JAPAN-AUSTRALIA MERCHANDISE TRADE: STRUCTURAL EFFECTS ON THE AUSTRALIAN ECONOMY

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The accompanying table contains the results of a study attempting to assess Australian dependence on trade with Japan using input-output methods. The findings are based on trade data for 1972-73. Exports to Japan in 1972-73 represented nearly one third of Australia's total exports of merchandise, whilst imports from Japan accounted for almost one fifth of all Australian imports. If a general expansion of trade between the two countries happens to be sought, Australia faces the task of reaching a satisfactory overall balance involving the probable development of industry biassed towards the exporting of basic materials in raw or partially processed form, the consolidation and possible rationalisation of the existing industrial framework, and the accommodation of rising levels of competitive imports from Japan.

The pattern of trade is at once evident in the table. Exports by Australia to Japan greatly exceed, in aggregate value, imports from Japan. Exports amounted to $1,929 million whereas imports were only $735 million. It can be immediately concluded that any movement towards more balanced trade, either by reductions in Australian exports or by rapid growth of Japanese imports, would adversely affect Australian income and employment, all other factors remaining constant.

We see that trade in both imports and exports is heavily concentrated in a relatively small number of commodity groups. As might be anticipated, exports to Japan emanate mainly from mining and agriculture, whereas imports from Japan are chiefly manufactured items. In diminishing order of importance the key export sectors are metallic minerals, textile fibres, coal and petroleum, cereal products, animal products and other crops. These six sectors were responsible for trade amounting to $1,729 million, or 90 per cent of export trade with Japan. The import pattern is somewhat more diverse, but nevertheless fairly concentrated in several dominating commodity groups, notably transport equipment, textile products, machinery, iron and steel and electrical products. In aggregate these groups accounted for imports to the value of $493 million or 67 per cent of total imports from Japan. An intensive examination of Japanese imports revealed that nearly all imports from Japan are directly competitive with Australian output, in the sense that similar items are either actually produced or could easily be produced by existing Australian industry.

Australian output generated directly and indirectly by exports to Japan was estimated by means of the following equation:

$$x_e=(I-A)^{-1}e_J \qquad (1)$$

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TABLE 1. STRUCTURAL EFFECTS

AGGREGATION KEY			
No.	Sector	I/O Industry	SITC Division
1	Animal products	A1, A4, A5, A6, C1,C2	00, 01, 02, 21, 29
2	Timber	A8, C23	24
3	Cereal products	A2, A3, C5, C6	04
4	Fish products	A9	03
5	Other crops	A7, C3, C7, C8	05, 06, 07, 08, 22
6	Metallic minerals	B1	28
7	Non-metallic minerals	B3	27
8	Coal and petroleum	B2, B4, C38	32, 33, 34, 52
9	Oils and fats	C4	41, 42, 43
10	Other food products	C9	09
11	Beverages	C10, C11, C12	11
12	Tobacco	C13	12
13	Textile fibres	C14	26
14	Textile products	C15, C16, C17, C18, C19	65
15	Clothing and knitted goods	C20, C21	84
16	Rubber products and footwear	C 22, C66	23, 62, 85
17	Wood products	C24	63
18	Furniture	C25	82
19	Pulp and paper	C26	25
20	Paper products	C27, C28, C30	64
21	Fertilisers and industrial chemicals	C31	56
22	Chemicals	C32	51, 59
23	Explosives	C33	57
24	Paints	C34	53
25	Pharmaceutical and cleaning products	C35, C36, C37	54, 55
26	Non-metallic mineral products	C39, C40, C41, C42	66
27	Iron and steel	C43, C44	67
28	Non-ferrous metals	C45, C46	68
29	Metal products	C47, C48, C49, C50, C51, C52, C53	69, 81
30	Transport equipment	C54, C55, C56, C57	73
31	Scientific equipment	C58	86
32	Electrical products	C59, C60, C61	72
33	Machinery	C62, C63	71
34	Leather goods	C64, C65	61, 83
35	Plastics	C67	58
36	Miscellaneous manufactures	C68, C69, C29	89, 9A
37	Electricity	D1	
38	Gas	D2	
39	Water, sewerage and drainage	D3	
40	Residential building	E1	
41	Other building and construction	E2	
42	Wholesale trade	F1	
43	Retail trade	F2	
44	Motor vehicle repairs and service	F3	
45	Transport and storage	G1	
46	Communication	H1	
47	Finance and life insurance	I1	
48	Other insurance	I2	
49	Investment and real estate	I3	
50	Business services	I4	
51	Public administration	J1	
52	Defence	J2	
53	Health	K1	
54	Education	K2	
55	Welfare and religious institutions	K3	
56	Entertainment and hotels	L1	
57	Other personal services	L2	
58	Ownership of dwellings	M1	
59	Business expenses	N1	
	Total		

