Impact Project

Impact Centre
The University of Melbourne
153 Barry Street, Carlton
Vic. 3053 Australia
Phones: (03) 341 7417/8
Telex: AA 35185 UNIMEL
Telegrams: UNIMELB, Parkville

IMPACT is an economic and demographic research project conducted by Commonwealth Government agencies in association with the Faculty of Economics and Commerce at The University of Melbourne, the Faculty of Economics and Commerce and the Departments of Economics in the Research Schools at the Australian National University and the School of Economics at La Trobe University.

THE ORANI 78 INPUT-OUTPUT AND PARAMETER FILES FOR 1977-78

by

Ian Bruce

IMPACT Project Staff
Melbourne

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1. INTRODUCTION*

In 1983 the Australian Bureau of Statistics (ABS) released national input-output (IO) tables for the year 1977-78. The Industries Assistance Commission (IAC) used these tables and other relevant information to update the standard ORANI data input files from 1974-75 to 1977-78 (Bruce (1984)). In later work, staff at the IMPACT Project implemented two improvements to the IAC database, namely the incorporation of a typical-year agricultural sector and the balancing of the modified IO data. The purpose of this paper is to describe how these files were generated and to present their principal characteristics as an aid to users of the ORANI 78 model of the Australian economy.

Sections 2 and 3 of the paper are updates of the descriptions of the 1968-69 ORANI IO database and elasticities files presented in sections 28 and 29 of Dixon et al. (1982). Certain additional material has been included in the Appendix. It is assumed in this document that the reader already has some familiarity with the ORANI model of the Australian economy, including its database and parameters.

2. THE CONSTRUCTION OF THE 1977-78 INPUT-OUTPUT DATABASE FOR ORANI

The input-output (IO) data files are described in general terms in section 25 and illustrated in Figure 25.1 - the so-called "infinite diagram" - of Dixon et al. (1982), reproduced here as Figure 2.1. In the standard 1977-78 version of Figure 2.1, there are g = 114 commodities produced by h = 112 industries and M = 10 occupations.[1] The commodity and industry classifications can be seen in Table 3.2, while the ten-order occupational classification is shown in Tables 3.3 and A.5. Although the ORANI theory allows all industries to produce all commodities, at present ORANI's multiproduct industries are confined to the agricultural sector. Each nonagricultural commodity is modelled as being produced by a unique, single-product industry. Thus, where the agricultural industries and commodities are listed first, ORANI's product-mix matrix (Y) consists of a rectangular submatrix in the north-west quadrant, a diagonal submatrix in the south-east, and zeros in the north-east and south-west. Similarly, although the ORANI theory allows all commodities to be used as margin services, in practice the input-output database shows only nine types of margins, including commodity taxes.

The aim of this section is to explain how the 1977-78 version of Figure 2.1 was constructed from IO data provided by the Australian Bureau of Statistics (ABS), supplemented by survey data from the Bureau of Agricultural Economics (BAE). The data from these two sources are described in subsection 2.1. In subsection 2.2 the modifications made to the ABS IO data for use in ORANI are described, the major modification being the changes to the agricultural sector. Finally, the manipulation of the modified data into the format of the ORANI infinite diagram is described in subsection 2.3.

Figure 2.1: INPUT-OUTPUT DATABASE FOR ORANI 78

		Final Demands			
	Domestic industries (current production)	Domestic industries (capital formation)	Household cons'n.	Exports	Other
	←h→	←h→	←1→	←1→	←1→
Domestic commodities	g $\tilde{A}$	$\tilde{B}$	$\tilde{C}$	$\tilde{D}$	$\tilde{E}$
Imports	g $\tilde{F}$	$\tilde{G}$	$\tilde{H}$	$\underset{=}{0}$	$\tilde{J}$
Margin type 1 on domestic flows	g $\tilde{K}_1$	$\tilde{L}_1$	$\tilde{M}_1$	$\tilde{N}_1$	$\tilde{O}_1$
Margin type 1 on imports flows	g $\tilde{P}_1$	$\tilde{Q}_1$	$\tilde{R}_1$	$\underset{=}{0}$	$\tilde{T}_1$
Continues through margin types 2 to g					
Margin type g+1 (tax) on domestic flows	g $\tilde{K}_{g+1}$	$\tilde{L}_{g+1}$	$\tilde{M}_{g+1}$	$\tilde{N}_{g+1}$	$\tilde{O}_{g+1}$
Margin type g+1 (tax) on imports flows	g $\tilde{P}_{g+1}$	$\tilde{Q}_{g+1}$	$\tilde{R}_{g+1}$	$\underset{=}{0}$	$\tilde{T}_{g+1}$
Primary inputs: Labor	M $\tilde{U}$	$\underset{=}{0}$	$\underset{=}{0}$	$\underset{=}{0}$	$\underset{=}{0}$
Primary inputs: Capital	1 $\tilde{V}$				
Primary inputs: Land	1 $\tilde{W}$				
Primary inputs: Other costs	1 $\tilde{X}$				
	Column sums = outputs of domestic industries at basic values	Column sums = investment expenditure by each industry	Column sums = total household expenditure	Column sums = total exports	Column sums = total "other" final demand

Domestic commodities	g $\tilde{Y}$ (Product-mix matrix)	Row sums = domestic output by commodity
	Column sums (of $\tilde{Y}$) = output by industry	

Imports	- Duty - $\tilde{Z}$	Rows sums = total imports (c.i.f.)

2.1 The Data Sources[2]

2.1.1 The ABS 1977-78 IO tables

The main data sources for the construction of the ORANI IO database are two IO tables and nine margins matrices supplied by the ABS. The first IO table (ABS magnetic tape table 2), usually called the absorption matrix, is a gross (i.e., it contains nonzero intra-industry entries), 108 commodity group x 108 industry table at basic values with indirect allocation of competing imports. The second table (ABS tape table 3) is an imports matrix. The nine margins matrices show the margins flows of Wholesale trade, Retail trade, Road transport, Rail and other transport, Water transport, Air transport, Marine insurance, Restaurants, hotels and clubs and Commodity taxes less subsidies associated with all commodity flows identified in the absorption matrix.

The general format of the ABS IO data is illustrated in Figures 2.2 and 2.3. Figure 2.2 lists the row and column labels of the absorption matrix. The rows of the imports matrix have the same labels as the columns of the absorption matrix (as shown in Figure 2.2). The imports matrix has 334 columns, comprising: 108 sets of three columns (c.i.f. value of competing imports, duty and total duty paid competing imports) for each of the IO commodities; plus three similar sets of three columns for total competing imports, complementary imports and grand totals; and the fourth last column shows re-exports. Figure 2.3 illustrates the format of the nine margins matrices. The typical ij^{th} cell of one of these matrices contains the value of the margin of the relevant type associated with the delivery of commodities of classification i, from all sources, to user j.

2.1.2 The BAE survey data.

The Bureau of Agricultural Economics undertakes regular surveys of the financial position of Australian agricultural industries. In assembling cost and sales data for the ORANI agricultural industries, data in the ABS IO tables have been supplemented with information from several of these surveys. Cost information for the first three ORANI multiproduct industries (see Table 2.1), for example, is based on Australian Agricultural and Grazing Industry Surveys (AAGIS).[3] Similarly, the ORANI Milk Cattle and Pigs Industry is constructed largely from information contained in the BAE's Australian Dairy Industry Survey (BAE (1981 and previous years)).

Figure 2.2: ROW AND COLUMN LABELS OF THE ABS ABSORPTION MATRIX FOR 1977-78

ROW LABELS		COLUMN LABELS	
ABS IO Code	Description	ABS IO Code	Description
01.01 . . . . . 93.01	108 Commodity groups (See ABS (1983) for description of commodity group names and codes)	01.01 . . . . . 93.01	108 Industries
T1	Intermediate usage (total down the first 108 rows)	T4	Intermediate usage (total across the first 108 columns)
P1	Wages, salaries and supplements	Q1	Household consumption
P2	Gross operating surplus	Q2	Government consumption
P3	Commodity taxes (net)	Q3	GFCE[(a)] - private
P4	Indirect taxes nec (net)	Q4	GFCE - public enterprises
P5	Sales by final buyers	Q5	GFCE - general government
P6A	Complementary imports cif	Q6	Increase in stocks
P7A	Duty on P6A	Q7	Exports of goods and services
T2	Australian production (total down rows T1 to P7A)	T5	Total final demand (total across columns Q1 - Q7)
P6B+C	Competing imports cif	T6	Total supply (total across columns T4 and T5)
P7B+C	Duty on P6B+C		
T3	Total usage (total down rows T2 to P7B+C)		

(a) Gross Fixed Capital Expenditure.

Figure 2.3: SCHEMATIC REPRESENTATION OF AN ABS MARGINS MATRIX

Columns / Rows	Intermediate Demands		Final Demands[a]								Grand
	1,2,...,108	Total (T4)	H.C.	G.C.	GFCE(PR)	GFCE(PE)	GFCE(GG)	Stocks	Exports	Total(T5)	Total (T6)
Commodity 1 108											
Sales by final buyers											
Complementary imports											
Re-exports											
Totals											

(a) Abbreviations can be interpreted by reference to Figure 2.1.

