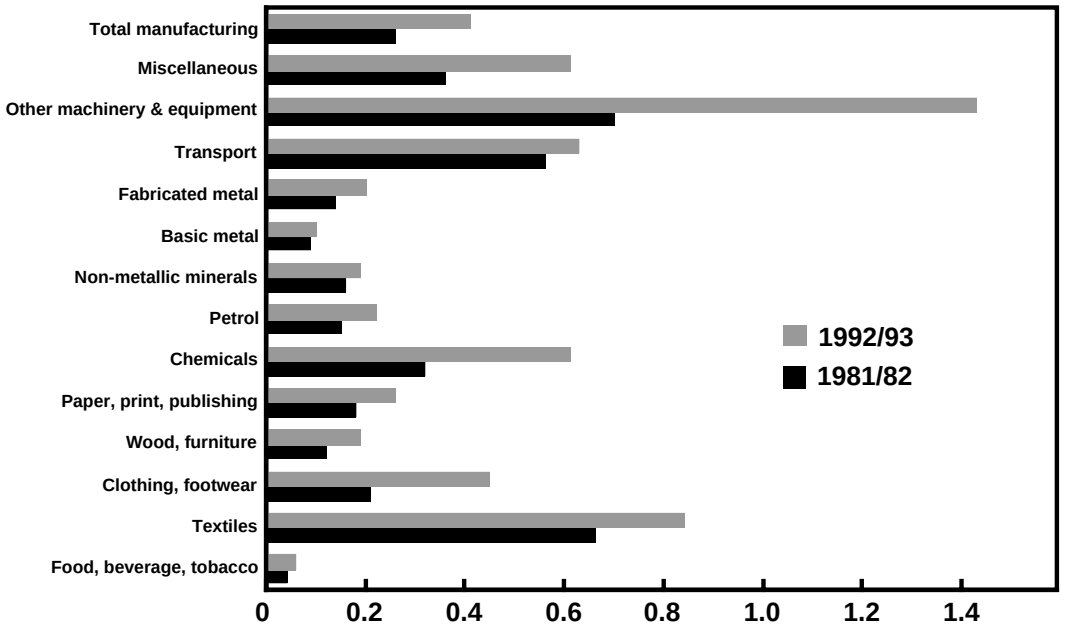
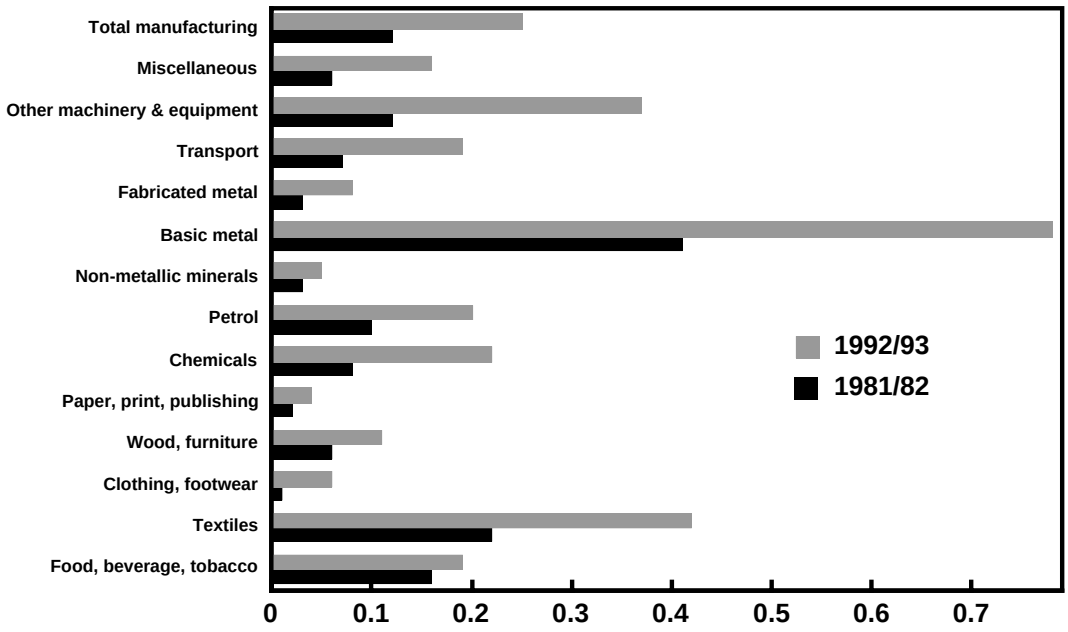


Figure 6: Ratio of Exports to Output
(average 1989/90 prices)



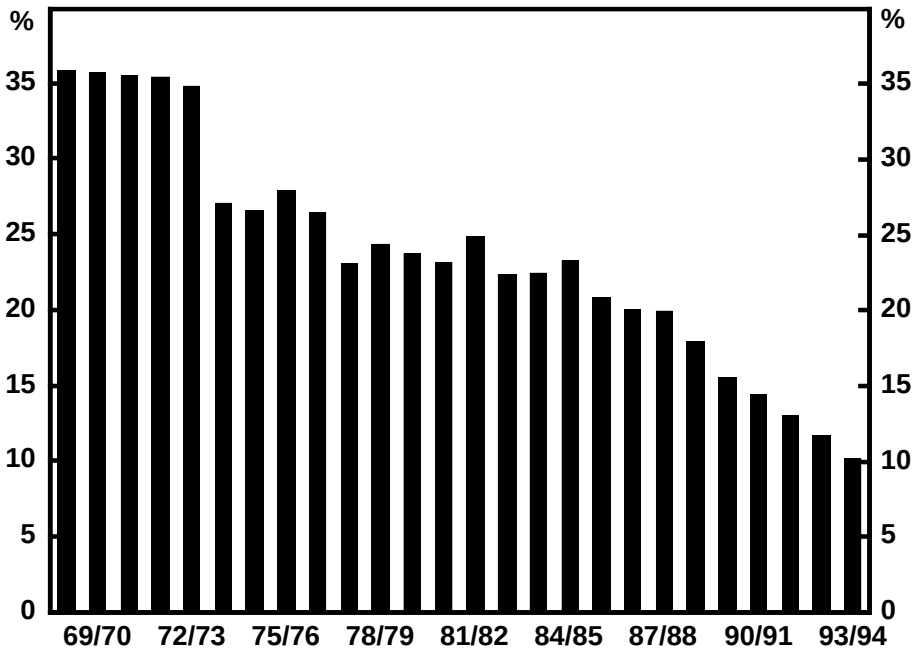
changes in the ratio of export volumes to output. Overall, this ratio increased from 12.2 per cent to 25.4 per cent, with the largest increases occurring in Textiles, Chemicals and Chemical Products, Basic Metal Products, and Other Machinery and Equipment.

The fact that the largest increases in both import and export penetration have sometimes occurred in the same industries suggests that intra-industry trade has become more important.[13] We take up this issue further in Section 3.3 in our discussion of elaborately transformed manufactured exports. Another interesting question is whether these increases have occurred because of increases in imports and exports *per se*, or whether they have been due to the declines in manufacturing output relative to the economy as a whole. We estimate that about half of the increase in the import penetration ratio has been due to a general increase in the propensity to import (the ratio of imports to GDP), and about half due to the declining share of manufacturing output to GDP (see Appendix B for details). For exports, about two-thirds of the increase in the ratio of manufactured exports to output has been due to an increase in the manufactured export share of GDP, with the remaining one-third due to the declining share of manufacturing output. Thus, the increase in the proportion of manufactured output that is exported has been due to a general increase in the propensity to export as well as an apparent reallocation of resources away from import-competing industries.

Another measure of international integration is the degree of protection domestic industries receive from imports. Figure 7 shows the effective rate of assistance (ERA)

13. See Industry Commission (1993) Appendix G for a discussion of recent developments in intra-industry trade.

Figure 7: Effective Rate of Assistance to Manufacturing



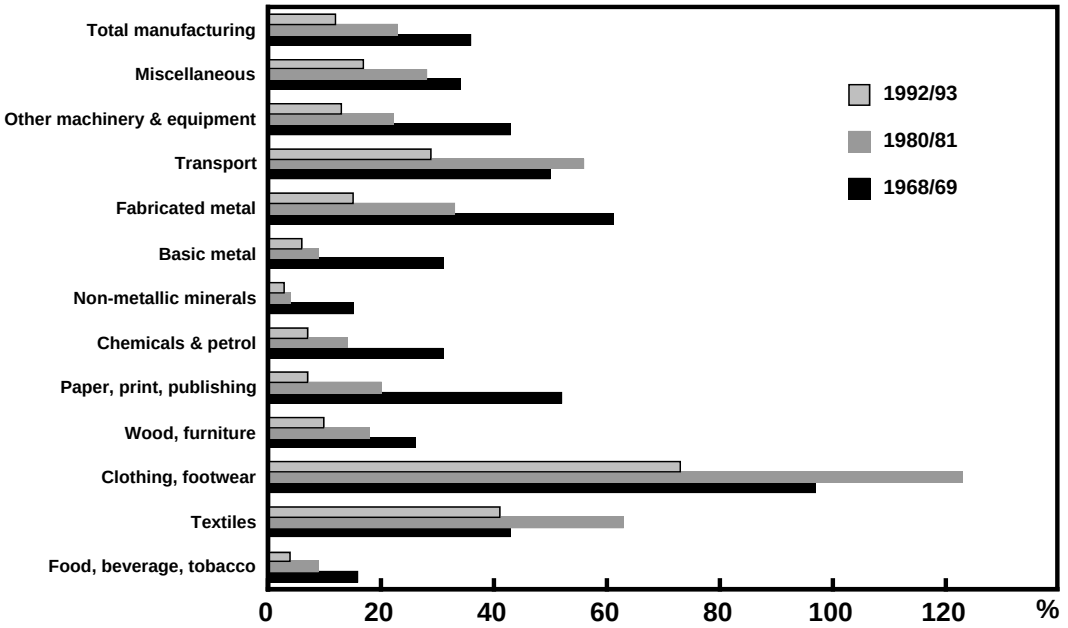
received by the manufacturing sector since 1968/69, while Figure 8 shows assistance in selected years for each 2-digit manufacturing industry.[14]

Trade liberalisation has generally occurred in two stages. The first stage was a discrete fall in effective assistance in 1973/74, caused by a 25 per cent across the board cut in tariffs. The second stage, which is ongoing, started in the mid 1980s; in 1993/94 the average effective rate of assistance to manufacturing was 10.2 per cent, compared with 23.2 per cent in 1984/85. The only industries in which assistance was significantly increased over the past two decades were Clothing and Footwear, Textiles and, to a lesser extent, Transport Equipment, where protection was increased from the mid 1970s to the mid 1980s. (The high point, or low point depending on one's point of view, occurred in 1984/85 when the ERA to Clothing and Footwear reached 240 per cent.) However, this development has since been reversed, and the ERAs to these industries are at historically low levels, albeit still significantly higher than in the rest of the manufacturing sector. Under current policies, assistance is set to fall further until the end of the decade, culminating in an average ERA to manufacturing of only 5 per cent, although considerably higher for the three industries mentioned above.

In summary, the Australian economy has become more open over the past decade. As a share of real output, volumes of exports and imports have increased significantly.

14. The level of effective assistance received by an industry is the percentage by which a country's trade barriers (tariffs, quotas, subsidies and other protective devices) raise that industry's value added per unit of final expenditure.

Figure 8: Effective Rates of Assistance for Manufacturing Subdivisions



Moreover, this expansion has been fairly broadly based. The data are consistent with the standard story that, as protection has been removed, resources have moved from the import-competing to the exporting sectors. In addition, there has been a general increase in the propensity to export manufactured goods, as well as an increase in intra-industry trade, no doubt facilitated by the decrease in tariffs on imported inputs.

3.2 Low-Wage Imports

Figure 3 above shows that manufactured imports from low-wage countries have generally increased as a proportion of total manufactured imports. However, this aggregate result masks some quite diverse trends among different industries. This can be seen in Table 1 where we show 2-digit import data for two years, 1981/82 and 1992/93, including country-specific data for Australia's four largest low-wage trading partners: China, Taiwan, Korea and Indonesia. (Appendix A contains more detailed data.)