OF JAPAN-AUSTRALIA TRADE

EXPORTS TO JAPAN 1972-73						IMPORTS FROM JAPAN 1972-73					
Exports at current purchasers prices	Exports at base-year basic values	Australian output effects	Wages effects	G.O.S. effects	Employment effects	Imports at current prices f.o.b.	Imports at base-year basic values	Australian output effects	Wages effects	G.O.S. effects	Employment effects
$m	$m	$m	$m	$m	persons	$m	$m	$m	$m	$m	persons
237.7	125.0	438.7	48.5	153.0	51845	0.5	0.5	44.0	4.8	15.2	5207
		25.4	8.0	5.4	3714	0.1	0.2	11.9	3.7	2.5	1738
111.4	106.5	147.6	14.6	60.3	19913	0.2	0.2	2.8	0.2	1.1	381
24.1	12.7	14.5	2.0	7.3	3521	11.4	8.8	9.2	1.2	4.6	2226
104.0	77.2	111.5	18.1	35.7	12946	3.2	3.3	6.1	1.0	1.9	719
503.3	454.9	460.7	183.6	107.4	56404	0.1	0.3	17.7	7.0	4.1	2176
12.6	34.0	37.2	7.9	14.7	4399	1.8	5.9	11.6	2.5	4.6	1381
272.0	184.2	263.7	38.0	50.7	12227	1.3	2.4	30.2	4.3	5.8	1404
8.0	6.0	9.8	1.4	1.8	457	0.5	0.4	1.7	0.2	0.3	81
0.1		2.7	0.5	0.4	172	0.1	0.1	0.7	0.1	0.1	47
0.1		1.2	0.2	0.2	114			0.6	0.1	0.1	62
		0.2			11			0.1			7
501.2	286.3	291.8	34.9	14.3	45442	7.9	12.3	45.0	5.3	2.2	7016
2.1	1.4	24.2	5.5	3.2	2402	112.4	102.4	155.5	35.4	20.8	15398
0.3	0.2	3.0	0.9	0.4	504	2.5	3.4	4.8	1.4	0.6	816
		9.4	3.4	0.8	1403	18.3	20.2	32.4	12.0	2.8	4822
23.1	16.6	19.8	6.6	2.5	2228	1.2	1.3	4.4	1.4	0.5	499
0.1	0.1	0.8	0.2	0.1	170	1.2	1.3	3.0	0.9	0.3	593
		26.2	6.0	4.9	2705		0.1	26.3	6.0	4.9	2716
		28.5	9.3	4.2	3797	11.3	12.2	29.7	9.7	4.4	3947
		42.1	10.0	6.9	1937	0.3	0.6	31.8	7.6	5.2	1466
34.7	16.9	21.9	4.7	5.0	1827	28.2	40.9	43.4	9.4	9.9	3627