Table 2.1: TYPICAL YEAR VALUE OF AGRICULTURAL OUTPUT BY COMMODITY AND INDUSTRY FOR 1977-78 ($MILLION)

Industries / Commodities[a]	(1) Pastoral Zone	(2) Wheat-sheep Zone	(3) High Rainfall Zone	(4) Northern Beef	(5) Milk Cattle and Pigs	(6) Other Farming (sugar cane, fruits and nuts)	(7) Other Farming (vegetables, cotton, oilseeds and tobacco)	(8) Poultry	Aggregate Commodity Output
A1 Wool	314.1	647.7	546.9						1508.7
A2 Sheep meat	57.3	295.6	225.8						578.7
A3 Wheat	42.8	856.9	21.4						921.1
A4 Barley	8.5	148.5	19.5						176.5
A5 Other grains	4.1	113.7	43.9						161.6
A6 Meat cattle	73.5	218.3	245.8	208.1	57.9				803.6
A7 Milk cattle and pigs	0.5	60.5	23.5		900.5				985.0
A8 Other farming (sugar cane, fruits and nuts)	0.4	3.0	6.6			1247.7			1257.7
A9 Other farming (vegetables, cotton, oilseeds tobacco)	12.9	36.5	54.1				853.1		956.6
8 Poultry								400.4	400.4
Aggregate Industry Output	514.1	2380.7	1187.5	208.1	958.4	1247.7	853.1	400.4	7749.7

(a) The choice of the labels A1, A2,..., A9 for the agricultural commodities is explained in note (a) to Table 3.2.

Source: Higgs (1985).

2.2 Modification of the ABS IO Tables

In five respects - (a) the representation of the agricultural sector, (b) the treatment of joint production in the non-agricultural sector, (c) the aggregation of coal, oil and gas into a single product produced by a single industry, (d) the treatment of inventories and (e) the inclusion of two industries having negative gross operating surplus and one having a very low gross operating surplus - the ABS tables were judged to be inappropriate for use with the ORANI model. In the remainder of this subsection the modifications which were made to the ABS data before it was converted into Figure 2.1 are described.

2.2.1 Changes to the agricultural sector

In the ABS IO tables six product groups are identified as agricultural "industries". These are: 1 Sheep, 2 Cereal grains, 3 Meat cattle, 4 Milk cattle and pigs, 5 Poultry and 6 Other farming. However, nearly all of the Australian production of wool, sheep, cattle, wheat, barley and other cereal grains occurs on multiproduct farms. An implication of the joint-production characteristics of Australian agriculture is that input bundles cannot be apportioned uniquely to the production of individual products. The columns in the ABS IO tables for the agricultural product group industries therefore reflect arbitrary cost allocations. A second problem with the ABS treatment of the agricultural sector is that it masks regional differences in production technology which, because of climatic and biological factors, are important in the Australian context. A third, more specific, problem concerns the commodities produced by the industry Other farming, as defined by the ABS. Two of the major components included in this category are tobacco, which is import-competing, and sugar cane, virtually all of which is subsequently made into an exportable commodity. In ORANI, which emphasizes international trade, it is unsatisfactory to have import-competing and export components (or export related components) aggregated within a single commodity classification.

Because of the role of agriculture in Australia's international trade, it is important for ORANI to include a realistic representation of the agricultural sector. In view of the difficulties inherent in the ABS treatment, the rows and columns for the agricultural industries in the ABS IO tables and the margins matrices have been replaced with a nine commodity by seven industry system which avoids arbitrary cost allocations, includes regional variations in production technology and disaggregates Other farming into its import-competing (vegetables, cotton, oilseeds and

tobacco) and export (sugar cane, fruits and nuts) components. The regional cost of production surveys of the BAE, which were described in subsection 2.1.2, provided the required information.

The responsiveness of the agricultural industries is sensitive to the share of fixed factors in total costs (i.e., the combined returns to land and fixed capital). This share has fluctuated markedly over time due to both demand influences (e.g., world agricultural commodity price changes) and supply shifts (e.g., droughts). To enable ORANI to give projections that reflect the response of agriculture in a typical year, Higgs (1985) imposed an average share of fixed factors from data collected by Adams (1984) over the period 1967-68 to 1979-80. Briefly, four main steps were involved. First, a typical year ratio of Gross Farm Product to Gross Domestic Product was computed and used as a basis to calculate typical output of the agricultural sector in millions of 1977-78 dollars. This figure is the grand total of the matrix shown in Table 2.1, which summarises the industry and commodity composition of the agricultural sector in the ORANI database. The elements of the matrix were calculated by multiplying the matrix total by the typical year shares of each commodity's output by industry in the total output for the agricultural sector. Table 2.1 summarises the industry and commodity composition of the agricultural sector in the ORANI database. It is the north-west quadrant of the matrix Y in Figure 2.1, i.e., the first eight columns of the first ten rows.[4] It shows the value of production (in millions of 1977-78 dollars) of each agricultural commodity produced by each agricultural industry in a typical year. Notice that the first four industries all have a regional dimension. Notice also, that industries 1,2,3 and 5 are shown as producing more than one commodity. Farms classified to these industries use their major inputs jointly in the production of several commodities.

The second step Higgs (1985) took to insert a typical year agricultural sector into the database was to adjust the commodity sales data (matrices A to E in Figure 2.1) by imposing values for export sales which would give rise to typical year export shares. Margins and taxes were moved in proportion with their associated basic value flows. Thirdly, industry costs data were replaced with values which give typical year shares of total inputs to current production for the primary factors in matrices U, V and W and the working capital component of X in Figure 2.1. In the final step, the database was balanced to ensure that sales of agricultural commodities were set equal to the outputs shown in Table 2.1.

2.2.2 Single-product specification for the non-agricultural industries

Apart from the agricultural industries and commodities above, the incidence of joint production in the ABS multiproduct matrix is relatively low. That is, it is nearly diagonal except in the top left (agricultural) corner. To save computing costs it was decided to specify a one-to-one relation between industries and commodities in the rest of the database. Thus, the entire production of each commodity was deemed to originate from the industry for which that commodity constituted the greatest share of production. The same result would have been achieved by assigning to each commodity the industry which produced the greatest amount of that commodity.

Both individual industry costs and production of each commodity were unchanged by this procedure. However, the equality between costs and sales for each industry was broken. Thus, an industry which engaged in some secondary production, but was the sole producer of its main product would lose sales with unchanged costs. On the other hand an industry which only produced one commodity, which was the secondary product of other industries, would gain sales at no increased cost.

These induced changes in sales were not matched by any adjustment to gross operating surpluses. Instead, they were neutralised by a final balancing process described in section 2.4. Most of the discrepancies were very small, and summed across all industries to zero, since any sales deducted from one industry accrued to another.

2.2.3 The disaggregation of Coal, oil, and gas

In the ABS IO tables "Coal, oil and gas" is treated as a single product produced by a single industry. This aggregation is inappropriate for ORANI for the same reason as was noted in the case of Other farming. It involves mixing an export commodity, black coal, with an import-competing commodity, crude petroleum. The row and column for "Coal, oil and gas" were split using ABS input-output and mining industry census data (ABS (1980)) to produce separate rows and columns for "Black coal" and "Oil, gas and brown coal" in the ORANI database. Note that, for Australia, brown coal can be regarded as a non-traded commodity so that its placement in one or other of the disaggregated commodity groupings is somewhat arbitrary. The decision to place brown coal with oil and gas reflects the way in which

other ABS publications for 1977-78 combine the two.

2.2.4 The exclusion of changes in inventories

The vector of inventory changes which appears in the final demand sector of the ABS IO tables (column Q6, see Figure 2.2) reflects the actual accumulation or dissipation of commodity inventories over a particular year. The increase in inventories as a percentage of sales for each industry is therefore not necessarily the percentage which is typical over a longer period. The current version of ORANI has no short-run dynamics to track phenomena such as inventory cycles. The model requires a database which yields a demand structure for the output of each industry which is typical of the whole period to which the model is to be applied. As in the construction of previous ORANI databases, the assumption was made that, on average, there would be no change in the level of inventories held of each product. The inventory columns of the ABS IO tables and margins matrices were therefore not included in the ORANI database. Sales shares for each industry were calculated net of contributions to inventories. By ignoring inventory changes the possibility of negative sales shares was also avoided.

As with the single-product specification for non-agricultural industries (see 2.2.2 above), the exclusion of changes in inventories introduced discrepancies between costs and sales for each industry. The differences were greatest in the agricultural sector, where output and export demand tend to fluctuate. The agricultural discrepancies were eliminated as part of the 'typicalisation' adjustments described elsewhere (Higgs (1985)). For the remaining industries, the differences were small enough to be left for final elimination by the balancing process described in section 2.4.

2.2.5 The adjustment of gross operating surpluses

For two industries in the ABS 1977-78 IO tables, the sum of wage costs, material costs, and indirect taxes exceeds the value of sales with the result that they have negative gross operating surpluses (GOS). The first of these industries, Services to Mining, undertakes mineral exploration. Except to the extent that it takes place on production leases, the ABS IO tables do not charge this exploration against the mineral industries either as a cost of current output, or as a capital item. Such expenditure tends to be lumpy, so that to recognize sales of it

from the industry to the mineral producers would result both in unstable IO coefficients and in a possible misrepresentation of the typical profitability of the mineral industries. The second industry exhibiting negative gross operating surplus is Railway, other transport and storage, which is dominated by government railway authorities which may have set their charges below cost. A third industry, Railway rolling stock, had a GOS of only $383 000, which was considered to be too low.

Retention of negative elements in the gross operating surplus row of the ORANI database would yield, for the relevant industries, negative capital shares in total costs. ORANI would then project a fall in the price of the output of those industries following a rise in the rental rates on their capital. In order to avoid such paradoxical results Cox (1984) re-estimated the three values using a two step method adapted from Brooks and Stevenson (1981), which had been used in the development of the ORANI database for 1974-75. In the first step, the return to fixed capital for each industry was derived by multiplying the estimated capital stock for 1977-78 by the gross rate of return on fixed capital in the industry. This gross rate of return includes net profit and depreciation components and was obtained by averaging the results from profitability surveys of companies operating in the sectors in the period 1974-75 to 1981-82. Secondly, the return to total capital was estimated by multiplying the value obtained in the first step by the ratio of total capital to fixed capital (used in the calculation of the investment parameters). The return to total capital was considered to equal GOS on the assumption that capital is the only production input which attracts a return.