The import data can be summarised in the following five points:

- Over the period 1981/82 to 1992/93, the share of manufactured imports from low-wage countries increased from 15.0 per cent to 22.9 per cent. This increase was almost entirely due to increased imports from China, Taiwan, Korea and Indonesia whose share as a group more than doubled, from 6.2 per cent to 13.1 per cent. China's share more than trebled, from 1.4 per cent to 4.5 per cent.
- While all industries recorded a rise in the share of low-wage imports, the magnitude of the increases varied markedly. Wood, Wood Products and Furniture recorded a

Table 1: Manufactured Imports

		Percentage from:					
1981/82	$m	China	Tai-wan	Korea	Indo-nesia	Other low wage	Total low wage
Food, beverages, tobacco	774	3.4	2.3	0.8	1.5	27.3	35.3
Textiles	1,094	7.8	5.6	4.5	0.1	13.1	31.1
Clothing, footwear	579	12.1	23.4	7.9	1.7	13.3	58.3
Wood, furniture	444	2.3	11.2	0.5	0.9	22.8	37.7
Paper, print, publishing	961	0.3	0.8	1.2	0.0	3.5	5.8
Chemicals	1,617	1.3	0.7	0.5	0.1	13.0	15.5
Petroleum	1,204	2.3	0.0	1.0	0.0	50.2	53.5
Non-metallic minerals	373	1.6	3.4	1.8	0.1	8.3	15.2
Basic metal	764	0.5	0.7	6.5	0.0	9.4	17.1
Fabricated metal	686	0.9	6.4	2.9	0.0	3.5	13.7
Transport	3,495	0.0	1.5	0.1	0.0	0.9	2.4
Other machinery and equipment	6,792	0.1	1.7	0.5	0.0	2.4	4.7
Miscellaneous	1,266	0.6	8.8	4.0	0.0	6.9	20.2
Total manufacturing	20,049	1.4	3.1	1.5	0.2	8.9	15.0
1992/93							
Food, beverages, tobacco	2,521	1.9	1.1	0.8	2.2	32.6	38.7
Textiles	2,356	11.7	8.9	7.4	5.0	17.2	50.2
Clothing, footwear	1,769	50.0	3.9	5.9	3.3	13.3	76.4
Wood, furniture	1,116	4.0	5.1	0.2	7.1	23.5	39.9
Paper, print, publishing	2,401	2.1	0.8	1.3	1.5	6.3	11.9
Chemicals	6,072	1.4	1.3	1.4	0.3	15.8	20.3
Petroleum	1,612	1.8	0.1	1.2	17.4	42.1	62.6
Non-metallic minerals	931	6.9	4.8	1.5	2.0	14.7	30.0
Basic metal	1,763	0.9	2.2	7.0	0.1	16.2	26.4
Fabricated metal	1,837	5.4	12.0	3.1	0.5	7.2	28.2
Transport	9,159	0.8	1.1	2.5	0.2	1.4	5.9
Other machinery and equipment	20,019	2.3	4.9	3.1	0.7	4.5	15.5
Miscellaneous	3,819	9.7	8.9	4.2	0.9	9.8	33.6
Total manufacturing	55,375	4.5	4.0	3.0	1.6	9.9	22.9

rise of only 2.2 percentage points (37.7 per cent to 39.9 per cent), while the low-wage share of Textile imports rose by 19.1 percentage points (31.1 per cent to 50.2 per cent). The low-wage share of Clothing and Footwear imports also rose significantly, from 58.3 per cent to 76.4 per cent. Within this category the share from

China more than quadrupled, from 12.1 per cent to 50.0 per cent; this was offset somewhat by a fall in Taiwan's share from 23.4 per cent to 3.9 per cent, reflecting a change in Taiwan's industrial structure, as that country moves up the quality ladder and produces more technologically-sophisticated goods.

- Other industries recording large increases in the low-wage share were Other Machinery and Equipment (4.7 per cent to 15.5 per cent); Fabricated Metal Products (13.7 per cent to 28.2 per cent); Non-Metallic Mineral Products (15.2 per cent to 30.0 per cent); and Miscellaneous Manufactures (20.2 per cent to 33.6 per cent). Within this last category, the Chinese share (which was mainly sporting equipment) rose from 0.6 per cent to over 9.7 per cent. The low-wage country share of Transport Equipment imports (mainly Motor Vehicles and Parts) was the smallest of all manufacturing industries. It increased from 2.4 per cent to 5.9 per cent, due mainly to more imports of cars from Korea.
- The Korean share of manufactured imports doubled over the period to 3.0 per cent. Korea is now a significant supplier to Australia of Textiles (with an import share of 7.4 per cent), Footwear (14.9 per cent); Basic Iron and Steel (10.0 per cent) and Rubber Products (9.0 per cent). Imports of manufactured goods from Indonesia also grew quickly over the period, but still accounted for only 1.6 per cent of the total in 1992/93. However, Indonesia is now a significant supplier to Australia of Wood, Wood Products and Furniture, with an import share of 7.1 per cent, Textiles (5.0 per cent), Footwear (6.1 per cent), and, most particularly, Petroleum, with a share of 17.4 per cent, compared with zero at the beginning of the 1980s.
- In 1992/93 nearly 40 per cent of imports of Food, Beverages and Tobacco came from low-wage countries, but very little of this was from the four major low-wage Asian countries. The most important sources were Thailand, Puerto Rico and Malaysia which, between them, accounted for about half of all low-wage imports in this category.

3.3 Exports

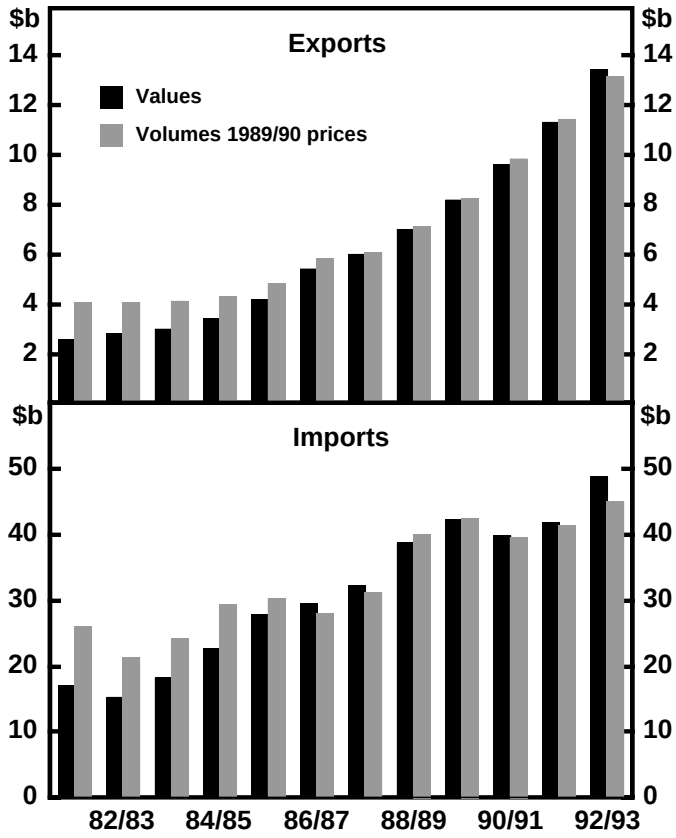
Between 1981/82 and 1992/93, exports of agricultural and mining products increased by 50 and 241 per cent, respectively in nominal terms and, in constant dollars, by 19 and 118 per cent. While these sectors account for about 40 per cent of total merchandise exports,[15] they account for only about 6 per cent of total employment, so the direct impact of this export expansion on the labour market would have been slight. Of more immediate interest are exports of manufactured goods, especially elaborately transformed manufactures (ETMs), about which much has been written recently.[16]

The top panel of Figure 9 shows that exports of these goods have indeed grown impressively in recent years, with average annual real growth of around 15 per cent in the eight years to 1992/93. However, this growth does not necessarily mean that many jobs have been created in these industries. As the bottom panel of Figure 9 shows, imports

15. Based on the ASIC classification. Using the SITC breakdown, rural and resource-based exports (which include some simply transformed manufactures) constitute around 80 per cent of merchandise exports.

16. See, for example, Reserve Bank of Australia (1992).

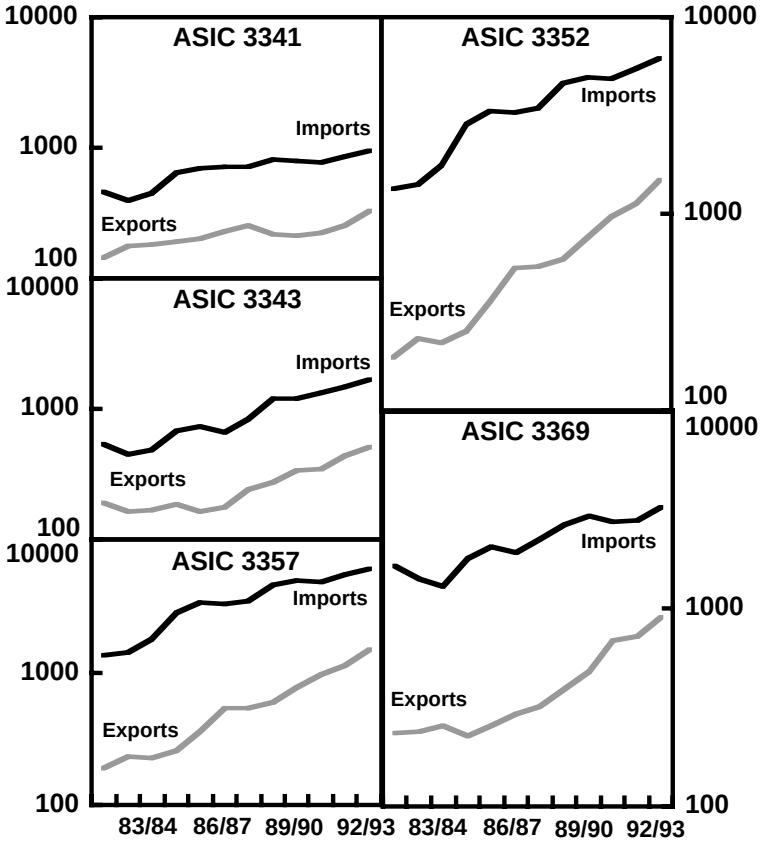
Figure 9: Exports and Imports of Elaborately Transformed Manufactures



of elaborately transformed manufactures have also shown large increases over this time period, in part reflecting a growing tendency for imported manufactures to be used as inputs for goods which are subsequently exported. Inasmuch as this simultaneous increase in exports and imports of manufactured goods reflects international differences in resource endowments and technology, it is a desirable result of internationalisation and free trade. We should expect different parts of the production process for some goods to efficiently take place in different countries. This means that growth in domestic value added (and therefore employment) in these industries is likely to be substantially less than the growth of exports. The principal benefits of increased trade in ETMs are therefore likely to be experienced elsewhere in the economy, as increased exports lead to increased demand for services and non-traded inputs.

We can examine some disaggregated data to determine more precisely the link between growth in exports, imports and value added in elaborately transformed manufactures. Figure 10 shows exports and imports in five 4-digit categories of elaborately transformed manufactures: Photographic and optical goods; Measuring, professional and scientific equipment n.e.s.; Electronic equipment n.e.s.; Electrical

Figure 10: Imports and Exports of Selected ETMs
(average 1989/90 prices, $m, log scale)



Note: 3341 Photographic and optical goods; 3343 Measuring, professional and scientific equipment n.e.s.; 3352 Electronic equipment n.e.s.; 3357 Electrical machinery and equipment n.e.c.; 3369 Industrial machinery and equipment n.e.c.

machinery and equipment n.e.c.; and Industrial machinery and equipment n.e.c. Between them, they account for about 30 per cent of ETM exports. It is immediately apparent that while exports from each of these five narrowly defined industries have grown strongly, so too have imports (though not quite as strongly).

Table 2 shows export and import values, and nominal value added, for each of these industries. In every case, value added is quite low relative to exports. Indeed, in two industries (Photographic and optical goods, and Measuring, professional and scientific equipment n.e.s.), the export values are greater than the value of production. This implies that while exports of ETMs might be booming, output and job growth in these industries will be relatively small.

This conclusion is confirmed by Figure 11, which shows employment and output growth in these five industries, and in elaborately transformed manufacturing as a whole.