		8.5	4.1	0.7	3405	0.1	0.1	1.1	0.5		453
0.3	0.2	2.6	0.5	0.4	164	1.3	1.7	7.0	1.3	1.1	434
3.2	2.4	8.1	1.6	2.1	772	2.0	2.7	6.5	1.3	1.7	624
5.5	4.1	10.1	3.1	2.2	1431	24.2	24.4	34.6	10.8	7.6	4872
8.8	8.3	47.2	15.4	8.8	6729	67.3	93.0	159.0	52.0	29.8	22645
		15.5	2.3	1.8	469	4.1	6.5	48.9	7.2	5.6	1472
3.0	2.2	32.3	9.0	4.4	3687	20.1	18.8	44.4	12.4	6.0	5066
6.2	4.6	16.7	5.1	2.1	1990	167.1	175.8	182.6	56.3	24.0	21749
1.1	0.8	1.2	0.4	0.2	258	22.7	21.5	22.4	8.3	3.8	4731
1.7	1.3	16.4	5.1	2.1	1983	64.7	72.3	92.5	29.0	12.0	11121
2.3	1.7	26.0	8.9	3.4	3353	82.0	87.7	101.8	35.0	13.5	13101
0.6	0.4	1.6	0.4	0.1	241	2.1	2.1	6.0	1.6	0.6	871
		5.3	1.6	0.6	615	20.6	20.8	28.3	8.7	3.4	3242
60.2	43.3	53.6	19.1	11.7	7159	52.9	53.4	59.9	21.4	13.1	7990
		45.1	12.0	20.7	5110			21.8	5.8	10.0	2477
		1.6	0.4	0.3	234			1.8	0.5	0.4	277
		11.2	3.3	5.8	2321			2.5	0.7	1.3	527
		11.4	3.8	1.1	1684			7.3	2.4	0.7	1074
		60.4	24.5	21.6	12775			31.2	12.6	11.1	6594
		3.3	1.5	1.1	953			0.9	0.4	0.3	267
		15.0	5.7	2.4	2160			4.9	1.8	0.7	708
		64.4	22.3	14.1	11455			41.7	14.4	9.1	7417
		15.8	7.8	3.5	3650			9.2	4.5	2.0	2138
		3.4	2.4		704			2.0	1.4		412
		9.1	3.9	2.3	2054			5.3	2.3	1.3	1202
		0.9	0.2	0.5	157			0.5	0.1	0.2	92
		15.6	5.4	6.6	3273			8.9	3.1	3.7	1869
		1.5	1.0		395			0.9	0.6		232
		0.5	0.2	0.1	168			0.1			31
		0.3	0.2		81			0.1	0.1		48
		5.5	2.1	1.9	1456			3.2	1.2	1.1	854
		2.6	1.3	0.8	2057			1.5	0.8	0.5	1205
		82.6						48.4			
1929.5	1392.9	2579.0	581.5	604.9	311082	735.7	799.3	1502.7	415.2	259.1	182119