The procedure resulted in GOS estimates of $19.8m for Services to mining, $17.9m for Railway rolling stock and $715.5m for Railway, other transport and storage. To rebalance the input-output table following modifications to the GOSs of the former two industries, fictitious sales were introduced from Services to mining to capital formation and from Railway rolling stock to the "other" final demand category. The GOS estimates for these industries were subsequently changed to $13.4m and $9.0m, respectively, in the balancing process described in section 2.4. The estimate for Railway, other transport and storage was deemed to be unsatisfactory and was set equal to zero in the database (see Appendix Table A.1).

2.3 Conversion of the Data Sources into the ORANI Database

After the modifications described in subsection 2.2 have been made, the data sources contain a system of IO information which is compatible with the structure of the ORANI model. The data are, at this stage, in essentially the same form as Figs. 2.2 and 2.3, except that, instead of containing 108 industry rows and columns, there are 113 commodity rows and 111 industry columns. New rows 1-9 (as labelled in Table 2.1) replace rows 1-4 and 6 from the ABS tables. Row 5 in the ABS tables, Poultry, becomes new row 10. Rows 11-113 in the modified database correspond to rows 7-108 in the ABS tables except that row 12 (Coal, oil and gas) in the ABS tables is split into rows 16 (Black coal) and 17 (Oil, gas and brown coal) in the modified table. Similarly new columns 1-7 (see the labels in Table 2.1) replace old columns 1-4 and 6, with Poultry moving to new column 8. New columns 9-111 correspond to old columns 7-108 with the exception of the split of the Coal, oil and gas column. Before the database can be employed in the model, however, it must be converted from the (modified) form of Figures 2.2 and 2.3 to the form of Figure 2.1.

The first row of matrices in Figure 2.1 (matrices **A** to **E**) contains the direct (nonmargin) flows at basic values of domestically produced commodities to intermediate and final users. The first 113 rows of these matrices (except for the rows corresponding to the eight margin commodities) are derived by subtracting from the absorption matrix the corresponding elements of the imports matrix. Apart from the margin rows, we now have direct domestic flows at basic prices. For margin commodities, the rows contain direct sales plus the margins of the relevant type associated with each user's purchase of all commodities. The separation of the direct flows from the margins flows was achieved by subtraction of the column totals (less margins on sales by final buyers and on re-exports) of the margins matrices from the margins rows of these matrices.[5] After these subtractions, the first 113 rows and 111 columns of the resulting matrix (called the direct domestic flows matrix) become the corresponding rows and columns of matrix **A** of Figure 2.1. **A** also contains a 114th row and 112th column which represent a dummy category included to facilitate our treatment of noncompeting imports.[6] Much of the information in matrix **A** is summarised, inter alia, in the first four Appendix Tables. The vectors **C**, **D** and **E** in Figure 2.1 are created in an analogous manner to the **A** matrix, namely from the first 113 rows of columns Q1, Q7, and Q2 respectively, less the corresponding imports flows and margins flows. Each vector has in addition a 114th element for the dummy category.

The relationship between columns Q3-Q5 of the absorption matrix and matrix B in Figure 2.1 is a little more complex. In the ABS IO tables, Gross Fixed Capital Expenditure (GFCE) is disaggregated by IO industry of supply but not by investing industry. GFCE is presented in only three broad investing groups: the private sector, public enterprises and general government. Hence, to form matrix B it is necessary to disaggregate the data from the three GFCE columns of the direct domestic flows matrix into 112 columns, showing inputs to investment for each investing industry.

The procedure for disaggregation requires a capital stock matrix, i.e., a matrix containing estimates of the value of inputs of each commodity in the capital stock of each industry. The matrix used in the current version of ORANI is based on a capital stock measurement project undertaken within IMPACT (see Hourigan (1980) and Lawson (1985)). The proportions along the rows of our standardised capital stock matrix form the basis for the disaggregation of the GFCE vectors. That is, the elements of the matrix B of Figure 2.1 are created according to the formula:

$$B_{ij} = \frac{I_i . K_{ij}}{\sum_j K_{ij}} \quad , \qquad i = 1,\ldots,114, \quad j = 1,\ldots,112,$$

where I_i is the sum of the i^{th} elements of columns Q3 - Q5 of the modified direct domestic flows matrix for $i = 1,\ldots,113$ and is zero for $i=114$ (domestic noncompeting imports), and K_{ij} is the ij^{th} element of the capital stocks matrix.[7]

The first five matrices in the second row of Figure 2.1 (matrices F to J) show the flows of imports at basic values (that is, c.i.f., duty paid to intermediate and final users.[8] Each matrix has 114 rows. The first 113 refer to competing imports. The 114^{th} row of the matrices F to J contains the flows of complementary imports. The IO data required for their formation were derived from the imports matrix (ABS (1983 Table 3)). No adjustment to the margins rows of this competing imports matrix is required since all imports classified to the margins categories are assumed to go to nonmargin uses. The first 111 columns of the final 114-row imports matrix form the first 111 columns of matrix F in Figure 2.1. A 112^{th} column of zeros is added to represent flows to the dummy domestic noncompeting imports industry. Rows Q1 and Q2 of the imports matrix form, respectively, vectors H and J, and rows Q3-Q5 are disaggregated into matrix G. The procedure for the disaggregation of these GFCE rows is identical to that employed in constructing the matrix B:

where M_i is the sum over the i^{th} columns of the GFCE rows of the imports matrix,

$$G_{ij} = \frac{M_i . M_{ij}}{\sum_j M_{ij}} \quad , \qquad i = 1,\ldots,114, \quad j = 1,\ldots,111.$$

The 112^{th} column of **G** is all zeros.

The final vector, **-Z**, in the second row of Figure 2.1, is derived from the total duties column in the ABS imports matrix.

Matrices **A** to **J** in Figure 2.1 account for the basic values of all direct commodity flows. They exclude flows of margins services and commodity taxes paid (or subsidies received) in association with direct commodity and service flows. These elements of the margin between the basic value of a commodity flow and its purchasers' price are accounted for in Figure 2.1 in the sets of matrices K_r to T_r, $r = 1,\ldots,g+1$. In the ABS 1977-78 IO tables there are eight mark-up commodities (Wholesale trade, Retail trade, Road transport, Rail and other transport, Water transport, Air transport, Marine insurance, and Restaurants, hotels and clubs) of which part or all of the constituent commodities are used as margins services (ABS (1983, pp. 315-316)). Hence, K_r to T_r are nonzero only for values of r corresponding to these eight commodities and for $r = g + 1$ (commodity taxes less subsidies).

For each of the nine types of margins, ORANI requires a pair of rows of matrices K_r to O_r and P_r to T_r. The first row contains markups on the domestic flows represented in matrices **A** to **E** and the second row contains margins on the import flows shown in matrices **F** to **J**. The nine margins matrices supplied by the ABS in the form of Figure 2.3 do not contain any information on the split of the margins flows between those associated with the domestic commodity and those associated with imported commodity flows. They also leave the problem of allocating the entries in the GFCE columns over the using industries to form the L_r and Q_r matrices. To solve the first of these problems, it was assumed that the base year percentage margin on flows of commodity i (say) does not vary with the source (i.e. domestic or imported) of i. For example, the ij^{th} element of the intermediate sector of the r^{th} margins matrix (as illustrated in Figure 2.3 but after modification for the factors discussed in subsection 2.2) was split between K_r and P_r according to the proportions of the corresponding entries in matrices **A** and **F**. The second problem was solved by assuming that, in the base year, the supply of product i from either source as an input to capital formation entails the same percentage margin for all using

industries.

The remaining input matrices in Figure 2.1, **U** to **X**, show the flows of primary inputs and miscellaneous "other costs". The data for the derivation of matrices **U** to **X** is taken from columns 1 to 111 of the modified absorption matrix. The relevant rows are P1, P2, P4 and P5; the correspondence between the information in these rows and the primary-factor matrices in the ORANI database is summarised in Figure 2.4.

Figure 2.4: CORRESPONDENCE BETWEEN THE TREATMENTS OF PRIMARY INPUTS AND "OTHER COSTS" IN THE ORANI DATABASE AND THE 1977-78 ABS IO TABLES

ORANI Database	1977-78 ABS IO Tables
Matrix **U**: Labour (10 x 112)	P1. Wages, salaries and supplements P2. Gross Operating Surplus (GOS)(part): imputed wages in rural, road transport and health industries (a)
Vector **V**: Fixed Capital (1 x 112)	P2. GOS (part): estimated returns to fixed capital
Vector **W**: Land (1 x 112)	P2. GOS (part): estimated rent on agricultural land
Vector **X**: "Other Costs" (1 x 112)	P2. GOS (part): estimated returns to working capital P4. Indirect taxes n.e.c. P5. Sales by final buyers

(a) For short run ORANI analyses, the rural part of this component is included in **V** instead (see footnote no. 9).

As can be seen from Figure 2.4, the primary input data from the IO tables require some restructuring for use in ORANI. The IO category P2 - gross operating surplus (GOS) - has to be split into estimates of imputed labour cost, rent on agricultural land, returns to fixed capital and returns to working capital. After imputed labour cost for owner-operators has been added to the P1 row of the ABS tables, the resulting labour-cost row must be disaggregated into a matrix of labour costs by occupation as well as by industry.