Table 2: Trade and Value Added of Selected Elaborately Transformed Manufactures

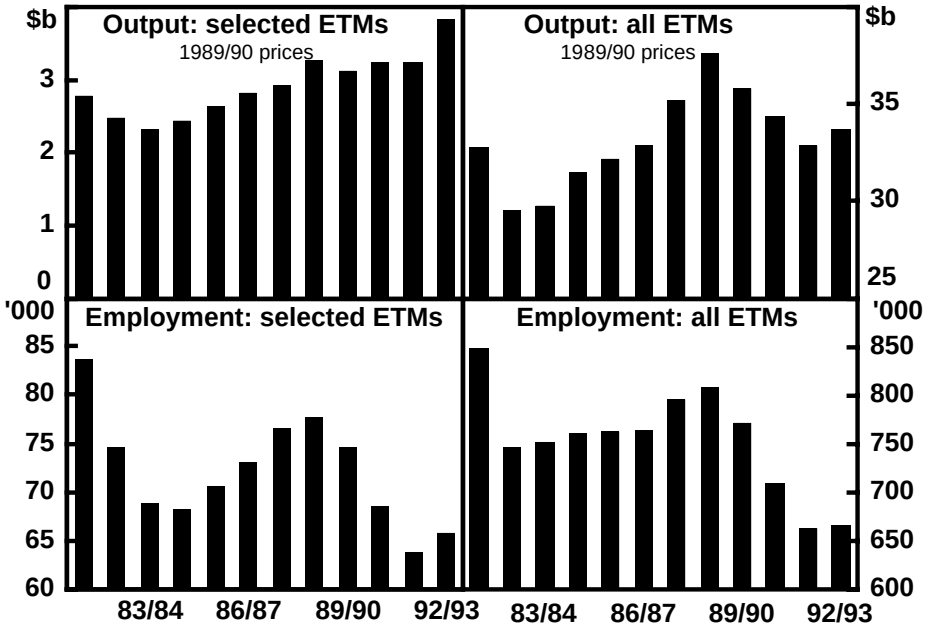
	Industry	3341	3343	3352	3357	3369	Total
1984/85	value added ($m)	71	137	603	689	782	2,281
	exports ($m)	154	151	207	152	182	846
	imports ($m)	538	564	2,358	792	1,486	5,738
	export/v.a.	2.18	1.10	0.34	0.22	0.23	0.37
	exports/imports	0.29	0.27	0.09	0.19	0.12	0.15
1989/90	value added ($m)	161	220	1,163	1,263	1,250	4,057
	exports ($m)	211	340	767	257	481	2,056
	imports ($m)	787	1,201	4,923	1,478	2,917	11,307
	export/v.a.	1.31	1.54	0.66	0.20	0.38	0.51
	exports/imports	0.27	0.28	0.16	0.17	0.16	0.18
1992/93	value added ($m)	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
	exports ($m)	326	500	1,471	445	892	3,635
	imports ($m)	975	1,712	6,310	1,738	3,380	14,115
	export/v.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
	exports/imports	0.33	0.29	0.23	0.26	0.26	0.26

Note: Selected ETMs are: 3341 Photographic and optical goods; 3343 Measuring, professional and scientific equipment n.e.s.; 3352 Electronic equipment n.e.s.; 3357 Electrical machinery and equipment n.e.c.; 3369 Industrial machinery and equipment n.e.c.

In sharp contrast to the rapid increase in ETM real exports, which have shown unabated growth since the mid 1980s, ETM real output growth has been relatively weak, even allowing for the recent recession. In 1992/93, ETM output was still more than 10 per cent below its cyclical peak of four years earlier. (GDP, in contrast, was 3.6 per cent higher in 1992/93 than the cyclical peak of three years earlier.) Indeed, between 1981/82 and 1992/93 ETM output fell as a proportion of manufacturing output, from 67 per cent to 62 per cent. The boom in ETM exports has not led to any big employment gains either, with ETM employment falling by about 21 per cent between 1981/82 and 1992/93.

While there has been little direct output and employment growth as a result of increased ETM exports, it is quite likely that this growth has led to increased employment in those parts of the economy that provide inputs to these industries, such as banking. Moreover, the strong growth in productivity implied by the output and employment data in Figure 11 is in itself beneficial, and the implied growth of real incomes should lead to the creation of jobs in some service industries. All of this does, however, caution against thinking that the recent fast growth of ETM exports is going to generate many 'high-skill, high-wage' manufacturing jobs that replace those lost in industries facing stiffer import competition.

Figure 11: Employment and Output in Industries that Produce ETMs



Note: Selected ETMs are the sum of ASIC: 3341 Photographic and optical goods; 3343 Measuring, professional and scientific equipment n.e.s.; 3352 Electronic equipment n.e.s.; 3357 Electrical machinery and equipment n.e.c.; 3369 Industrial machinery and equipment n.e.c.

4. International Trade and Wages: The Stolper-Samuelson Effect

In the standard two country, two good, two factor Heckscher-Ohlin theory of international trade, a country has a comparative advantage in, and will export, the good that is produced relatively intensively by the factor in which it has a relative abundance. An important implication of this theory is given by the Stolper-Samuelson theorem, which states that a decrease in protection will raise the return of a country's relatively abundant factor, and lower the return of its scarce factor.[17] Suppose each country produces two goods, biotech and T-shirts, with two factors of production, skilled and unskilled labour. Biotech is produced relatively intensively with skilled labour. If the country intensive in skilled labour lowers its tariff on T-shirts, the price of T-shirts in that country will fall.[18] It will produce more biotech (some of which it will export) and fewer T-shirts (importing some of the other country's extra T-shirt production) with both types

17. Under reasonable assumptions, the Stolper-Samuelson theorem holds when there are more than two goods and factors.

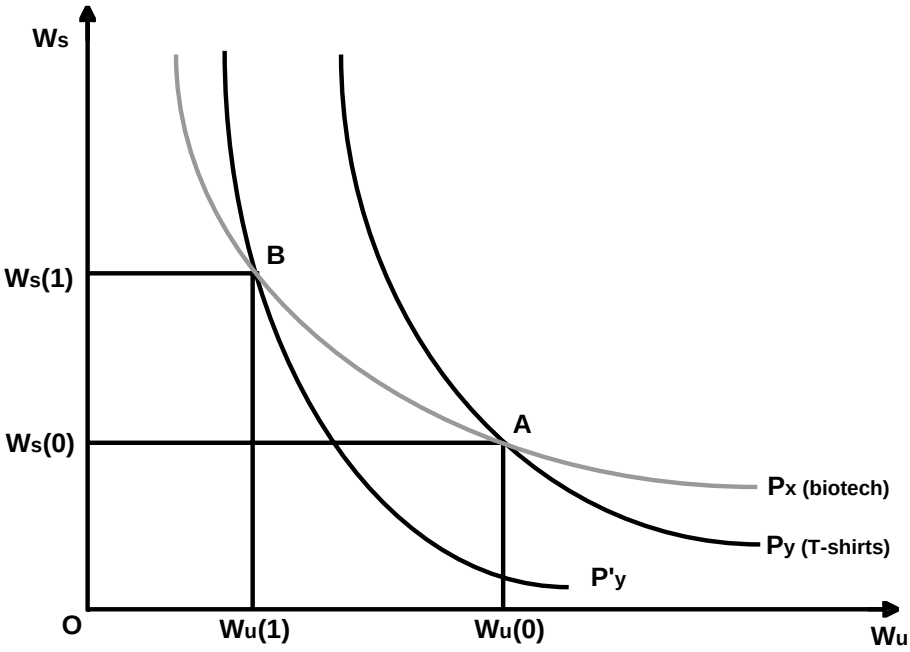
18. Strictly speaking, for this to be true, the marginal propensity to spend the foregone tariff revenue on biotech must not be so large that the reduction in spending leads to a fall in its price relative to T-shirts. This case can be ruled out by simply assuming that the country is too small to affect its terms of trade.

of labour moving from the contracting T-shirt industry to the expanding biotech industry. Because T-shirts are produced relatively intensively with unskilled labour, more unskilled than skilled labour is released by the T-shirt industry. For the labour market to clear, the wage paid to skilled workers rises, and that paid to unskilled workers falls. Because the relative price of skilled labour has risen, the ratio of skilled to unskilled labour falls in each industry, although (by assumption) production of biotech remains relatively intensive in skilled labour.

This can be seen diagrammatically in Figure 12, which we take from Mussa (1979). On the axes are the wages paid to skilled and unskilled labour (Ws and Wu). The curve labelled Px denotes the combinations of Ws and Wu at which biotech can be produced with zero economic profit, and similarly for Py in producing T-shirts. The absolute values of the slopes of the curves give the ratios of unskilled to skilled labour, at the corresponding wage ratios. A fall in the price of T-shirts shifts the Py curve inwards along a ray from the origin – that is, for a given ratio of factor quantities, factor prices fall proportionately. The point of intersection of the curves (point A) gives the equilibrium wage paid in each industry (Ws(0) and Wu(0)).

Suppose the price of T-shirts falls following a tariff cut. In the new equilibrium the ratio of unskilled to skilled labour has increased in both industries; both curves are steeper at B than at A. The nominal wage paid to skilled labour has risen to Ws(1), and so obviously has risen in real terms. The nominal wage paid to unskilled labour falls to Wu(1) and, because of the shift in factor proportions, falls by more than the price of T-shirts. The real wage paid to unskilled labour therefore falls.

Figure 12: Trade and the Relative Wages of Skilled and Unskilled Workers



The Stolper-Samuelson theorem provides the rationale for the claim that, with the liberalisation of international trade, Australian unskilled labour faces the bleak choice of either falling real wages or unemployment, if wages are insufficiently flexible to clear the labour market. However, there are a number of reasons why the theorem might not hold:[19]

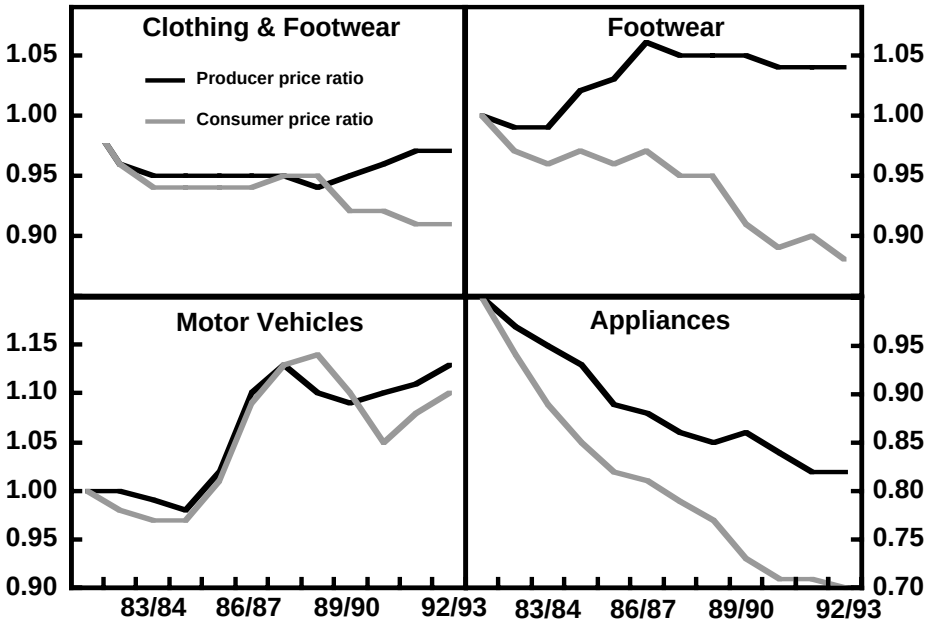
- *a reversal of factor intensities.* This occurs when T-shirt production is relatively intensive in unskilled labour at one set of factor prices, but relatively intensive in skilled labour at a different set of factor prices. (It will take place when the production function for each good is CES but the elasticities are different.) In terms of Figure 12, Py and Px intersect twice, in which case the real wage paid to unskilled labour can rise following a fall in the price of T-shirts.
- *complete specialisation.* If the two countries' endowments of the factors are sufficiently different, then under free trade each will completely specialise in the production of one good. In terms of Figure 12, Py and Px do not intersect. In this case, the simple relationship between goods and factor prices breaks down, and both factors can gain from free trade.
- *scale economies.* If the two countries have sufficiently similar factor endowments and economies of scale are sufficiently large, then intra-industry trade will take place and both unskilled and skilled labour will gain from trade (Helpman and Krugman 1986). This point would seem to have particular applicability in the Australian case to the industry Other Machinery and Equipment, where both exports and imports have been growing very quickly.
- *trade and efficiency.* If trade leads to more competition and productive efficiency, the returns to both factors could rise, again offsetting the Stolper-Samuelson effects.

These theoretical qualifications notwithstanding, how well does the Stolper-Samuelson theorem explain the Australian facts? If Stolper-Samuelson effects have been present, it must be the case that the relative price of imports has been falling. In their examination of American data, Lawrence and Slaughter (1993) conclude (amongst other reasons) that Stolper-Samuelson effects have been absent because import prices have been rising faster than export prices. For Australia, however, this is not a useful way of analysing this question since the Australian terms of trade are driven almost entirely by the cycle in world commodity prices.