where x_e is output generated by export trade, $(I-A)^{-1}$ is the Leontief inverse matrix and e_J is exports by Australia to Japan in 1972-73.

The impact of competitive imports was estimated along similar lines:

$$x_m=(I-A)^{-1}m_J \qquad (2)$$

Equation (2) shows the fullest extent to which Australian production, directly and indirectly, might have been enlarged if it were not for competitive imports from Japan, everything else remaining constant. The vector of displaced outputs is x_m and m_J the vector of competitive imports.

The input-output matrix was obtained, with some aggregation of industries to correspond with the trade data, from *Australian National Accounts: Input-Output Tables 1962-63* published by the Australian Bureau of Statistics. This was the only reliable input-output information available, thus all calculations and results appear in terms of 1962-63 technology and values. The table selected for condensation was an industry by industry matrix expressed in basic values. Imports and exports were converted to 1962-63 prices and basic values before being substituted into their respective equations. Further input coefficients were used to calculate the levels of wages, employment and gross operating surplus (G.O.S.) associated with each output vector.

Let us turn first to the macroeconomic effects of imports and exports. The aggregate effects of exports to Japan in 1972-73 on Australian output, income and employment are shown in the table by way of column totals. Taking industry interactions into account, these exports led to employment of 311,082 persons, or 5.9 per cent of the 1972-73 work force. The macroeconomic implications on the income side are a little more difficult to interpret because of price index problems. The ratio of 1972-73 exports to Japan to Australian 1972-73 GDP, both measured in current purchasers' prices, can be readily determined as 4.7 per cent. It is in terms of the results in the table that comparisons become more involved. Measured in 1962-63 values, exports to Japan led to Australian output totalling $2,579 million, wages of $581 million and gross operating surplus of $604 million. The figure of $1,186 million, representing total wages and gross operating surplus generated by exports in the input-output sectors, when converted to 1972-73 values via a general GDP price index, emerges as $1,803 million, or 4.4 per cent of the 1972-73 GDP at current purchasers' prices. This, however, does not cover the overall income effect for the economy as a whole. The difference between the result just presented and the previous ratio of 4.7 per cent for exports / GDP will comprise other income arising in the primary inputs sub-matrix such as taxes and customs duty on inputs, and sales by final buyers, supplemented by commodity taxes and markups interposing between exports at basic values and exports at purchasers' prices.

Now let us consider the overall displacement of Australian output, income and employment by competitive imports from Japan in 1972-73. Directly and indirectly, employment opportunities for 182,119 persons would have been potentially attainable in the absence of competitive Japanese imports. Displaced Australian production is $1,502 million, wages $415 million and gross operating surplus $259 million. Again, it should be remembered that these estimates are in 1962-63 values and that wages and gross operating surplus need to be supplemented by various taxes and other income such as markup on output to arrive at the total income forfeiture.

The aggregates in the table provide a number of ratios of substantial interest in

anticipating the likely impact of future changes in trade with Japan. First, it will be observed, for both exports and imports, that Australian output almost doubles in reacting to a given bill of final demands. Measured in base-year basic values, that is, the direct and indirect output effects are almost double the first-round effects. More importantly, however, the results suggest that the economy is much more sensitive to imports than to exports. We find that total Australian output, generated directly and indirectly by exports to Japan, taken as a ratio to total exports at current f.o.b. values is 2579 / 1929 or 1.3. The corresponding ratio on the import side is 1503 / 736 or 2.0 On this measure, the response factor for imports is 54 per cent greater than that for exports. Recalculation of these ratios using trade flows in base-year basic values—which would understate the impact of imports due to the disparity between f.o.b. and c.i.f. prices—again suggests greater sensitivity to import competition, yielding a ratio of 1.9 for imports as compared with 1.8 for exports.

Similar patterns apply for wages, gross operating surplus and employment. The ratio of directly and indirectly displaced employment to total imports from Japan measured in current f.o.b. prices, for instance, is 182,119 / 735,731 as compared with a ratio for exports of 311,082 / 1929,513. The import ratio is 53 per cent higher. The same picture emerges for wages and gross operating surplus. The wage ratio is 87 per cent higher for imports, and the gross operating surplus ratio 12 per cent higher. The latter figures bear out the fact that the wage content of import-competing output is much higher than that of exports.

The validity of the preceding conclusions depends on the assumption that price changes for imports and exports have been roughly equal on average between 1962-63 and 1972-73, and that net commodity taxes and markups on domestic outputs have been approximately equal on average for the export and import-competing sectors.

Structural analysis was carried out to assess the linkage effects of the main import-competing and export sectors. As is evident in the table, the absolute levels of direct and indirect effect, considered on a sectoral basis, follow quite closely the commodity group values in the import and export vectors. The export categories with the largest values, that is, generate the highest levels of output, income and employment in the corresponding input-output sectors; and the displacement effects are most pronounced in the sectors competing with trade categories featuring the greatest values of imports. Thus metallic minerals, which is the most important export category, gives rise to the highest absolute levels of income and employment. On the import side, displaced production is greatest in transport equipment.