Imputation of labour costs for owner-operators and unpaid helpers was made for the eight agricultural industries in the typical year database (see Higgs (1985)). For Forestry and logging, Fishing and hunting, Health and Road transport, the estimated imputed labour cost was deducted from the GOS shown in the P2 rows of the modified ABS tables and was added to the wages and salaries rows, P1 (Cox (1984)). For Forestry and logging and Fishing and hunting, estimates of the ratio of employers and self-employed (ESE) to wage and salary earners (WSE) in 1974-75 were taken from Stevenson (1981) and multiplied by the 1977-78 estimate of wages, salaries and supplements. These imputed wage bills were then subtracted from the GOS. A similar technique was used for the Road transport and Health industries except that the ESE/WSE ratios were calculated from 1976 and 1981 Population Census data and averaged between the two years.

At present, only the first seven (agricultural) industries are recognised as using land in the ORANI 78 database. Adams (1984) compiled data on the shares of returns to agricultural land in total industry output for the period 1967-68 to 1979-80. The averages of these shares were imposed by Higgs (1985) in the typical year database.

After deduction, where appropriate, of imputed payments to labour and agricultural land, the remaining gross operating surplus was split into estimated returns to fixed and working capital. For the agricultural industries, typical year shares were employed in making this split (see Higgs (1985)). For the remaining industries, estimates of the ratio of fixed capital to total assets were obtained from published accounting data, IAC annual reports and Reserve Bank data (see Cox (1984)). These ratios were used as measures of the appropriate proportions of GOS to be allocated as payments to fixed capital.

The next task in the creation of Figure 2.1 is the splitting of the adjusted labour costs row (i.e., the labour costs row after allowance for

imputed wages for owner-operators, etc.) into a matrix of the form **U**. This is described in Tulpulé and Mannion (1983).[9] Later modifications to the agricultural sector of the matrix are detailed in Higgs (1985).

The 112th and last column of the matrices **U**, **V**, **W** and **X** show inputs to the dummy industry which is required for the handling of noncompeting imports. Except for a notional $1000 in row 1 of **U**, the entries in this column are zeros.

The shares of materials, primary inputs and other costs in industry costs for the 1977-78 ORANI database are summarised in Appendix Table A.1. More information on intermediate costs is given in Appendix Table A.4. Appendix Tables A.2 and A.3 summarise the key features of commodity sales in 1977-78.

The final matrix in Figure 2.1 is **Y**, the product-mix matrix. The derivation of the entries for the agricultural sector (the north-west quadrant) was described in subsection 2.2.1 and Table 2.1. The only other nonzero entries are along the diagonal of the south-east quadrant where the basic values of outputs for the non-agricultural industries are shown. These values are sums down the non-agricultural columns of **A**, **F**, $\mathbf{K}_1$, $\mathbf{P}_1$, ..., **X** and are given in Appendix Table A.1.

2.4 Final Balancing of Costs and Sales

As described in subsections 2.2.2 and 2.2.4, the single product specification for the non-agricultural industries and the exclusion of inventory changes generated discrepancies between the input costs and the value of sales for many industries. Although this was rectified for the agricultural sector during the insertion of 'typical year' data, the remainder of the ORANI industries remained 'unbalanced', albeit usually only to a very small degree. These discrepancies do not appear in the ABS input-output data - they were generated by the adjustments described above.

Table 2.2, which shows data from ABS (1983), illustrates the problem with regard to the six industries which showed the largest discrepancy between costs and sales in the ORANI database prior to mechanical balancing. (Against the ORANI convention, the ABS here lists commodities by column and industries by row.) The first column shows the sums of the appropriate rows in the ABS make matrix, representing the total

production of all commodities by each industry. The second column shows column totals of the make matrix representing total production by all industries of the commodity associated with each industry. Imagine the row and column of the ABS make matrix associated with a particular industry. Let the intersecting cell have the value α, the row sum (industry production) be $(\alpha+\beta)$ and the column sum (commodity output) be $\alpha+\gamma$. The ORANI single-product specification amounts to deducting β and adding α to industry sales - costs being left unchanged. The discrepancy between costs and sales introduced by this operation is $\beta-\gamma$ or $(\alpha+\beta)-(\alpha+\gamma)$, the difference between the row and column sums of the ABS make matrix. This difference is shown in the third column of of Table 2.2; it is the amount by which industry sales decreased due to the single-product specification for the non-agricultural industries. The fourth column shows the change in inventories of the domestic product. The fifth column shows the sum of the previous two columns, which is the total discrepancy between industry sales as generated by the ABS and as recorded in the 'unbalanced' ORANI input-output tables. The industry costs remain, at this stage, at the levels estimated by the ABS.

Table 2.2: MAJOR DISCREPANCIES IN THE INPUT-OUTPUT TABLES WHEN INVENTORY CHANGES ARE DELETED

Industry No.	Code	Description	Make Matrix		Discrepancy	Inventory Change	Total
			Row sum	Column sum			
31	23.02	Man-made fibres	241.9	249.2	-7.3	-4.6	-11.9
49	27.01	Chemical fertilisers	413.5	387.3	26.2	22.7	48.9
50	27.02	Other basic chemicals	1135.6	1256.8	-121.2	12.2	-109.0
64	29.02	Other basic metals	2606.4	2652.3	-45.9	92.2	46.2
83	34.05	Other manufacturing	300.5	329.8	-29.3	-8.5	-37.8
102	61.05	Other business services	5992.3	6535.0	-542.7	0.0	-542.7

Source: See text.

A mechanical procedure was used to eliminate these differences. For each industry the mean of cost and sales was set to be the new value for both. All costs were scaled to sum to this mean. The same procedure was adopted for each industry's sales. For any one industry, therefore, values of a cost multiplier C_j and of a sales multiplier S_i were deduced to bring about this scaling.

Industry costs were defined as the sum of intermediate inputs, both domestic and imported, margins and taxes on intermediate inputs, factor payments, and other cost tickets. Sales comprised all usage of the domestically produced good, including that in margin services. Thus a large part of the database, namely the matrices **G**, **H**, **J**, **Z**, $\mathbf{L}_r$, $\mathbf{N}_r$, $\mathbf{Q}_r$, $\mathbf{R}_r$ and $\mathbf{T}_r$ in Figure 2.1, remained untouched.

On the other hand, the **A** matrix and the margins on intermediate flows were scaled twice as they figure in both costs and sales. Further, scaling operations on one industry affected the balance of others. This necessitated an iterative process to determine the final values of the S_i and C_j vectors. Three iterations were sufficient to reduce discrepancies by two orders of magnitude. The remaining discrepancies were eliminated by adjustment of the domestic 'other demands' vector **E**.

Table 2.3 shows the transition from the raw to the balanced ORANI database. The first column is the same as the first column in Table 2.2, showing that industry costs were transferred from the ABS IO tables unchanged. The second column shows the sales of the associated commodity in the unbalanced ORANI data. The third column, which is the difference of the previous two is, of course, the same as the fifth column of Table 2.2. Costs and sales are made to balance at the figure in the fourth column, midway between the cost and sales in columns one and two. This is achieved by multiplying all sales by S_i and all costs by C_j as shown in the final columns. Note that the product of each S_i with the associated C_j is close to unity. This indicates that there was only small interaction between the balancing of this industry and the balancing of all the others.

Table 2.3: BALANCING OF MAJOR DISCREPANCIES IN THE MODIFIED INPUT-OUTPUT TABLES

Industry No.	Description	Original		Difference	Balanced Cost/Output	S_i	C_j
		Costs	Sales				
31	Man-made fibres	241.9	253.9	-11.9	247.9	.975	1.030
49	Chemical fertilisers	413.5	364.5	48.9	389.0	1.270	.914
50	Other basic chemicals	1135.6	1244.6	-109.0	1190.0	.959	1.053
64	Other basic metals	2606.4	2560.4	46.0	2583.2	1.015	.986
83	Other manufacturing	300.5	338.3	-37.7	319.4	.945	1.063
102	Other business services	5992.3	6535.0	-542.8	6263.2	.964	1.045

Sources: See text.

This method of biproportional adjustment has no particular economic content. It was selected, from amongst other arbitrary balancing methods, because it promised to disturb least the cost and sales shares of any particular industry. Since all entries along a row or column are equally scaled, the shares for industry i are only affected to a second degree by the scalings performed on industry j. Further, the adjustments required for balance, usually within 3 per cent of the original values, are an order of magnitude less than the uncertainty surrounding our estimates for many of the elasticities in the ORANI parameter files. The coefficients used in ORANI's linear form are usually products of these elasticities with database shares, so negligible information loss is incurred through this balancing operation.

Why bother to perform an operation which makes so little difference to model results? By adhering rigidly to the formal model specifications, computing errors - which will occur - may be pinpointed and remedied. A database which is not an exact solution of the model equations might introduce discrepancies which might mask more serious errors.

3. PROGRESS ON THE ELASTICITIES FILES

The items contained in the elasticities files (apart from the user specified indexing parameters, the h's), are considered in this section. Short notes are provided for each of the items on the values adopted in standard ORANI applications. Where appropriate, summaries are given of the econometric background.