In Figure 13 we show for four industries the ratio of the consumer price to the CPI, and the ratio of the producer price to the GDP deflator. (These are the only manufacturing industries for which consumer price data are available.) For Clothing and Footwear, especially Footwear, it is evident that there has been a trend decline in the relative consumer price, but not in the producer price. Since consumer prices are an average of producer and import prices, it must be the case that import prices have declined relative to the prices of domestically produced goods. For motor vehicles, on the other hand, import price effects seem to be absent, as there has been no significant divergence between relative consumer and producer prices. For Household Appliances, both relative prices have fallen, probably because of technological improvements. While the larger fall in relative consumer prices in this category indicates the possible presence of

19. See the discussion in Bhagwati and Dehejia (1993).

Figure 13: Relative Consumer and Producer Prices



import price effects, a closer examination of the data shows that this divergence started well before any cuts in tariffs on imported appliances.

The price evidence suggests the presence of Stolper-Samuelson effects in Clothing and Footwear, with cuts in protection having triggered falls in import prices, especially since the late 1980s, exactly the time when imports from low-wage countries started to increase rapidly. An interesting question is why the relative price of domestically produced Clothing and Footwear did not also fall. This cannot happen in a world of perfect competition, where the price of domestically produced goods and imports (including tariffs) must be equal. It can, however, happen in a world of imperfect competition and differentiated products, particularly if domestic prices are set as markups over costs and, for some reason – such as a wages system that constrains changes in relative wages – costs do not fall.

In Table 3 we show industry wage data for the manufacturing sector. The first column of Table 3 shows average nominal weekly wage levels in 1992/93. If we assume that industries that pay higher average wages have, on average, more highly-skilled workers, it appears to be true (as expected) that the Clothing and Footwear industry is dominated by relatively low-skilled workers, as are Textiles, Wood, Wood Products and Furniture, and Miscellaneous Manufacturing. The relatively high-skill industries appear to be Petroleum Products, Basic Metal Products, Chemicals and Chemical Products, and Non-Metallic Mineral Products. It seems that the industries which have experienced large increases in import competition from low-wage countries are those with relatively unskilled labour, but there have been exceptions: low-wage imports have also increased

Table 3: Manufacturing Wages (1981/82-1992/93)

	Weekly nominal wages			Real product wages (1981/82=100)
		Ratio to AWE		
	1992/93 ($)	1981/82	1992/93	1992/93
Food, beverages, tobacco	568.2	1.10	1.11	104.9
Textiles	557.7	1.05	1.09	116.3
Clothing, footwear	428.2	0.88	0.84	102.1
Wood, furniture	489.6	0.96	0.96	96.7
Paper, print, publishing	626.6	1.16	1.23	103.5
Chemicals	733.6	1.27	1.44	123.1
Petroleum	1,162.5	1.77	2.28	223.2
Non-metallic minerals	661.3	1.32	1.29	98.6
Basic metal	782.4	1.42	1.53	126.5
Fabricated metal	559.5	1.08	1.09	110.0
Transport	624.3	1.13	1.22	97.8
Other machinery and equipment	596.8	1.16	1.17	110.9
Miscellaneous	549.0	1.09	1.07	102.2
Total manufacturing	598.5	1.14	1.17	109.7

appreciably in Other Machinery and Equipment, where wages are about equal to the average for the whole manufacturing sector.

The real wage data, shown in the last column, reveal that, on average, real product wages in manufacturing increased by about 10 per cent over the period 1981/82 to 1992/93. As we show in Section 5 this was considerably less than labour productivity, which increased by over 40 per cent. Within the aggregate, there were large variations between industries, ranging from a fall of 3.3 per cent in Wood, Wood Products and Furniture to an increase of more than 100 per cent in Petroleum Products, driven largely by the fall in oil prices in 1986. Apart from this special case, the largest increases were recorded in Basic Metals Products and Chemicals and Chemical Products.

The second and third columns of Table 3 show the ratio of industry earnings to average weekly earnings (AWE) for the years 1981/82 and 1992/93, respectively. Except for Petroleum Products no large changes appear to be evident. At one level, it could be argued that this lack of relative wage movement proves little, since international trade is supposed to affect the relative wages paid to different factors of production (such as skilled versus unskilled labour), not relative wage levels in different industries.[20]

20. It is often asserted in policy discussions that Australian relative wages are inflexible by world standards, though this statement is actually quite difficult to substantiate empirically. In a cross-country study, Coelli, Fahrer and Lindsay (1994) find that Australian wage flexibility, measured in terms of inter-industry wage dispersion, is about equal to that of the United States, a country which is considered to have a flexible labour market. This leaves open the possibility, however, of inflexible relative wages measured along other margins, e.g. between or within occupational groups.

However, this evidence does at least suggest one of two possibilities: either trade has placed little pressure on relative wages, or such pressure has been suppressed by the operation of the centralised wages system.

A clean test of the Stolper-Samuelson theorem would examine whether there has been a systematic tendency, on an industry basis, for unskilled wages to fall relative to skilled wages. Unfortunately, this is not possible with Australian data since there are no long time series of skilled and unskilled wages by industry. We do, however, have data on wages by occupation from 1987 to 1993. We use the wages of Business Professionals as a proxy for high-skill wages, and the wages of Machine Operators as a proxy for low-skill wages. Only with the latter can we match the occupations to particular industries.[21] In Table 4 we show the ratio of the economy-wide hourly wage paid to high-skill workers to low-skill workers in each manufacturing industry. The data tend to be volatile because they are derived from relatively small samples but, overall, there is little evidence of Stolper-Samuelson effects in wages; that is, nowhere has there been a significant reduction in the ratio of unskilled to skilled wages. This remains true if we broaden the definition of skilled and unskilled workers.[22] However, like the relative industry earnings in Table 3, what is not clear is whether these effects have been absent, or just suppressed by labour market institutions which have inhibited changes in relative wages.

In all likelihood, the answer varies from industry to industry. For Clothing and Footwear, the combined price and wage evidence suggests that in a liberalised labour market, relative wages would have been driven down by Stolper-Samuelson effects. In other industries, where prices appear to have been moved more by changes to the production technology, the incipient change to relative wages (if any) is determined by where the technological change is concentrated. Technological change that affects skilled and unskilled labour equally will have no effect on relative wages, but technological change biased against unskilled labour could depress unskilled labour's relative wage, at least implicitly.

In the United States, the most telling evidence against Stolper-Samuelson effects, and in favour of biased technological effects, is that the ratio of unskilled to skilled employment, and the relative wage paid to unskilled labour, have *both* decreased throughout the economy (Lawrence and Slaughter 1993, p.193). We have no Australian data on skilled and unskilled employment by industry; however, at the aggregate level, the same picture emerges. In 1987, the ratio of Machine Operators to Business Professionals was 0.974. By 1993, it had fallen to 0.631. The fall in the ratio of unskilled to skilled workers, more broadly defined, was from 1.000 to 0.881. These decreases should be interpreted with caution as they might have been affected by the recent cyclical downturn, and they might be due to relatively fast growth of skill-intensive industries, with possibly little change in skill-intensity within each industry. Nonetheless, they are still striking, and suggest that, in recent years, either technological factors have been very

21. We could match no category of machine operators with the industry Transport Equipment so instead we used the occupation Vehicle accessories fitters, which comes under the category Miscellaneous labourers and related workers.

22. Our broad definition of unskilled workers is Plant and Machine Operators, and Drivers, and Labourers and Related Workers; while skilled workers are defined as Managers and Administrators, and Professionals. Between 1987 and 1993 this unskilled/skilled wage ratio fell only from 0.63 to 0.59.

Table 4: Relative Wages

Low-skilled occupation	Ratio of hourly wage to skilled hourly wage (as at May)						
	1987	1988	1989	1990	1991	1992	1993
(21) Food processing machine operators	0.70	0.67	0.71	0.70	0.68	0.70	0.70
(23) Textile sewing machinists	0.53	0.54	0.54	0.56	0.55	0.54	0.53
(24) Shoemaking machine operators	0.60	0.56	0.59	0.57	0.60	0.59	n.a.
(25) Wood processing machine operators	0.64	0.67	0.66	0.68	0.63	0.61	0.65
(26) Paper and paper products machine operators	0.89	0.88	0.82	0.79	0.80	0.82	0.82
(27) Chemical production machine operators	0.78	0.85	0.82	0.71	0.87	0.87	0.75
(28) Clay and stone processing machine operators	0.72	0.71	0.69	0.68	0.82	0.64	0.62
(29) Basic metal product machine operators	0.71	0.77	0.74	0.74	0.73	0.69	0.68
(31) Other metal products machine operators	0.75	0.67	0.68	0.66	0.64	0.71	0.64
(32) Vehicle accessories fitters	0.55	0.56	0.59	0.60	0.57	0.61	0.75
(33) Photographic products machine operators	0.72	0.79	0.70	0.76	0.63	0.69	0.81
(34) Plastics production machine operators	0.69	0.71	0.67	0.69	0.64	0.64	0.69

Note: Corresponding ASIC industry code in parentheses.

important, or that the absence of relative wage falls for unskilled workers has had very large negative effects on their employment.

5. International Trade and Employment

The evidence presented on Section 4 suggests that if the liberalisation of international trade has affected the labour market, it has been through employment rather than wages. In Table 5 we show the changes in manufacturing employment and productivity over the period 1981/82 to 1992/93. The first column shows average employment levels in each industry over this period, the second shows the percentage change in employment, the third shows the contribution of each industry to the change in total manufacturing employment, and the last column shows the change in productivity over the period. Overall, manufacturing employment fell by nearly 25 per cent. Within the manufacturing

Table 5: Manufacturing Employment and Productivity (1981/82-1992/93)

	Average level ('000)	Employment percentage change	Contri-bution	Productivity percentage change
Food, beverages, tobacco	170.8	-14.2	-2.2	48.2
Textiles	31.7	-33.4	-1.0	53.6
Clothing, footwear	68.8	-31.3	-2.1	28.7
Wood, furniture	79.8	3.1	0.2	-15.7
Paper, print, publishing	105.8	-8.1	-0.7	20.4
Chemicals	49.7	-15.8	-0.7	45.4
Petroleum	4.9	-36.7	-0.2	71.0
Non-metallic minerals	40.5	-24.5	-1.0	36.5
Basic metal	73.3	-37.1	-3.0	116.8
Fabricated metal	100.9	-33.6	-3.4	28.3
Transport	108.8	-38.9	-4.5	62.3
Other machinery and equipment	132.6	-28.0	-3.9	56.4
Miscellaneous	62.5	-11.3	-0.6	20.8
Total manufacturing	1,030.1	-23.2	-23.2	44.5

sector, there were some very large falls: employment decreased by nearly 40 per cent in Transport Equipment and Basic Metal Products; by over 30 per cent in Textiles, Clothing and Footwear and Fabricated Metal Products; and by nearly 30 per cent in Other Machinery and Equipment. Interestingly, among these industries only Textiles and Clothing and Footwear are low-skilled industries under apparent threat from low-wage imports. For the most part, the large losses in manufacturing employment have been concentrated in industries that have greatly increased their labour productivity (such as Basic Metal Products, Transport Equipment and Other Machinery and Equipment), and where import competition, especially from low-wage countries, has been relatively unimportant.

To determine more precisely the contribution of changes in demand, exports, imports and labour productivity to employment in each industry we use a simple numerical method called shift-share analysis.[23] Expenditure (E) on the good produced in each industry i is defined as domestic expenditure (D) plus exports (X), minus imports (M):

$$E_i \equiv D_i + X_i - M_i^L - M_i^H \qquad (1)$$

where we divide imports into those coming from high (H) and low (L) wage countries. At the level of GDP, expenditure is conceptually equal to output, but this is obviously

23. For applications of this method to other countries, see Krueger (1980) and UNIDO (1986).

not true at the industry level, where output is equal to the sum of the value added at many stages of production. This distinction can be important. For example, taken at face value, it appears that each year Australia exports more textiles than are actually produced. This is because most of the value added in textile exports comes not from the textile industry but from the raw materials that are used as inputs. We overcome this problem by scaling the industry export and import data by the ratio of value added to final expenditure.

If we denote output per employed person by Π_i, it then follows that:

$$\Pi_i \equiv \frac{Y_i}{N_i} \equiv \frac{\tilde{D}_i + \tilde{X}_i - \tilde{M}_i^L - \tilde{M}_i^H}{N_i} \tag{2}$$

where N_i is employment in the *i*th industry, and the tilde above exports and imports indicates that they have been adjusted by the value added ratios. We use these adjusted trade data, as well as production-based data on output, to define $\tilde{D}$ as:

$$\tilde{D}_i \equiv Y_i - \tilde{X}_i + \tilde{M}_i^L + \tilde{M}_i^H$$

where Y_i is real value added in the *i*th industry.