The sensitivity of the economy to changes in the output of the key sectors does not, however, correlate with the absolute importance of each commodity group. Take, as an indicator, the sum of the column coefficients in the Leontief inverse matrix for each of the key sectors involved in trade with Japan. The sum of the coefficients in the jth column of the total requirements matrix measures the direct and indirect change in Australian output, across all industries, arising from a one dollar change in output by the jth sector, measured in base-year basic values. A high value suggests that interaction processes are especially important, and a value of unity signifies a complete absence of feedback effects. On this criterion, the most important export sector turns out to be textile fibres with a column total of 2.48. The remaining export sectors, with their respective column totals are animal products (1.99), other crops (1.91), cereal products (1.89), metallic minerals (1.59) and coal and petroleum (1.45). The most sensitive import-competing sector is textile products, with

a column total of 2.42, followed by electrical products (1.97), iron and steel (1.81), machinery (1.75), and transport equipment (1.65). Taking an average separately for the six key export and five key import sectors, we obtain a column total of 1.88 on the export side and 1.92 for imports. Again, therefore, it would appear that the sectors competing against imports from Japan have a greater transmission of effect than those exporting to Japan.

Examination of the distribution of effects down each key sector's column of coefficients in the Leontief inverse matrix revealed even further interesting differences between the import-competing and export sectors. If we denote the Leontief matrix by α_{ij} then each α_{ij} shows the number of dollars' worth of output of the ith sector that are created or displaced directly and indirectly by a dollar change in output on the part of the jth sector. Applying this, for example, to the metallic minerals sector, we find that exports of a dollar's worth of metallic minerals at base-year basic values implies the domestic use of a further 4 cents' worth of metallic minerals, with other output effects occurring mainly in coal and petroleum (9 cents), business expenses (6 cents), electricity (5 cents), iron and steel (3 cents) and transport (3 cents). A systematic coverage of all the key sectors led to the discovery that in general the structural effects of sectoral output change are quite widely dissipated on the export side but more concentrated in the case of imports. With the exception of 88 cents of output of animal products associated with each dollar of output by the textile fibres sector, none of the column coefficients for the key export sectors suggest a feedback exceeding 6 cents for any other sector. The most significant coefficients in general tend to involve only 1 or 2 cents.

For imports, on the other hand, the impact multipliers typically exhibit higher values and apply to a restricted range of other industries. Feedbacks are particularly strong on iron and steel and metal-based industries. Textile products is the one exception, having a linkage of 25 cents with the animal products sector and 28 cents with textile fibres. For the remaining four key import-competing sectors, we find that a dollar change in the output of transport equipment brings about a change of 10 cents in iron and steel; the machinery sector a change of 19 cents in iron and steel; electrical products a change of 11 cents in iron and steel (and 16 cents in non-ferrous metals) whilst iron and steel itself has an intra-industry effect of 107 cents.

What are the main policy implications? The most significant generalisation which emerges is that the sensitivity of the economy would seem to be much higher for imports than for exports. If an overall expansion of trade with Japan is sought, current indications are that resources will need to be channelled mainly into rural and mining production to sustain export performance, whilst a curtailment of growth may need to take place in industries such as motor vehicles, electrical products and machinery. Iron and steel production also could be adversely affected.

In view of the relative magnitude of the export sector, equal rates of expansion would still imply a shift of resources into export production larger than the corresponding displacement resulting from increased import competition; but as emphasised previously, equal absolute changes on either side of the trade account could necessitate much more rapid adjustment in import-competing industry. Whether resources should, or even could, be transferred from declining to expanding sectors is of course dependent upon the geographic and economic mobility of the resources involved and upon the social costs and benefits of any redeployment schemes the Australian Government might see fit to implement.