3.1 The Elasticities of Substitution between Domestic and Foreign Sources of Supply

The required substitution elasticities (the "Armington elasticities") can be deduced from import demand equations based on the CES expansion path equation. The estimation of such equations requires time-series data on import prices and quantities, domestic prices and quantities and various other variables to reflect pressure of demand, seasonality and the imposition or removal of quantitative restrictions. In 1976 the Industries Assistance Commission initiated a detailed study of prices and quantities of imported and domestic commodities, described in Marsden and Milkovits (1977). As a result of this study, access was obtained to quarterly time series for the period 1968(2)-1975(2) on domestic output and prices classified by four-digit ASIC, and on import flows and prices classified by four-digit ASIC industry of origin, i.e., the industry in which the imports would have been classified had they been produced locally. To supplement the price and quantity data, domestic pressure-of-demand variables have been constructed by the IMPACT team using data from the Associated Chamber of Manufacturers and the Bank of New South Wales survey of industrial trends.[10] Finally, dummy variables for the effects of quantitative restrictions on imports are available from the Industries Assistance Commission.[11]

Originally, it was hoped that the IAC import study (Marsden and Milkovits (1977)) would classify imports not only by four-digit ASIC but also by end-use, i.e., whether used as an intermediate input, an input to capital creation or a consumption good. This, however, proved impractical. Hence, the data provides little basis[12] for estimation of more than one substitution elasticity per commodity. Therefore, the obvious restriction is imposed:

$$\sigma_{ij}^{(1)} = \sigma_{ij}^{(2)} = \sigma_{ij}^{(3)} = \sigma_i \ , \qquad i = 1,\ldots,g,\ j = 1,\ldots,h,$$

i.e., the elasticity of substitution between domestic and imported good i

is the same for all users. In defence of this assumption, it was pointed out in Dixon et al. (1982, p. 182) that most of Australia's major imports are used predominantly in one end-use category only. This was certainly the case for imports in 1968-69. However, Table 3.1, which was prepared from 1977-78 input-output data (ABS (1983)), reveals that principal end-use represented less than 70 per cent of total use in half of the 16 input-output categories in which competitive (duty paid) imports exceeded $300 million. It may be concluded that a stronger case now exists for estimating import substitution elasticities for different end uses when data limitations ease and general agreement is reached as to how the effects of quantitative import restrictions should be accommodated. The above restriction has been temporarily retained until these conditions are met.

Substitution elasticities have been estimated for about 50 groups of commodities classified at the four-digit ASIC level.[13] Two estimating models were applied. The first assumes that adjustment of demand to the expected ratio of import to domestic prices occurs rapidly. The second was a partial adjustment formulation. The estimating equations arising from the two models, are, respectively,

$$\ln Q_{it} = \bar{\alpha}_i + \bar{\sigma}_i \ln \bar{P}_{it} + \bar{\delta}_{i1} Z_{1it} + \bar{\delta}_{i2} Z_{2it} + \bar{\varepsilon}_{it}, \qquad t = 1968(2),\ldots,1975(2),$$

and

$$\ln Q_{it} = \lambda_i \bar{\bar{\alpha}}_i + \lambda_i \bar{\bar{\sigma}}_i \ln \bar{\bar{P}}_{it} + (1-\lambda_i)\ln Q_{i(t-3/2)} + \bar{\bar{\delta}}_{i1} Z_{1it} + \bar{\bar{\delta}}_{i2} Z_{2it} + \bar{\bar{\varepsilon}}_{it}, \qquad t = 1968(2),\ldots,1975(2),$$

where Q_{it} is the ratio of the quantity of imports of good i (an ASIC four-digit category) in period t to the anticipated use of domestic good i as viewed in the import-ordering period (t-3/2), i.e., it is assumed that import-ordering decisions are made one and a half quarters before import arrivals; $\bar{P}_{it}$ and $\bar{\bar{P}}_{it}$ are alternative versions of the ratio of the anticipated domestic price of domestically produced good i in its ordering period (t-1/2),[14] as viewed in the import-ordering period (t-3/2), to the quoted price of imported good i in (t-3/2); and Z_{1it} and Z_{2it} are, respectively, proxies for excess domestic pressure of demand and below average pressure of demand. $\bar{\sigma}_i$ and $\bar{\bar{\sigma}}_i$ are alternative estimates of the elasticity of substitution while λ_i, $\bar{\alpha}_i$, $\bar{\bar{\alpha}}_i$, $\bar{\delta}_{i1}$, $\bar{\bar{\delta}}_{i1}$, $\bar{\delta}_{i2}$ and $\bar{\bar{\delta}}_{i2}$ are also parameters. λ_i is the coefficient of adjustment in the second model. The $\bar{\varepsilon}_{it}$ and $\bar{\bar{\varepsilon}}_{it}$ are disturbance terms.

TABLE 3.1: SHARES OF USAGE CATEGORIES IN THE ABSORPTION OF COMPETING IMPORTS (a)

ORANI	Commodity Classification	Intermediate Usage	Final Consumption Expenditure Households	Gross Fixed Capital Expenditure	Other Usage	Value of Imports l.d.p. ($ million)
17	Oil, gas and brown coal	1.00	0	0	0	869
46	Pulp, paper and paperboard	1.00	0	0	0	350
52	Other basic chemicals	1.00	0	0	0	704
58	Petroleum and coal products	0.89	0.11	0	0	495
69	Other metal products	0.80	0.13	0.07	0	322
70	Motor vehicles and parts	0.45	0.29	0.26	0	1575
73	Aircraft	0.61	0	0.39	0	310
74	Photographic, scientific equipment	0.43	0.32	0.25	0	419
75	Electronic equipment	0.51	0.33	0.16	0	762
76	Household appliances	0.32	0.62	0.06	0	321
77	Other electrical equipment	0.61	0.05	0.34	0	390
79	Construction machinery	0.25	0	0.75	0	358
80	Other machinery and equipment	0.29	0.03	0.68	0	986
83	Plastic and related products	0.85	0.13	0.02	0	345
97	Water transport	0.79	0.21	0	0	308
98	Air transport	0.41	0.57	0	0.02	584

(a) This table is derived from the ABS 1977-78 input-output tables and lists all commodity groups for which duty paid competing imports exceeded 300 million dollars.

The results of the two estimating models were surveyed by Mannion and Fallon (1981), who recommended which estimates should be used in the short run and long run databases. These recommendations were followed in the import substitution elasticities file for the 1977-78 ORANI database except in the case of "local" industries, where the procedure was to set the $\sigma_i = 0.^{15}$ Other changes were to set $\sigma_{A9} = 2.0$ (previously 0.001) and $\sigma_{15} = 50$ (previously 0.0). The latter is to ensure that the domestic and imported prices of crude petroleum do not diverge. This is important because the crude petroleum industry is very inflexible in the short run, due to its heavy reliance on fixed capital. A high import substitution elasticity implies that consumers can switch readily to imported sources of crude petroleum if demand increases. A low substitution elasticity would preclude this, and would lead to large price rises to choke off any increases in demand.

The values for the elasticities of substitution between domestic and foreign sources that are currently used in ORANI are listed in Table 3.2. Those estimates marked with a "(d)" are based on satisfactory econometric results from one of the models described above. Where there is currently no satisfactory estimate, the Industries Assistance Commission has made its best guess, based, where possible, on estimates obtained for similar commodities. For many commodities, imports are negligible, e.g.,the nontraded services. In these cases the σ_i were simply set equal to 2, which is typical of the estimated values. A σ value of zero was set for the non-competing imports dummy category.

Table 3.2: SELECTED ITEMS FROM THE ELASTICITIES FILES FOR 1977-78

ORANI Industry or Commodity Category[a]	Domestic-Import Substitution Elasticities σ_i	Household Expenditure Elasticities ε_i	Investment Parameters and Coefficients β_j	G_j	Q_j
Industries only					
1 Pastoral zone			39(f)	.09	1.6
2 Wheat sheep zone			10(f)	.19	2.0
3 High rainfall zone			10(f)	.10	3.2
4 Northern beef	Not applicable(b)		25	.08	2.3
5 Milk cattle and pigs			10(f)	.02	6.2
6 Other farming (sugar cane, fruits and nuts)			10(f)	.06	5.1
7 Other farming (vegetables, cotton, oilseeds and tobacco)			39(f)	.10	2.2
Commodities only					
A1 Wool	0.5	0.5			
A2 Sheep	2.0	0.5			
A3 Wheat	0.5	0.1			
A4 Barley	0.5	0.1			
A5 Other grains	0.5	0.1	Not applicable(c)		
A6 Meat cattle	2.0	0.5			
A7 Milk cattle and pigs	2.0	0.0			
A8 Other farming (sugar cane, fruits and nuts)	2.0	0.4(e)			
A9 Other farming (vegetables, cotton, oilseeds and tobacco)	2.0	0.4(e)			
Either commodities or industries					
8 Poultry	2.0	0.0(e)	19	.12	2.0
9 Services to agriculture	0.0	0.4	30	.09	1.8
10 Forestry and logging	2.0	1.0	23	.12	2.6
11 Fishing and hunting	0.5	0.5(e)	15	.08	2.9
12 Ferrous metal ores	0.5	0.9	12	.21	1.8
13 Non-ferrous metal ores	0.5	0.9	31(f)	.15	1.6
14 Black coal	0.5	1.0	14	.20	1.5
15 Oil, gas and brown coal	50.0	1.0	18	.16	1.7
16 Other minerals	2.0	0.4	17	.18	1.6

Notes appear at the end of the table.