The contributions of domestic demand, exports, imports and productivity to changes in employment between two points in time can be found by re-arranging and linearising equation (2):

$$\Delta N_i = \frac{1}{\Pi_i^*}(\Delta\tilde{D}_i + \Delta\tilde{X}_i - \Delta\tilde{M}_i^H - \Delta\tilde{M}_i^L - N_i^*\Delta\Pi_i) \tag{3}$$

where the superscript * denotes the geometric mean of a variable's value at the beginning and end periods. Other things equal, employment in an industry will increase with increases in domestic demand and exports, and with decreases in imports and labour productivity.

Apart from the linearisation error (which is in practice small), equation (3) is an identity. This has the advantage of being by definition correct, but the disadvantage of having no behavioural content. The decomposition has, therefore, to be interpreted carefully. In particular, these influences need not be independent. For example, an increase in import competition might lead firms to adopt measures that improve their productivity. Additionally, if an increase in domestic demand is met through increased imports this will appear as a gain in employment through the demand effect, but a loss of employment through more imports, with no net employment benefit. In practice, however, no employment has been gained or lost in the first place, and it would be incorrect to conclude that a certain number of jobs had been 'lost' because of increased imports. Similarly, an industry which imports and re-exports goods with little value added will have neither gained nor lost jobs, but this will show up in the decomposition as a gain and loss of equal size. It is correct to conclude that imports have led to decreases in employment only if there have been no offsetting increases from domestic demand and/or exports.

Another important consideration is that compositional effects can lead to spurious results in this type of analysis. For example, suppose that within a 2-digit category there is a shift in demand from a low-productivity industry to a high-productivity industry.

Less labour is therefore required to produce the same level of (2-digit) output. If the analysis is conducted at the 2-digit level, the correct answer – that the fall in employment is due to demand effects – will not be revealed since demand at the 2-digit level is unchanged. Instead, the analysis will incorrectly lead to the conclusion that the employment has fallen because of an increase in productivity; this is incorrect as there has been a change only in average productivity, but not in any individual industry. This problem is important in practice. For example, the decomposition of the change in employment in Textiles at the 2-digit level leads to a large, but false, positive contribution of exports due to the very large increase in exports of Cotton ginning (ASIC 2341), an industry with an exceptionally high level of labour productivity.

To minimise this problem we conduct the analysis at the 4-digit level. The 2-digit results reported in Table 6 are the sum of the 4-digit results**,** and their interpretation is slightly different from that given above. A negative domestic demand effect for a particular 2-digit industry, for example, does not necessarily imply that demand actually fell; rather, that there was a shift in demand within that category towards industries with

Table 6: Sources of Employment Changes in Manufacturing ('000) (1981/82 – 1991/92)

	Change in employment	Contributions of: Domestic demand	Exports	Imports	Low wage imports	Productivity
Food, beverages, tobacco	-13	24	11	-6	-2	-42
Textiles	-10	4	3	-5	-6	-12
Clothing, footwear	-28	-1	3	-9	-9	-19
Wood,furniture	-9	-4	2	-3	-2	-3
Paper, print, publishing	-3	24	2	-8	-1	-21
Chemicals	-9	20	7	-17	-4	-19
Petroleum	-1	0	0	0	0	-1
Non-metallic minerals	-8	-1	1	-3	-2	-6
Basic metal	-34	-18	28	-2	-1	-42
Fabricated metal	-27	-16	6	-2	-3	-15
Transport	-50	-3	12	-12	-2	-46
Other machinery and equipment	-49	61	29	-100	-20	-39
Miscellaneous	-8	13	8	-17	-9	-12
Total manufacturing	-248	104	112	-182	-62	-278
Total manufacturing [a]	-249	24	89	-102	-53	-258

Note: (a) Excludes Measuring, professional and scientific equipment n.e.s. (ASIC 3343), Electronic equipment n.e.s. (ASIC 3352), Aircraft (ASIC 3244), and Pharmaceutical and veterinary products (ASIC 2763).

high levels of productivity. It remains true that job losses can be ascribed to increased imports only if negative import effects have not been offset by positive export or demand effects.

We decompose the change in employment over the period 1981/82 to 1991/92 (the last year for which we have the necessary data) with the following results:

- Productivity effects have been the dominant force behind the decline in manufacturing employment, in aggregate accounting for more than 100 per cent of lost jobs between 1981/82 and 1991/92.
- The only industry in which imports from low-wage countries accounted for a substantial decrease in employment (i.e. where increased imports were not offset by increased domestic demand or exports) was Clothing and Footwear, where low-wage imports accounted for about one third of the 28,000 lost jobs, including about half of 6,000 lost jobs in Footwear.[24] Despite this large import effect, productivity improvements accounted for about two-thirds of the fall in employment in this industry.
- Low-wage imports accounted for a large number of gross job losses in Textiles and Miscellaneous Manufacturing, but not after netting out the effect of domestic demand and exports. Two 4-digit industries in Other Machinery and Equipment – Measuring, Professional and Scientific Equipment n.e.s. and Electric Equipment n.e.s. – between them accounted for an increase in employment of about 58,000 through increased demand, and an identical decrease in employment through increased imports. In fact, there was essentially no change in employment in these two industries. Excluding them leaves only a small demand effect in Other Machinery and Equipment, and an import effect net of exports of about 24,000 jobs lost, mostly due to imports from high-wage countries.[25] This is consistent with the evidence on the falling relative price of imported household appliances reported in Section 4, and may be due to domestic firms being slower to adopt new technologies than their foreign competitors.
- About 29,000 of the 39,000 jobs lost in Other Machinery and Equipment through productivity improvements were in the five industries identified in Section 3.3 as being significant exporters of elaborately transformed manufactures. It would appear that firms that are successful exporters are also those which shed the most jobs through productivity gains.
- Excluding the four industries where employment gains and losses have been grossed up by demand and import effects (the two mentioned above plus Aircraft and Pharmaceutical and Veterinary Products, which between them account for only about 5 per cent of total manufacturing output and employment) gives an aggregate effect reported in the bottom row of the table. The decline in manufacturing

24. It also appears that low-wage imports accounted for large numbers of job losses in Non-Metallic Mineral Products, since the contributions of domestic demand and exports were essentially zero. However, this is misleading. The 4-digit industries which recorded large losses through low-wage imports also recorded large gains through domestic demand; these gains were offset by decreases in demand in other industries.

25. However, in the industries Refrigerators and household appliances (ASIC 3353) and Industrial machinery and equipment n.e.c. (ASIC 3369) imports from low-wage countries accounted for a relatively high share of job losses.

employment due to productivity effects slightly exceeds the total fall in employment. Additionally, about 24,000 jobs were added through demand effects and about 13,000 jobs were subtracted by the effect of imports net of exports. Although exports grew by more than imports over the period, the comparatively low level of labour intensity in the exporting industries has meant that the expansion of the traded goods sector has led to a small net loss of manufacturing jobs.

These results indicate that, similarly to other industrialised countries, productivity improvements have far outweighed any direct trade effects on manufacturing employment. In only one industry, Clothing and Footwear, did imports from low-wage countries have a substantial direct impact on employment. However, this conclusion begs the obvious question of what caused the improvements in productivity. As many writers have pointed out, it is quite plausible that either the threat or existence of increased import competition leads, via increased competitive pressure, to productivity improvements. This can happen through the adoption of labour-saving technologies or through the reduction of featherbedding, managerial inefficiencies and so on. Additionally, in each industry, the competitive effects of trade might drive the least efficient firms from the market, leading to an increase in average industry productivity.

Conceptually, the problem is to separately estimate the productivity-induced job losses that would have occurred in the absence of trade (or the absence of an increase in trade) and those that have been due to competitive pressure from imports. Wood (1994) tries to control for internal influences by examining productivity in the non-traded sectors of several industrialised countries. This technique is inapplicable with Australian data, however, as the non-traded sector comprises primarily service industries for which the output data are constructed by assuming no growth in labour productivity.

Another way of assessing the effects of import competition while isolating productivity effects is to estimate an econometric model. This is the approach taken by Grossman (1987) and Revenga (1992) in examining how imports have affected manufacturing employment and wages in the United States. Grossman estimates reduced form wage and employment equations for nine US manufacturing industries, and finds import competition to have harmed employment in only one industry (radios and televisions). Revenga estimates wage and employment equations across a panel of 38 manufacturing industries and finds imports to have had a more widespread effect on employment and wages. Again, data limitations prevent these models being estimated for Australia.[26]

6. Technology, Wages and Employment

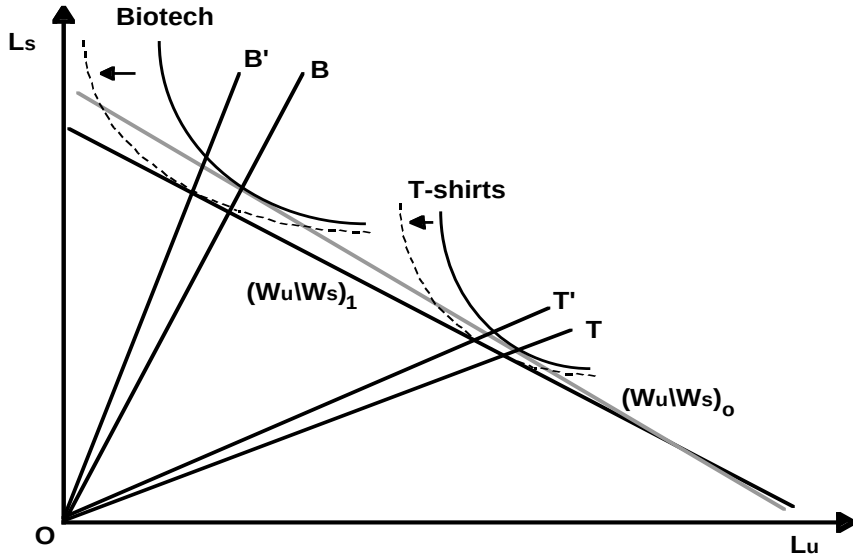
In this section we examine the relationships between one possibly important source of productivity growth – technological progress – and wages and employment. Lawrence and Slaughter (1993) suggest that technological improvement, biased against unskilled labour, can explain the increase in the ratio of skilled to unskilled labour employed throughout the American economy, and the fall in the ratio of unskilled to skilled wages. Figure 14 shows how this can occur. In the diagram, there are isoquants labelled biotech

26. Specifically, we lack the disaggregated capital stock measures for the Grossman procedure, and the finely disaggregated data on import prices of the Revenga model.

and T-shirts, with biotech (T-shirts) relatively intensive in skilled (unskilled) labour. (The skill intensities in biotech and T-shirts are given by the rays OB and OT, respectively.) The relative wage of unskilled labour is given by the slope of the line $(Wu/Ws)_0$. Technological change biased against unskilled labour shifts each isoquant to the left: for a given amount of skilled labour, less unskilled labour is needed to produce a given quantity of output. Crucially, this technological advance is concentrated in biotech, so its isoquant shifts further. In the new equilibrium, each industry is more intensive in skilled labour and the ratio of unskilled to skilled wages, now given by $(Wu/Ws)_1$, has fallen. This result depends on the technological change being concentrated in the skill-intensive industry; otherwise, the relative wage of unskilled labour increases. It also depends on there being not too much factor substitutability in either industry; otherwise the increase in the ratio of unskilled to skilled labour in response to the change in relative wages more than offsets the effect of the technological change.