.... continued

Table 3.2(continued)

ORANI Industry or Commodity Category[a]	Domestic-Import Substitution Elasticities	Household Expenditure Elasticities	Investment Parameters and Coefficients		
	σ_i	ε_i	β_j	G_j	Q_j
Either commodities or industries (continued)					
17 Services to mining	2.0	0.9	17(g)	.18	1.6
18 Meat products	0.5	0.5(e)	28(f)	.10	2.3
19 Milk products	1.6(d)	0.1(e)	82	.10	2.2
20 Fruit and vegetable products	0.8(d)	0.4(e)	34	.09	2.6
21 Margarine, oils and fats	1.7(d)	0.4(e)	30	.12	1.9
22 Flourmill and cereal food products	2.1(d)	0.1(e)	49	.10	1.6
23 Bread, cakes and biscuits	0.0	0.1(e)	106	.08	1.6
24 Confectionery and cocoa prods	2.0	0.4(e)	90	.08	1.8
25 Other food products	0.5	0.4(e)	52	.09	2.0
26 Soft drinks, cordials and syrups	0.0	0.4(e)	28(f)	.10	1.6
27 Beer and malt	0.0	0.7(e)	42	.08	1.6
28 Other alcoholic drinks	4.8	1.2(e)	42	.08	1.6
29 Tobacco products	2.0	0.5(e)	89	.12	1.6
30 Cotton ginning	0.4	0.9	39	.12	2.3
31 Man-made fibres, yarns, fabrics	4.7(d)	0.3	31	.12	2.3
32 Cotton yarns, fabrics, textiles	4.7	0.3(e)	31	.12	2.3
33 Worsted woollen yarns	2.0(d)	0.3(e)	31	.12	2.3
34 Textile finishing	2.0	0.3(e)	86	.10	2.3
35 Textile floor coverings	2.2(d)	1.4(e)	57	.10	2.3
36 Other textile products	1.6(d)	0.9(e)	52	.10	2.3
37 Knitting mills	1.9(d)	0.3(e)	105	.10	1.9
38 Clothing	2.8(d)	0.3(e)	79	.10	1.9
39 Footwear	6.8(d)	0.3(e)	96	.11	1.7
40 Sawmill products	2.3	0.8	78	.09	2.1
41 Veneers and boards	0.9	0.4	39	.11	2.1
42 Joinery and wood products nec	2.0	0.7(e)	29	.14	1.7
43 Furniture and matresses	2.3(d)	1.4(e)	28(f)	.11	1.5
44 Pulp, paper and paperboard	1.1(d)	0.4	29	.13	1.9
45 Bags, fibreboard containers	1.1	0.4	29	.13	1.9
46 Paper products, nec	1.1	0.4(e)	29	.13	1.9
47 Publishing, printing	2.0	0.4(e)	46	.12	1.7
48 Paper stationery, printing etc.	2.0	0.4	46	.12	1.7

Notes appear at the end of the table.

.... continued

Table 3.2(continued)

ORANI Industry or Commodity Category[a]		Domestic-Import Substitution Elasticities σ_i	Household Expenditure Elasticities ε_i	Investment Parameters and Coefficients β_j	G_j	Q_j
Either commodities or industries (continued)						
49	Chemical fertilisers	1.6(d)	0.4	35	.13	2.2
50	Other basic chemicals	1.9(d)	0.4	35	.13	2.2
51	Paints	2.5	0.4	53	.10	1.8
52	Pharmaceutical products	2.0	1.3(e)	31	.12	1.8
53	Soap and other detergents	1.3(d)	0.4(e)	30	.15	1.7
54	Cosmetics and toilet preparations	2.0	0.4(e)	44	.11	1.6
55	Other chemical products	2.0	0.4(e)	46	.11	1.4
56	Petroleum and coal products	0.4(d)	1.1(e)	30	.11	2.0
57	Glass and glass products	1.2	1.4	28(f)	.13	2.5
58	Clay products and refractories	1.2(d)	1.4	32	.09	1.7
59	Cement	0.8	0.4	36	.11	1.8
60	Ready mixed concrete	0.0	0.9	36	.11	1.8
61	Concrete products	1.2(d)	1.4	36	.11	1.8
62	Other non-metallic mineral products	0.8(d)	0.4	36	.11	1.8
63	Basic iron and steel	0.8(d)	0.4	34	.10	2.2
64	Non-ferrous basic metals	1.0(d)	0.4	30	.10	2.2
65	Structural metal products	1.5	1.4	75	.09	1.7
66	Sheet metal products	1.5	1.4	75	.09	1.7
67	Other metal products	2.0	1.2	75	.09	1.7
68	Motor vehicles and parts	5.2(d)	1.1(e)	87	.11	2.7
69	Ships and boats	0.5	1.4(e)	113(f)	.08	1.4
70	Railway rolling stock	0.5	0.9	113(f)	.08	1.4
71	Aircraft	0.5	0.9	113(f)	.08	1.4
72	Photographic, scientific equipment	0.5	0.9(e)	38	.12	1.9
73	Electronic equipment	1.9	1.4(e)	58	.12	2.3
74	Household appliances	1.6(d)	1.4(e)	34	.13	2.3
75	Other electrical equipment	0.8(d)	1.3	110	.11	2.3
76	Agricultural machinery	0.5	0.4	74	.09	1.9
77	Construction equipment	0.5	1.4	113(f)	.08	1.9
78	Other machinery and equipment	0.5	1.4	100	.08	1.9
79	Leather products	2.0	0.4(e)	28(f)	.11	2.4
80	Rubber products	1.5	0.9(e)	44	.10	2.5
81	Plastic and related products	1.5(d)	0.8(e)	30	.16	2.1

Notes appear at the end of the table.

.... continued

Table 3.2(continued)

ORANI Industry or Commodity Category[a]	Domestic-Import Substitution Elasticities σ_i	Household Expenditure Elasticities ε_i	Investment Parameters and Coefficients β_j	G_j	Q_j
Either commodities or industries (continued)					
82 Signs, writing equipment	2.0	0.4	37	.12	1.9
83 Other manufacturing	2.0(d)	0.7(e)	37	.12	1.9
84 Electricity	0.0	1.0(e)	14(g)	.15	1.6
85 Gas	0.0	1.0(e)	14(g)	.15	2.0
86 Water, sewerage and drainage	0.0	1.4	9(g)	.12	1.3
87 Residential building construction	0.0	0.9	25	.16	1.7
88 Other construction	0.0	0.9	25	.16	1.7
89 Wholesale trade	0.0	0.4	20	.16	1.3
90 Retail trade	0.0	1.4	18	.16	1.4
91 Mechanical repairs	0.0	1.1(e)	12	.20	1.4
92 Other repairs	0.0	1.4(e)	12	.20	1.4
93 Road transport	0.0	0.2(e)	12	.26	1.7
94 Railway, other transport and storage	0.0	0.4	31(f,g)	.06	1.6
95 Water transport	2.0	0.4	13	.17	1.9
96 Air transport	2.0	2.2(e)	10	.25	2.4
97 Communication	0.0	1.4(e)	18	.12	1.8
98 Banking	0.0	1.4(e)	8	.17	2.1
99 Non-bank finance	0.0	1.3(e)	10	.20	1.8
100 Investment	0.0	1.4(e)	10	.19	1.9
101 Insurance, services to insurance	0.0	1.4(e)	12	.17	1.4
102 Other business services	0.0	1.4	12	.20	1.4
103 Ownership of dwellings	0.0	1.7(e)	12(g)	.20	1.4
104 Public administration	0.0	1.4	12(g)	.20	1.4
105 Defence	0.0	0.9	12(g)	.20	1.4
106 Health	0.0	1.4(e)	12(g)	.20	1.4
107 Education, museums, libraries	0.0	1.4	12(g)	.20	1.4
108 Welfare and religious institutions	0.0	1.4(e)	12(g)	.20	1.4
109 Entertainment, recreation	0.0	1.4(e)	12	.20	1.4
110 Restaurants, hotels and clubs	0.0	1.4(e)	12	.20	1.4
111 Personal services	0.0	1.4(e)	12(g)	.20	1.4
112 Non-competing imports	0.0	1.7	12(g)	.20	1.4

Notes

(a) In standard applications using the 1977-78 database, ORANI has 114 commodities and 112 industries. The commodities are labelled A1, A2,..,A9, 8, 9,...,112, while the industries are labelled 1, 2,...,112. Commodity 8 is produced by industry 8 only and industry 8's production consists entirely of commodity 8. Similarly, commodity 9 is produced only by the single-product industry, industry 9, etc. It is convenient to allow the label "8 Poultry" to refer either to the commodity poultry or to the industry which produces the commodity poultry. Similarly, it is convenient to allow the label "9 Services to agriculture" to refer to either the commodity or to the producing industry. In the case of commodities A1 - A9, it is not possible to make a unique industry identification. Each of these commodities is produced by more than one industry (see Table 2.1).

(b) Domestic-import substitution elasticities and expenditure elasticities are defined with respect to commodities, not industries.

(c) The investment parameters and coefficients are defined with respect to industries, not commodities.

(d) These estimates are based on satisfactory econometric results (see subsection 3.1).

(e) In 1977-78, 10 per cent or more of the sales of these commodities were non-margin sales to households. For other commodities the values for the ε_i's are of little significance in ORANI computations.

(f) These values were set according to a boundary rule (see Cox (1984)). For 17 of the industries, formula (3.2) produced apparently unsatisfactory values
for β_j. For example, in declining or very slow growing industries, the estimated β_j's were negative or extremely large.

(g) Investment in these industries is normally exogenous in ORANI, i.e., for these industries $j \notin J$ and the β_j, Q_j and G_j play no role in an ORANI solution.

Sources: Cox (1984), Fitzgibbon (1983) and Mannion and Fallon (1981).

3.2 The Substitution Parameters between Primary Factors

For short run analyses, the parameters $\sigma^{(1)}_{(g+1,v)j}$ are set at the common value of 0.5 for all v and j. This implies that (i) the elasticity of substitution between labour and fixed capital is 0.5 for all the non land-using industries, and (ii) that pairwise substitution elasticities between land, labour and capital in each of the land-using agricultural industries are also 0.5.[16] The value of 0.5 was chosen after a detailed survey and review of the empirical literature by Caddy (1976). Caddy concluded that although there are numerous studies of capital-labour substitution at the industry level, these provide little basis for assigning different substitution elasticities to different industries. The most that can be said is that time series studies, at the industry level, have tended to produce estimates centring on 0.5, while cross-sectional estimates have been centred on 1.0.[17] It was judged that for short-run analyses, the time-series figure of 0.5 was appropriate. The cross-sectional estimates probably should be interpreted as applying to an adjustment period considerably longer than one or two years. For long run analyses, all the substitution parameters between primary factors are set to 1.28 (Caddy (1977)).

Prospects for obtaining robust estimates of the $\sigma^{(1)}_{(g+1,v)j}$, j=1,...,h, via conventional econometric approaches are not good.[18] Not only did the results of Caddy (1977) indicate that the variability of capital-labour substitution elasticities across Australian manufacturing industries is relatively low, but his literature review (Caddy (1976)) reveals a large number of disappointing results. In comparing studies from several countries, Caddy found serious inconsistencies in the ordinal rankings of industries in terms of their capital-labour substitution elasticities. He also notes that even seemingly slight changes in the period or data concepts employed have led to drastic changes in the parameter estimates.

3.3 The Substitution Parameters between Labour Occupations

It was noted in Dixon et al. (1982, p. 191, footnote 34) that, for the 1968-69 ORANI database, the $\sigma^{(1)}_{(g+1,1,q)j}$ were set to 0.9 for all

q=1,...,M and j=1,...,h. For 1977-78, the method used by Higgs, Parham and Parmenter (1981) was followed, resulting in M different elasticity estimates, each of which applies to all the ORANI industries. Higgs et al. (p. 11) estimated a CES elasticity of substitution of 0.35 between five occupational groups in Australia using industry cross section data for 1968-69 and 1973-74. Unfortunately, the statistical fit was too poor to permit the estimation of pairwise CRESH substitution elasticities. Instead, an ad hoc procedure, based on wage shares between substitute occupations, was used to form notional values of the CRESH parameters characterising substitution possibilities among the M ORANI occupations. These values were constrained to be consistent with the estimated average cross substitution elasticity of 0.35 (see Higgs et al. (1981), pp. 43-45).

The CES estimate of 0.35 was also used as a restriction in establishing notional values of M CRESH labour-labour substitution possibilities for the 1977-78 database. Table 3.3, which is based on Table A1 of Higgs et al. (1981, p. 44), shows the resulting values.

It should be noted that the labour-labour substitution parameters play no role in ORANI solutions in which occupational wage relativities are fixed.

Table 3.3: GENERATION OF CRESH LABOUR-LABOUR SUBSTITUTION PARAMETERS

Occupation No.	Name	Share in 1977-78 Wage Bill	Close-Substitute Occupations	Sum of Wage Bill Shares of Close-Substitute Occupations	Estimated Substitution Parameter $\sigma^{(1)}_{(g+1,1,q)}$
1	Professional White Collar	.091	2,3	.185	.233
2	Para-professional	.093	1,3,4,5,9	.572	.719
3	Skilled White Collar	.092	1,2,4,5,9	.573	.720
4	Semi and Unskilled White Collar	.231	1,2,6,7	.230	.290
5	Skilled Blue Collar Metal and Electrical	.098	2,3,7	.204	.256
6	Skilled Blue Collar Building	.027	4,8	.505	.635
7	Skilled Blue Collar Other	.019	4,5	.329	.414
8	Semi and Unskilled Blue Collar	.274	6,9	.087	.111
9	Rural Workers	.060	2,3,8	.459	.577
10	Armed Services	.015	4	.231	.290

Source: See text.

3.4 The CRETH Product-Product Transformation Parameters

All of the nonagricultural industries in the current version of ORANI are assumed to produce only single products. Within the agricultural sector, CRETH transformation parameters [i.e., the $\sigma^{(o)}_{(r*)j}$'s of eq. (12.81) of Dixon et al. (1982)] have been estimated for composite commodities in the three zonal agricultural industries (industries 1, 2 and 3, see Table 2.1).[19] The remaining agricultural industries are specified to produce only single products or, in the case of industry 5, Milk cattle and pigs, two commodities in fixed proportions.

The estimates of the CRETH parameters were obtained by fitting systems of supply equations to annual time-series data (from the BAE's AAGIS surveys) on outputs and prices for each zonal industry for 1952-53 to 1973-74.[20] Results are shown in Table 3.4. Notice that the number of agricultural commodities recognized by ORANI in each of the agricultural zones exceeds the number for which CRETH transformation parameters have been estimated. The time series on which the estimation of the relevant transformation frontiers were based was not detailed enough to support an econometric analysis of the transformation behaviour of minor products in each zone. Consequently, some minor products were aggregated on the basis of zero pairwise transformation elasticities among themselves, or between themselves and major commodities; the transformation parameters between the resultant composite commodities and other commodities were then estimated econometrically. In terms of the notation used in eqs.(12.81),(12.83) and (12.84) of Dixon et al. (1982), G(1,1) = {A1,A2}, G(2,1) = {A6}, G(3,1) = {A3,A4,A5,A9}, G(1,2) = {A1}, etc.; i.e., the first composite commodity for industry 1 (Pastoral zone) consists of ORANI commodities A1 and A2, the second composite commodity in the Pastoral zone is ORANI commodity A6, etc. As already explained [see the discussion of (12.83) in Dixon et al. (1982)], it is assumed in ORANI computations that commodities within the composite commodity groups are produced in fixed proportions.

Table 3.4: ESTIMATES OF THE CRETH TRANSFORMATION PARAMETERS ($\sigma^{(o)}_{(r^*)j}$)

Pastoral Zone (Industry 1)		Wheat-sheep Zone (Industry 2)		High Rainfall Zone (Industry 3)	
Composite Commodity[a]	CRETH Parameters $\sigma^{(o)}_{(r^*)1}$	Composite Commodity	CRETH Parameters $\sigma^{(o)}_{(r^*)2}$	Composite Commodity	CRETH Parameters $\sigma^{(o)}_{(r^*)3}$
Wool/Sheep (A1,A2)	0.10	Wool (A1)	0.30	Wool (A1)	0.06
		Sheep (A2)	0.23	Sheep (A2)	0.12
Meat Cattle (A6)	1.61	Meat Cattle (A6)	0.52	Meat Cattle (A6)	0.37
Other Products (A3,A4, A5,A9)	4.55	Wheat (A3)	1.61	Other Products (A3,A4,A5, A7,A8)	3.85
		Barley (A4)	0.52		
		Other Products (A5,A7, A8,A9)	1.32		

(a) The commodity composition of the composites is indicated in parentheses.

Source: Dixon et al. (1983), Table 7, p. 257.

Because the CRETH parameters are not easily interpreted, Table 3.5 has been included, showing the implied pairwise transformation elasticities. As would be expected, transformation elasticities tend to be largest in absolute value when at least one of the products includes grains. Overall, Table 3.5 indicates that farming in the three zones, in particular the Wheat-sheep zone, is characterized by considerable technical prospects for farmers to change their product mix in response to changes in the expected prices of competing products.

Table 3.5: ESTIMATED PRODUCT TRANSFORMATION ELASTICITIES [a,b]

Industry 1 (Pastoral Zone)

	Cattle	Other
Wool/Sheep	-0.04	-0.10
Meat Cattle		-8.19

Industry 2 (Wheat-sheep Zone)

	Sheep	Cattle	Wheat	Barley	Other
Wool	-0.06	-0.13	-0.39	-0.13	-0.32
Sheep		-0.22	-0.68	-0.22	-0.55
Meat Cattle			-2.03	-0.65	-1.65
Wheat				-0.52	-1.31
Barley					-2.44

Industry 3 (High Rainfall Zone)

	Sheep	Cattle	Other
Wool	-0.004	-0.01	-0.12
Sheep		-0.05	-0.49
Meat Cattle			-1.58

(a) The ease of transformation between composite commodities r and s in industry j is indicated by their partial transformation elasticity (τ^{j}_{rs}) where:

$$\tau^{j}_{rs} = - \sigma^{(o)}_{(r^*)j} \sigma^{(o)}_{(s^*)j} \Big/ \sum_{t} \sigma^{(o)}_{(t^*)j} H^{(o)}_{(t^*)j} , \quad r \neq s.$$

$H^{(o)}_{(t^*)j}$ is, as defined in Table 27.1 of Dixon et al. (1982), the revenue share for the t^{th} composite commodity.

(b) The estimates shown refer to the ability of farmers to transform their product mixes over one year in response to changes in expected product prices. They show the percentage change in the product mix ratio generated by a one per cent change in the ratio of expected product prices for the pair of products concerned when the application of all inputs, and the prices of all other products, are held constant.

Source: See text.