The analysis is easily amended to fit the Australian facts, namely, the absence of changes to relative wages. If the technological change is spread evenly between each industry, the new relative wage line is parallel to the old line; each industry has become more intensive in skilled labour, with no change in relative wages. Alternatively, if the technological change is concentrated in the skill-intensive industry, but for some reason the wage paid to unskilled labour does not fall, unskilled labour will become unemployed. Which of these alternative explanations best represents reality is clearly important for policy purposes. As a guide to this question, we show in Figure 15 the implications of the market-clearing explanation for the absolute level of employment in each industry. The total amounts of skilled and unskilled labour in the economy are given by vertical

Figure 14: Technological Change and Relative Wages

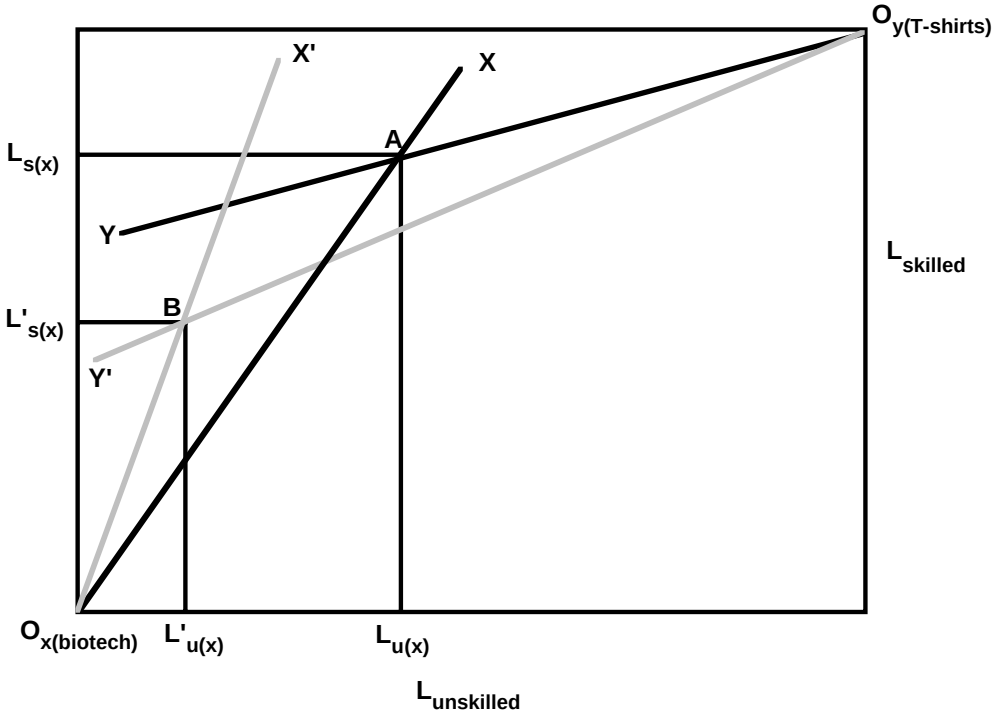


and horizontal sides of the box, respectively. The rays O_xX and O_yY show the factor intensity in each industry, with biotech relatively intensive in skilled labour. Equilibrium is given by the point A, with $O_xL_{u(x)}$ unskilled labour and $O_xL_{s(x)}$ skilled labour employed in biotech production, with the remaining labour of each type employed making T-shirts. The effect of increasing the skill-intensity of each industry is to rotate the rays to O_xX' and O_yY' with the new equilibrium at B. As a result, less labour of each type is employed in biotech and more in T-shirts.

This seems to be a good description of the labour market in industries like Other Machinery and Equipment and Transport Equipment, which produce elaborately transformed goods; that is, the fall in employment can be explained by technological factors, without recourse to stories about wage rigidities. However, this explanation does not sit well with the employment changes in the less-skilled-end of manufacturing, such as the Textile and Clothing and Footwear industries, in which, contrary to Figure 15, employment levels have contracted severely. Here the wage rigidity story is more appealing, with technological improvements leading to large falls in employment, augmented by direct trade effects in the case of Clothing and Footwear.

Another weakness of the technology story is that it does not explain why this change takes place. Many commentators have observed that increased import competition and internationalisation generally have motivated firms to improve their productivity, by reducing inefficiencies in production and by adopting new technologies. These insights have been recently formalised in models that integrate trade and technological change.

Figure 15: Technological Change and Relative Employment



Grossman and Helpman (1991) develop a model in which trade facilitates the transmission of technical knowledge. Campbell (1994) addresses the issue in a model in which protected firms, faced with the possibility of bankruptcy from emerging import competition, invest in cost-reducing technologies they had previously rejected as too risky. He calls this the 'cold shower' effect.

Bhagwati and Dehejia (1993) offer two models of trade and technology which predict a widening of the wage differential between skilled and unskilled labour. In their first model, there are two industries and two factors of production (skilled and unskilled labour). The terms of trade are volatile, increasing in one period and then decreasing in the next period to their initial level. Most important is the assumption about human capital formation. Skilled labour accumulates at the same rate in each sector, and is unaffected by any shift of skilled labour between sectors. Unskilled labour, on the other hand, is augmented only if it remains in the same sector. Thus skilled labour (e.g. computer programmers) can work equally well in either sector, but that is not true of unskilled labour. The effect of a rise then fall in the terms of trade is that the effective stock of skilled labour increases relative to the effective stock of unskilled labour. While there is no change in the real wage per effective worker of either type, the real wages of skilled workers increase by more than those of unskilled workers, because the skilled workers have accumulated more human capital.

The second model extends the first by applying the recently developed analysis of investment and uncertainty.[27] By incurring an irreversible fixed cost workers with few skills can invest in their human capital to become high-skilled workers. Suppose the relative reward to being high-skilled rather than low-skilled fluctuates with stochastic changes in the price of high-skill-intensive goods relative to low-skill-intensive goods. It then pays a low-skilled worker to wait and see before investing in new skills, because of the danger that the high to low-skilled wage differential will narrow after she has made the costly and irreversible investment in her human capital. If the initial apparent rewards to upgrading skills are sufficiently large the low-skilled worker will make the investment anyway, but, if not, a small increase in uncertainty is sufficient to postpone the investment. Thus, the increased wage inequality between high and low-skilled workers, observed in the United States and implicit in Australia, can be explained by increased uncertainty about relative goods prices.

This model implies that because low-skilled workers are behaving optimally (in the sense of individual utility maximisation) there is no immediate case for government-sponsored training schemes or subsidies aimed at increasing their welfare. However, as Bhagwati and Dehejia acknowledge, once imperfect capital markets are added to the model (so workers are unable to borrow to finance their retraining) an interventionist role for policy returns. The relevant and interesting question is whether such intervention should be confined to repairing failures in the capital market rather than the labour market, or whether this distinction can even be made in practice.

27. See, for example, Dixit and Pindyck (1994).

7. Summary and Policy Discussion

The major points to emerge from our analysis are:

- The opening of the Australian economy to international influences over the past decade has placed considerable competitive pressure on Australian manufacturing firms, which have responded by significantly increasing their levels of labour productivity.
- This has led to substantial decreases in manufacturing employment. However, there have been no falls to speak of in the wages of manufacturing workers relative to other workers, or of the wages of unskilled workers relative to skilled workers. This may have been due to changes in some relative wages being suppressed by the centralised wages system, especially in the low-skill industries like Clothing and Footwear.
- The popular perception that imports from low-wage countries have adversely affected manufacturing employment is correct only for the Clothing and Footwear industry, which accounts for just 6 per cent of total employment in the manufacturing sector.
- There has been no direct employment bonanza from the recent large increase in exports of elaborately transformed manufactures, for two reasons: the value added relative to exports in these industries is low, and they have a high level of labour productivity. Indeed, it is precisely these industries that have been shedding the most jobs through productivity improvements.

The analysis suggests a number of policy issues worthy of discussion. While internationalisation and the associated improvements in manufacturing productivity have led to large decreases in employment in that sector, this of course need not imply falls in employment in the economy as a whole. The increases in income generated by the improvements in manufacturing productivity ought to lead to increased demand, and therefore increased employment, elsewhere in the economy, especially in the service industries. However, a necessary condition for this structural adjustment to be successful is a labour market that works reasonably well. Throughout this century the centralised wage-setting system in Australia has evolved alongside, and been intimately connected with, the protection of manufacturing industries from import competition. Now that international trade is being liberalised, it seems reasonable to ask whether a corresponding liberalisation of the labour market must necessarily follow. There seems little doubt that the internationalisation of the Australian economy has increased the pressure on the low-skilled end of the labour market, though this appears to be more due to technological and productivity effects than directly through imports produced in low-wage countries. This implies, however, that this pressure will be felt by all low-skilled workers – not just those in the traded sectors – as these effects are spread throughout the economy.[28] The choice facing workers with few skills appears to be the one canvassed at the beginning of this

28. It could be argued, for example, that the recent very large increases in productivity, and corresponding falls in employment, in the railways and public utilities might be linked to a perceived need to increase efficiency throughout the economy because of the pressures arising from internationalisation (though we doubt that this can be demonstrated rigorously). Indeed, at times the entire 'microeconomic reform' agenda appears to be motivated by a need to improve 'international competitiveness' (at best an ambiguous concept) rather than productivity for its own sake.

paper: either their real wage falls or they become unemployed – or they increase their skills.

This idea has been formalised in a recent paper by Krugman (1993). In his model, technological changes lead incipiently to either less income equality or less employment. Which of these outcomes occurs is a matter of policy choice. A laissez-faire government responds by doing nothing; as a result, employment is maintained but inequality is widened. A redistributive government responds by maximising the welfare of the median voter; this leads to less inequality, but also distorts incentives and leads to a fall in employment. There is some evidence to support this idea in the literature comparing economic performance across countries. It appears that while country-specific institutions do not affect economic growth *per se*, they do affect the distribution of the burden of structural shocks in terms of unemployment and income differentials (Carlin 1994). Thus while in the 1970s and 1980s the United States and OECD Europe recorded roughly equal increases in per capita GDP, unemployment trebled in Europe but increased by much less in the United States, which 'paid' for its superior employment performance by reduced growth in productivity and real wages, and increased income inequality (Blank and Freeman 1993).

As far as Australia is concerned, for some commentators it is self-evident that any increased income inequality caused by labour-market liberalisation is preferable to higher unemployment caused by its absence. Even if true, however, a number of difficult questions remain unanswered, such as what happens if the market-clearing wage for those with few skills falls below the level of unemployment benefits? This raises the general issue of how, in a liberalised labour market, the social security and tax systems would interact to affect incentives to work while providing some kind of socially agreed upon minimum standard of living, or other distributional goals. This question is likely to become much more important than it has been in the past if the quasi-redistributive role of the wages system is discontinued and it is to act solely as an efficient allocator of labour resources.

In any case, questions about the social undesirability of a class of 'working poor' versus the social undesirability of a class of unskilled unemployed are not ones where economic analysis can offer any special insights, and are best resolved by the political process. Arguably of equal interest is whether policies which alter competitive labour market outcomes can actually enhance economic efficiency. For this to be the case, there must exist socially increasing returns or externalities from producing in some sectors rather than others. Agell and Lommerud (1993) develop a model in which growth and structural change are enhanced by compressing the relative wages of workers in the high and low-productivity sectors of the economy, where the high-productivity sector confers external benefits in the manner familiar from endogenous growth theory. The socially (but not privately) beneficial demise of the low-productivity sector is accelerated by keeping that sector's wage high. This paper is motivated by the experience of the Swedish 'solidary' wage policies which have been based on this principle, but have had to be complemented by large scale (and expensive) retraining programs for displaced workers.

Whether these market failures exist in practice is a difficult question to answer, though, in many respects, current Australian labour-market policies are at least consistent

with the view that they do: despite the recent reforms to the wage setting system, changes in relative wages are constrained by the existence of awards and a growing number of schemes exist for dealing with structural adjustment and the long-term unemployed.[29] This leads us to the question of how (or whether) governments should smooth the adjustment process as internationalisation leads some industries to contract and others to expand, irrespective of whether this process is brought about by market forces or policy intervention. While it is obviously true that sufficiently fast economic growth will solve any aggregate employment problem (just as it did when employment in agriculture contracted for essentially the same reasons as the current contraction in manufacturing) it may be the case that impediments to the adjustment process will constrain the economy's maximum feasible growth rate, with the natural rate of unemployment staying high as a result.

On this issue there remain many difficult and so far unresolved questions. Are the market failures sufficiently important that there exists a respectable role for 'industry policies' (i.e. discriminatory taxes and subsidies) which, for example, promote research and development? Will attempts by policy makers to pick winning skills prove to be more successful than previous attempts to pick winning industries? Is the problem of skills mismatch really a failure of capital markets rather than labour markets and, if so, should those people displaced from industries with declining employment simply be given training vouchers (or some other financial subsidy) with instructions to choose their own form of re-skilling? Can wage subsidy schemes be designed which actually facilitate structural change and lead to the efficient creation of new jobs, and do not just involve a transfer from taxpayers to those in receipt of the subsidy? Is there any sense in giving firms wage subsidies while simultaneously imposing wage taxes (i.e. payroll taxes)? Can a wages system developed at the national level be made consistent with microeconomic adjustment, where such adjustment is often concentrated in particular regions?

We do not have definitive answers to any of these questions, and the policy and academic studies which address them tend to the not very helpful conclusion that these issues are best dealt with on a 'case by case' basis. The absence of generalised and simple policy prescriptions does not, however, alter the fact that internationalisation is in one sense no different from any other structural change: potentially there are losers as well as those who stand to benefit. But this need not be the case, and the challenge for policy is to find ways to compensate the losers, or better yet, to clear the way for them to join in those parts of the economy that will profit from internationalisation. The aggregate benefits should be large enough to make the effort worthwhile.

29. Of course, not everybody is convinced by the market failure argument. Many critics of current policy, for example Sloan and Wooden (1994), contend that current labour-market policies are inefficient, and possibly also inequitable, once the welfare of the unemployed is taken into account.

Appendix A: Imports

Table A1: Imports of Food, Beverages, and Tobacco (21)

	1981/82			1992/93		
Industry	*211-217*	*218-219*	*21*	*211-217*	*218-219*	*21*
$m	645	129	774	1,996	525	2,521
Percentage from:						
China	4.0	0.1	3.4	2.4	0.1	1.9
Taiwan	2.7	0.0	2.3	1.3	0.1	1.1
Korea	1.0	0.0	0.8	1.0	0.1	0.8
Indonesia	1.8	0.1	1.5	2.8	0.1	2.2
Other low-wage	30.5	11.4	27.3	32.4	33.5	32.6
Total low-wage	40.0	11.6	35.3	40.0	33.9	38.7

Note: Categories include: 211-217 Food; 218-219 Beverages, Malt and Tobacco.

Table A2: Imports of Textiles (23)

	1981/82			1992/93		
Industry	*234*	*235*	*23*	*234*	*235*	*23*
$m	861	233	1,094	1,792	564	2,356
Percentage from:						
China	7.5	8.7	7.8	8.3	22.5	11.7
Taiwan	5.8	4.8	5.6	9.8	5.9	8.9
Korea	5.1	2.3	4.5	9.0	2.1	7.4
Indonesia	0.2	0.0	0.1	6.0	1.6	5.0
Other low-wage	12.7	14.4	13.1	17.0	18.1	17.2
Total low-wage	31.3	30.3	31.1	50.2	50.2	50.2

Note: Categories include: 234 Textiles fibres, yarns and woven fabrics; 235 Other textile products.

Table A3: Imports of Clothing and Footwear (24)

	1981/82				1992/93			
Industry	*244*	*245*	*246*	*24*	*244*	*245*	*246*	*24*
$m	60	372	147	579	220	1,042	507	1,769
Percentage from:								
China	11.2	13.1	9.8	12.1	68.5	51.2	39.7	50.0
Taiwan	32.5	18.0	33.3	23.4	2.2	2.5	7.3	3.9
Korea	10.2	7.0	9.5	7.9	6.5	1.4	14.9	5.9
Indonesia	0.0	2.0	1.6	1.7	0.8	2.5	6.1	3.3
Other low-wage	5.8	12.5	18.3	13.3	2.6	15.3	13.7	13.3
Total low-wage	59.7	52.5	72.5	58.3	80.6	72.8	81.8	76.4

Note: Categories include: 244 Knitting Mills; 245 Clothing; 246 Footwear.

Table A4: Imports of Wood, Wood Products and Furniture (25)

	1981/82			1992/93		
Industry	*253*	*254*	*25*	*253*	*254*	*25*
$m	332	112	444	862	254	1,116
Percentage from:						
China	2.2	2.5	2.3	2.6	8.9	4.0
Taiwan	9.4	16.6	11.2	2.4	14.2	5.1
Korea	0.3	1.0	0.5	0.1	0.4	0.2
Indonesia	1.1	0.3	0.9	6.4	9.8	7.1
Other low-wage	26.1	12.8	22.8	25.3	17.4	23.5
Total low-wage	39.2	33.2	37.7	36.8	50.6	39.9

Note: Categories include: 253 Wood and wood products; 254 Furniture and mattresses.

Table A5: Imports of Paper, Paper Products, Printing and Publishing (26)

	1981/82			1992/93		
Industry	*263*	*264*	*26*	*263*	*264*	*26*
$m	651	310	961	1,496	905	2,401
Percentage from:						
China	0.4	0.2	0.3	1.7	2.7	2.1
Taiwan	1.0	0.4	0.8	0.6	1.0	0.8
Korea	1.4	0.7	1.2	1.4	1.0	1.3
Indonesia	0.0	0.0	0.0	2.0	0.6	1.5
Other low-wage	4.7	0.9	3.5	8.9	2.2	6.3
Total low-wage	7.5	2.3	5.8	14.6	7.5	11.9

Note: Categories include: 263 Paper and paper products; 264 Printing and allied industries.

Table A6: Imports of Chemicals, Chemical Products and Petroleum (27)

	1981/82				1992/93			
Industry	*275*	*276*	*277-78*	*27*	*275*	*276*	*277-78*	*27*
$m	1,136	482	1,204	2,821	3,607	2,465	1,612	7,684
Percentage from:								
China	1.4	1.1	2.3	1.7	1.8	0.8	1.8	1.5
Taiwan	0.8	0.3	0.0	0.4	1.7	0.7	0.1	1.1
Korea	0.6	0.3	1.0	0.7	1.8	0.9	1.2	1.4
Indonesia	0.0	0.3	0.0	0.1	0.4	0.1	17.4	3.9
Other low-wage	16.9	3.6	50.2	28.9	24.0	3.8	42.1	21.3
Total low-wage	19.8	5.6	53.5	31.7	29.8	6.3	62.6	29.1

Note: Categories include: 275 Basic chemicals; 276 Other chemical products; 277-78 Petroleum.

Table A7: Imports of Non-Metallic Mineral Products (28)

	1981/82					1992/93				
Industry	*285*	*286*	*287*	*288*	*28*	*285*	*286*	*287*	*288*	*28*
$m	125	192	7	49	373	275	470	19	168	931
Percentage from:										
China	0.2	3.0	0.5	0.2	1.6	10.6	6.1	5.2	3.6	6.9
Taiwan	0.8	5.0	0.5	4.0	3.4	5.3	4.2	3.4	6.1	4.8
Korea	0.6	2.9	0.2	1.0	1.8	0.7	1.5	0.0	2.9	1.5
Indonesia	0.2	0.0	0.0	0.1	0.1	3.3	1.2	0.6	2.3	2.0
Other low-wage	15.3	4.8	1.9	5.1	8.3	14.0	16.0	7.7	12.9	14.7
Total low-wage	17.1	15.7	3.1	10.3	15.2	33.9	29.0	16.9	27.7	30.0

Note: Categories include: 285 Glass and glass products; 286 Clay products and refractories; 287 Cement and concrete products; 288 Other non-metallic mineral products.

Table A8: Imports of Basic Metal Products (29)

	1981/82				1992/93			
Industry	*294*	*295*	*296*	*29*	*294*	*295*	*296*	*29*
$m	614	63	88	764	1,135	87	541	1,763
Percentage from:								
China	0.1	4.6	0.6	0.5	1.3	1.1	0.1	0.9
Taiwan	0.8	0.1	0.5	0.7	3.2	0.1	0.1	2.1
Korea	8.1	0.0	0.6	6.5	10.0	1.1	1.5	7.0
Indonesia	0.0	0.0	0.0	0.0	0.1	0.9	0.0	0.1
Other low-wage	5.4	34.3	19.0	9.3	13.0	32.7	20.4	16.3
Total low-wage	14.4	38.9	20.7	17.1	27.6	35.9	22.3	26.4

Note: Categories include: 294 Basic iron and steel; 295 Basic non-ferrous metals; 296 Non-ferrous metal basic products.

Table A9: Imports of Fabricated Metal Products (31)

	1981/82				1992/93			
Industry	*314*	*315*	*316*	*31*	*314*	*315*	*316*	*31*
$m	79	13	594	686	124	191	1,523	1,837
Percentage from:								
China	0.0	0.7	1.1	0.9	0.2	7.9	5.5	5.4
Taiwan	0.1	5.0	7.3	6.4	0.1	15.7	12.5	12.0
Korea	5.7	1.2	2.5	2.9	0.2	6.2	2.9	3.1
Indonesia	0.0	0.0	0.0	0.0	0.0	2.0	0.4	0.5
Other low-wage	0.3	16.1	3.7	3.5	9.1	11.1	6.6	7.2
Total low-wage	6.2	23.0	14.5	13.7	9.6	42.9	27.9	28.2

Note: Categories include: 314 Structural metal products; 315 Sheet metal products; 316 Other fabricated metal products.

Table A10: Imports of Transport Equipment (32)

	1981/82			1992/93		
Industry	*323*	*324*	*32*	*323*	*324*	*32*
$m	2,039	1,456	3,495	6,770	2,388	9,159
Percentage from:						
China	0.0	0.0	0.0	0.4	1.8	0.8
Taiwan	1.0	2.1	1.5	0.9	1.8	1.1
Korea	0.1	0.1	0.1	2.6	2.1	2.5
Indonesia	0.0	0.0	0.0	0.3	0.0	0.2
Other low-wage	0.6	1.3	0.9	1.4	1.2	1.4
Total low-wage	1.7	3.5	2.4	5.6	7.0	5.9

Note: Categories include: 323 Motor vehicles and parts; 324 Other transport equipment.

Table A11: Imports of Other Machinery and Equipment (33)

	1981/82				1992/93			
Industry	*334*	*335*	*336*	*33*	*334*	*335*	*336*	*33*
$m	797	2,832	3,164	6,792	2,705	11,010	6,304	20,019
Percentage from:								
China	0.2	0.1	0.1	0.1	1.0	3.3	1.1	2.3
Taiwan	0.9	2.6	1.1	1.7	1.2	7.6	1.7	4.9
Korea	0.8	0.7	0.2	0.5	0.5	3.0	4.4	3.1
Indonesia	0.0	0.0	0.0	0.0	0.0	0.2	1.8	0.7
Other low-wage	1.0	3.4	1.8	2.4	2.2	6.5	2.1	4.5
Total low-wage	2.9	6.8	3.3	4.7	5.0	20.6	11.1	15.5

Note: Categories include: 334 Photographic, professional and scientific equipment; 335 Appliances and electrical equipment; 336 Industrial machinery and equipment.

Table A12: Imports of Miscellaneous Manufacturing (34)

	1981/82					1992/93				
Industry	*345*	*346*	*347*	*348*	*34*	*345*	*346*	*347*	*348*	*34*
$m	120	305	472	368	1,266	292	881	1,600	1,046	3,819
Percentage from:										
China	1.6	0.1	0.4	1.0	0.6	19.2	1.9	11.7	10.6	9.7
Taiwan	21.4	3.0	8.6	9.7	8.8	7.2	4.0	8.3	14.4	8.9
Korea	5.4	7.4	1.3	4.0	4.0	2.5	9.0	2.4	3.6	4.2
Indonesia	0.1	0.0	0.0	0.1	0.0	0.8	0.6	1.2	0.9	0.9
Other low-wage	18.0	4.2	2.8	10.7	6.9	16.3	12.0	5.5	12.6	9.8
Total low-wage	46.4	14.7	13.0	25.5	20.2	46.0	27.5	29.1	42.1	33.6

Note: Categories include: 345 Leather and leather products; 346 Rubber products; 347 Plastic and related products; 348 Other manufacturing.

Appendix B: Decomposition of Import and Export Shares

The contributions, for each industry, of changes in the propensity to import, and changes in the share of manufacturing output in GDP, to the increase in the ratio of imports to output can be determined by writing this ratio as:

$$\frac{m_i}{q_i} \equiv \frac{\dfrac{m_i}{GDP}}{\dfrac{q_i}{GDP}} \tag{B1}$$

That is, for each industry *i*, the ratio of imports to output is identically equal to the ratio of industry imports to GDP divided by the ratio of industry output to GDP. In each industry, import penetration can increase because of an increase in the propensity to import (the share of imports to GDP), or because of a decrease in the share of that industry's output in GDP.

Similarly, for exports,

$$\frac{x_i}{q_i} \equiv \frac{\dfrac{x_i}{GDP}}{\dfrac{q_i}{GDP}} \tag{B2}$$

The contributions of each of these factors to the change in import penetration (respectively exports) can be found by linearising equations B1 and B2, as follows:

$$\Delta\frac{m_i}{q_i} \approx \left(\frac{GDP}{q_i}\right)^* \Delta\frac{m_i}{GDP} + \left(\frac{m_i}{GDP}\right)^* \Delta\frac{GDP}{q_i} \tag{B3}$$

$$\Delta\frac{x_i}{q_i} \approx \left(\frac{GDP}{q_i}\right)^* \Delta\frac{x_i}{GDP} + \left(\frac{x_i}{GDP}\right)^* \Delta\frac{GDP}{q_i} \tag{B4}$$

where: Δ denotes the change in a variable between two points in time; * denotes the geometric mean of a variable's beginning and end-point values; and where the import and export data have been adjusted for value added in the manner described in Appendix C. The results of these decompositions are shown in Tables B1 and B2.

The major points of interest are:

- As noted in the text, about half of the overall increase in the import penetration ratio has been due to an increase in the ratio of imports to GDP, and about half due to the declining share of manufacturing output to GDP, with the corresponding proportions for exports about two-thirds and one-third.
- Within these aggregates, there have been large variations. While there has been a very large increase in import penetration in Textiles, more than 100 per cent of this has been due to a fall in share of textile production in GDP, i.e. the textile import share of GDP has fallen. (This might be appear to be strange given the large fall in

Table B1: Decomposition of Import Penetration (1981/82 – 1992/93)
(average 1989/90 prices)

	Change in m_i/q_i	Contributions of: Change in m_i/GDP	Change in q_i/GDP
Food, beverages, tobacco	0.020	0.016	0.004
Textiles	0.185	-0.065	0.251
Clothing, footwear	0.240	0.101	0.135
Wood, furniture	0.064	-0.006	0.070
Paper, print, publishing	0.079	0.026	0.053
Chemicals	0.282	0.244	0.037
Petroleum	0.067	0.030	0.037
Non-metallic minerals	0.034	-0.011	0.045
Basic metal	0.010	0.008	0.002
Fabricated metal	0.055	-0.027	0.083
Transport	0.070	-0.116	0.186
Other machinery and equipment	0.728	0.527	0.192
Miscellaneous	0.248	0.127	0.119
Total manufacturing	0.150	0.078	0.071

Table B2: Decomposition of Export Ratio (1981/82 – 1992/93)
(average 1989/90 prices)

	Change in x_i/q_i	Contributions of: Change in x_i/GDP	Change in q_i/GDP
Food, beverages, tobacco	0.029	0.014	0.015
Textiles	0.200	0.095	0.102
Clothing, footwear	0.057	0.043	0.009
Wood, furniture	0.047	0.007	0.039
Paper, print, publishing	0.024	0.017	0.007
Chemicals	0.146	0.134	0.011
Petroleum	0.099	0.069	0.029
Non-metallic minerals	0.019	0.008	0.011
Basic metal	0.361	0.346	0.014
Fabricated metal	0.049	0.022	0.026
Transport	0.117	0.077	0.037
Other machinery and equipment	0.245	0.199	0.041
Miscellaneous	0.092	0.065	0.025
Total manufacturing	0.132	0.093	0.037

the protection given to the domestic textile industry. However, the fall in the domestic production of clothing and footwear has led to fewer imported textiles being used as inputs into that industry.) On the other hand, about 90 per cent of the increase in import penetration in Chemicals and Chemical Products has been due to an increase in the propensity to import chemicals.

- The increase in export shares in these industries can be explained by similar factors. Additionally, the very large increase in the export share of Basic Metals Products is almost entirely due to an increase in export propensity, rather than the fall in this industry's share of GDP.

Appendix C: Data Sources and Description

C.1 Trade Data

Imports and exports by country, by 4-digit ASIC were obtained from the Department of Foreign Affairs and Trade (DFAT). Imports of Non-ferrous metals n.e.c., rolling, drawing, extruding (ASIC 2962) from Papua New Guinea have been deducted from total imports. This represents the imports of semi-processed gold from PNG, which grew from virtually nil in 1981/82 to over $800 million in 1992/93. The growth in these imports matches very closely the growth in imports of semi-manufactured gold (SITC 97101) in the ABS merchandise trade statistics. These imports receive minimal processing in Australia before being exported. As a result, the values of these imports are deducted from both manufactured imports and manufactured exports.

C.2 Manufacturing Census

Data on employment, earnings and output at 4-digit ASIC come from the census of manufacturing establishments (ABS Cat. No. 8202.0, 8203.0, 8211.0, 8221.0). The ABS has constructed the manufacturing census triennially since 1986/87, with a small scale census undertaken in the intervening years. Prior to this the census was constructed annually. No census was conducted in 1985/86. As a result, data for 1985/86 were constructed by taking the average of the 1984/85 and 1986/87 observations.

Employment data for 1992/93 at the 2, 3 and 4-digit ASIC level were constructed by applying the growth rates from the survey of employment and earnings (ABS Cat. No. 6248.0). Similarly, 2, 3 and 4-digit constant price output data for 1992/93 were constructed using the growth rates for 2-digit manufacturing gross product from the national accounts (ABS Cat. No. 5206.0).

C.3 Data Sources for Figures and Tables

Figure 1: Imports of Footwear from China

From the Department of Foreign Affairs and Trade. Volumes are calculated using the implicit price deflator for footwear (ASIC 246) available from the ABS (unpublished).

Figure 2: Employment in the Footwear Industry

From the manufacturing census. The 1992/93 observation was calculated by applying the growth rate for footwear employment from the survey of employment and earnings (PC-Ausstats).

Figure 3: Share of Manufactured Imports from Low-Wage Countries

Import data are from the Department of Foreign Affairs and Trade. Low-wage countries are defined to be the non-OECD countries, plus Greece, Portugal and Turkey, minus Singapore, Hong Kong and Israel. Manufacturing output at 1989/90 prices is from the national accounts (ABS Cat. No. 5206.0), and low-wage import volumes were

calculated using the implicit price deflator for manufactured imports available from the ABS (unpublished).

Since gross product measures by industry relate to value added and not the final value of production, the import data from DFAT have been adjusted to account for the share of the value added in final production in the corresponding 4-digit ASIC manufacturing industry. The share of value added in final production is calculated using Table 5 from the 1989/90 input-output tables (ABS Cat. No. 5209.0). Value added is calculated as final output less intermediate inputs and complementary imports. Final output is Australian production less competing imports. It is assumed that complementary imports are used as intermediate inputs, while competing imports are sold as final products.

Figure 4: Exports and Imports Ratio to GDP (1989/90 Prices)

National accounts ABS Cat. No. 5206.0.

Figure 5: Import Penetration (1989/90 Prices)

Figure 6: Ratio of Exports to Output (1989/90 Prices)

As in Figure 3, the import and export data from DFAT have been adjusted to account for the share of value added in production in the corresponding 4-digit ASIC manufacturing industry.

Implicit price deflators for manufactured imports and exports at 2-digit ASIC have been used to convert the trade series into constant 1989/90 prices. Constant price manufacturing gross product at 2-digit ASIC is from the national accounts (ABS Cat. No. 5206.0).

Manufacturing gross product for the 3-digit categories – Chemical Products (275/6) and Petroleum Products (277/8) – have been constructed by applying the shares of these categories in two digit value added from the manufacturing census, to 2-digit gross product in the national accounts.

Figure 7: Effective Rate of Assistance to Manufacturing

Figure 8: Effective Rates of Assistance for Manufacturing Subdivisions

Annual reports of the Industry Commission (IC) and the Industries Assistance Commission (various years). The level of the effective rate of assistance (ERA) is dependent upon the pattern of production within an industry. As a result the ERA can change because the level of protection changes, or because the pattern of production alters over time. The IC calculates effective protection rates using different base years in order to account for changes in the pattern of production. Because of this, ERAs using different base years will, for the same year, have different values. For example, the ERA for textiles in 1989/90 is 72 per cent using the series based in 1983/84, and 53 per cent using the series based in 1989/90. To link the series together, the 19 percentage points difference in the estimates are allocated evenly over the six years between 1983/84 and 1989/90. The original 1983/84 and 1989/90 base year estimates are preserved, while the observations in between are adjusted to reflect the changes in relative production that have occurred within the 2-digit category.

Figure 9: Exports and Imports of Elaborately Transformed Manufactures

SITC divisions 5 to 8 less subdivisions 67 and 68. Export values by SITC are available in ABS Cat. No. 5424.0, while volumes by SITC are available from the ABS upon request.

Figure 10: Imports and Exports of Selected ETMs

Department of Foreign Affairs and Trade (DFAT). Import and export data have been converted to 1989/90 prices using the import and export implicit price deflators for ASIC 33 available from the ABS upon request.

Figure 11: Employment and Output in Industries which Produce ETMs

Output and employment are from the manufacturing census. Output is constant price gross product at factor cost. It is defined by the ABS as turnover, plus the change in the value of stocks, less purchases, transfers in, selected expenses, land tax, rates, payroll tax and insurance premiums (other than for workers compensation). Industries which produce ETMs constitute ASIC subdivisions:

23	Textiles minus cotton ginning (2341) and wool scouring and top making (2342);
24	Clothing and footwear;
25	Wood, wood products and furniture minus log sawmilling (2531) and hardwood woodchips (2537);
26	Paper, paper products, printing and publishing;
275/276	Chemical products;
28	Non-metallic mineral products;
31	Fabricated metal products;
32	Transport equipment;
33	Other machinery and equipment minus photographic film processing (3342); and
34	Miscellaneous manufacturing.

This ASIC breakdown is based on the SITC definition of ETMs used in Figure 9.

Figure 13: Relative Consumer and Producer Prices

The producer price ratio is the ratio of the prices of articles produced by each ASIC category (ABS Cat. No. 6412.0), to the GDP deflator. Clothing and Footwear – ASIC 24; Footwear – ASIC 246; Motor Vehicles – ASIC 323; Appliances – ASIC 3353.

The consumer price ratio is the ratio of the consumer price sub-category index to the all items CPI (adjusted for Medicare, and from 1987 to 1989 for the new method of calculating mortgage interest charges).

Table 1: Manufactured Imports

DFAT trade data.

Table 2: Trade and Value Added of Selected Elaborately Transformed Manufactures

DFAT trade data. Nominal value added is from the manufacturing census. It is defined by the ABS as turnover, plus the change in the value of stocks, less purchases, transfers in, and selected expenses.

Table 3: Manufacturing Wages (1981/82 –1992/93)

From 1983/84, weekly nominal wages are from the survey of employment and earnings (ABS Cat. No. 6248.0). Prior to 1983/84 nominal wages from the census of manufacturing are spliced onto the survey of employment and earnings series. Average weekly earnings are total earnings for all employees, from ABS Cat. Nos. 6301.0 and 6302.0. Real product wages are weekly nominal wages divided by producer prices at 2-digit ASIC.

Table 4: Relative Wages

Hourly wages by occupation are from ABS Cat. No. 6306.0.

Table 5: Manufacturing Employment and Productivity (1981/82 – 1992/93)

Productivity is 2-digit ASIC gross product at 1989/90 prices divided by employment. Gross product and employment are from the manufacturing census.

Table 6: Sources of Employment Changes in Manufacturing (1981/82 – 1991/92)

The DFAT trade data have been adjusted for the share of manufacturing value added in final production (see Figures 5 and 6). Domestic demand is equal to value added less exports plus imports. Value added and employment are from the manufacturing census.

Tables A1 to A12

DFAT trade data.

C.4 ASIC Categories

	Australian Standard Industrial Classification	*Examples of main activities*
21	Food, Beverages and Tobacco	Meat products, frozen and canned vegetables, coffee, margarine, raw sugar, soft drinks, chocolate, processed seafoods, alcoholic spirits.
23	Textiles	Acrylic blankets and fabrics, cotton fabrics, cotton ginning, wool scouring.
24	Clothing and Footwear	—
25	Wood, Wood Products and Furniture	Particle board, wood veneer, picture framing, wooden toys, furniture, utensils, woodchips.
26	Paper, Paper Products and Publishing	Cardboard, newsprint, books, magazines, stationery.
27	Chemical, Petroleum and Coal Products	Fertilisers, plastics, pharmaceuticals, pesticides, paints, soap, cosmetics, adhesives, petrol, bitumen.
28	Non-Metallic Mineral Products	Glass, clay bricks, ceramics, cement, plaster products, stone products.
29	Basic Metal Products	Pig iron, wire, wrought iron, steel pipes, bauxite refining, aluminium smelting, gold refining.
31	Fabricated Metal Products	Kitchen utensils, sheet metal guttering, prefabricated steel buildings, hand tools.
32	Transport Equipment	Motor vehicles and parts, ships, aircraft, wheel barrows, bicycles.
33	Other Machinery and Equipment	Photographic goods, scientific equipment, computers, televisions, household appliances, agricultural machinery, industrial machinery.
34	Miscellaneous Manufacturing	Rubber tyres, plastic products, sporting equipment, leather tanning, jewellery.

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