3.5 Household Expenditure and Price Elasticities of Demand (the "Outside" Elasticities)

Estimates of the expenditure elasticities for the 114 commodities recognized in ORANI have been obtained from Fitzgibbon (1983), utilizing the work of Clements and Smith (1983) who themselves drew upon Tulpulé and Powell (1978). Tulpulé and Powell derived estimates initially for eight commodity groups by fitting Betancourt's (1973) Twice Extended Linear Expenditure System (TELES) to Australian time-series data on consumer expenditure for the period 1964-65 to 1975-76. These estimates were made with the Frisch parameter, ω, fixed a priori at -1.82. This value represents a weighted average of values for ω for different types of Australian households as reported by Williams (1978). His estimates in turn are based on pooled international evidence (Lluch, Powell and Williams, (1977, pp. 74-81)). The eight commodity groups are those distinguished at constant prices, at the time of estimation, in the Australian National Accounts: food; drink and tobacco; clothing and footwear; housing; household durables; private transport; public transport; and other goods and services. The estimated elasticity for the food group was used, via a nested expenditure system approach,[21] to generate estimates for six food components: bread and cereals; meat and fish; dairy produce and eggs; sugar, preserves and confectionery; fruit and vegetables; and other foods. Similarly, estimates for the three components, rail, bus and tram fares; air travel; and other travel, were obtained from the single estimate for the public transport group largely on the basis of data on volumes of traffic and elasticity estimates from other studies (see Tulpulé and Powell (1978, p. 21)). At this stage, 15 expenditure elasticities had been generated from the original 8 TELES estimates. Clements and Smith (1983, Table 2) expanded the number of elasticity estimates to 18 by disaggregating the drink and tobacco group into four commodities: beer, wine, spirits and tobacco.

Fitzgibbon (1983) disaggregated the other goods and services group into another four commodities: fuel, gas and electricity; services; expenditure overseas; and other, resulting in a 21-commodity classification. From these 21 commodities, Fitzgibbon created estimates for 109 ORANI commodities by means of a 21 x 109 transformation matrix between his 21 commodity classification and 109 commodity classification formed from 108 ABS IO commodities plus noncompeting imports. The ε_i's ($i=1,\ldots,109$) are weighted averages of the 21 estimated expenditure elasticities, where the weights reflect the shares of consumption in each ORANI commodity category accounted for by each of the commodities in the 21-order classification. Commodities which were not sold to households for

final consumption in 1977-78 were allocated unit expenditure elasticities. The vector was then expanded and re-normalised for the 114 ORANI 78 commodities. The values for the 114 expenditure elasticities are given in Table 3.2.

The Frisch formula for relating price elasticities to expenditure elasticities in the context of an additive utility specification was used to compute the η_{ik}'s (Frisch (1959)). That is to say, the η_{ik} were computed according to:

$$\eta_{ik} = -\varepsilon_i S_k^{(3)}(1 + \varepsilon_k/\omega) + \delta_{ik}\varepsilon_i/\omega \quad , \qquad i,k = 1,\ldots,g, \qquad (3.1)$$

where δ_{ik} has the value 1 for i=k and zero otherwise, and $S_k^{(3)}$ is the household budget share for good i (both domestic and imported). The $S_k^{(3)}$'s can be obtained from the "household" column of the modified 1977-78 IO data.

3.6 The Export Demand Elasticities

Substantial differences of opinion exist among Australian economists as to the extent to which Australia can exert market power for individual export commodities.[22] Little convincing econometric evidence is available to assist in resolving these differences. An IMPACT commissioned study (Freebairn 1978) was used to set values of the export demand elasticities for most agricultural and mining export commodities. Freebairn's paper provides estimates of Australia's share in world commodity markets together with demand elasticities in importing countries and supply elasticities in competing export countries. These estimates were reviewed by Fallon (1981) as a result of which some changes were made for the (1974-75 and) 1977-78 export demand elasticities. For 107 of the 114 ORANI commodities, the export demand elasticities have been set at absolute values of 20. Values for the seven remaining export demand elasticities and export sales shares are given in Table 3.6, which also lists similar details for the other commodities for which exports are treated endogenously in the standard ORANI database for 1977-78. That is, in terms of section 23 of Dixon et al. (1982), the set G contains the 12 commodities A1, A2, A3, A4, A5, 12, 13, 14, 18, 25, 30 and 64. These endogenous export commodities represent 58.4 per cent of total exports of Australian produce in the 1977-78 balanced ORANI database with a typical year agricultural sector.

Table 3.6: THE EXPORT DEMAND ELASTICITIES AND EXPORT SHARES IN TOTAL SALES

No.	Commodity	Export Demand Elasticity $-(\gamma_i)^{-1}$	Export Shares in 1977-78 (a)
A1	Wool	- 1.3	0.88
A2	Sheep	-20.0	0.40
A3	Wheat	-12.5	0.76
A4	Barley	-20.0	0.83
A5	Other grains	-20.0	0.39
12	Ferrous metal ores	-10.0	0.84
13	Non-ferrous metal ores	- 8.0	0.37
14	Black coal	-20.0	0.69
18	Meat products	-10.0	0.31
25	Other food products	-20.0	0.28
30	Cotton ginning, wool scouring, etc.	- 2.6	0.60
64	Basic non-ferrous metals	-10.0	0.55

(a) These shares are the basic value of export sales as a proportion of the basic value of output.

Source: ORANI input-output data file (TYAG778CID, cycle 1 on DTB1070).

3.7 The Investment Parameters and Coefficients

One set of parameters and two sets of other coefficients are required from the Elasticities Files for implementation of the investment equations, (19.7)-(19.10) of Dixon et al. (1982).[23] They are the β_j's (the elasticities of the expected rate of return schedules), the Q_j's (the ratios of the gross to net rates of return on fixed investment), and the G_j's (the ratios of annual gross investment to future capital stocks).

Starting from (19.2) we find that

$$\beta_j = \frac{\ln R_j(0) - \ln \Omega}{\ln[K_j(1)/K_j(0)]} \quad , j \in J, \tag{3.2}$$

where J is the set of industries for which the rate-of-return investment theory is to apply.

Using (3.2), Cox (1984) estimated the β_j from observations of net[24] rates of return averaged over time $[Av[R_j(0)]]$, average growth factors $[Av[K_j(1)/K_j(0)]]$ and the average safe rate of interest $[Av(\Omega)]$, which was set at 2 per cent. The identification of Ω with an economy-wide safe rate of interest is taken to mean that, each year, investors plan to expand capacity in industry up to the point where the anticipated, risk-adjusted, rate of return equals the safe bond rate.

The G_j's and Q_j's were computed according to the formulae:

$$G_j = 1 - \left[Av \frac{K_j(0)}{K_j(1)}\right] \quad (1-d_j) \tag{3.3}$$

and

$$Q_j = \frac{[Av[R_j(0)]] + d_j}{Av[R_j(0)]}, \tag{3.4}$$

where d_j is an estimate of the average rate of depreciation of fixed capital in industry j. The values which are currently used in ORANI for the investment parameters and coefficients are given in Table 3.2.

Finally, it is noted that in most applications of ORANI the set J (the set of all industries in which investment is determined exogenously), contains all but the following thirteen industries: 17 (Services to mining), 84 (Electricity), 85 (Gas), 86 (Water and sewerage), 94 (Railways, other transport and storage), 103 (Ownership of dwellings), 104 (Public administration), 105 (Defence), 106 (Health), 107 (Education and libraries), 108 (Welfare services), 111 (Personal services), and 112 (Non-competing imports). In the cases of industries 84, 85, 86, 94, 104, 105, 106, 107 and 108, investment activity is government dominated. Short-run fluctuations in housing purchases (investment by industry 103) are also largely a function of government macroeconomic policy and are probably not well described by the ORANI investment theory. Industries 17 and 94 involve special data problems which have led to the conclusion that their investment should be set exogenously, while industry 112 is simply a dummy category to facilitate the treatment of noncompeting imports.

FOOTNOTES

* This paper describes the fruits of the labours of many others, both at the Industries Assistance Commission and at the IMPACT Project. I am grateful for the assistance of Peter Higgs, Mark Horridge, Mike Kenderes, Tony Lawson, Dean Parham, Brian Parmenter, Alan Powell and John Sutton in bringing this paper to its final form. Remaining errors are my own. Judi Herkes and Frances Peckham gave excellent assistance in word processing.

1. ORANI users often vary the model's commodity, industry and occupational classifications. See subsection 8.2.2 of Dixon et al. (1982).

2. Familiarity with input-output accounting is necessary for a complete understanding of this subsection and the two following. Possible references are ABS (1983) and Parmenter (1976).

3. The AAGIS (see BAE 1983) is a stratified random sample of Australian farms drawn from a population which encompasses a very high proportion of the cereals-livestock complex. The sample and population size of the AAGIS vary from year to year. In the 1977-78 Survey, the sample constituted 3386 farms drawn from a population of 247 126 farms.

4. This is the "rectangular submatrix" of Y which is referred to at the beginning of section 2.

5. This procedure implies an assumption that all margins are supplied domestically. This assumption is built into the ORANI equations.

6. Each commodity in ORANI can be supplied from two sources, domestic and foreign. It is convenient from a computational point of view to avoid making an exception for the commodity noncompeting imports. Thus, a fictitious domestic supplier is allowed to produce a negligible quantity. The 114^{th} row of A,B,.....,E shows the sales of domestically produced noncompeting imports, while the 112^{th} column shows the inputs to their production. The only nonzero entry in the

row is $1000 in the E vector. All the entries in the 112th column of A and B are zeros.

7. Following the procedure used by Stevenson and Lawson (1981, page 10), margin commodities rows in the capital stocks matrix were set to zeros (except for $19.6m recorded as an intra-industry stock for Retail trade, which records the flow of clothing for hire) and the values which had been in those rows were added to row 113, Personal services, to preserve the property of the column totals having the value of the total capital stocks in each industry.

8. Note that the flow to exports is assumed to be zero. Re-exports are ignored in the ORANI model. Margins on re-exports are treated as direct export sales by the margins producing industry.

9. Tulpulé and Mannion (1983) also provide estimates of the shares of each occupation in total employment in 1977-78, which are used to calculate aggregate employment changes in the ORANI model (eq. 22.3 in Dixon et al. 1982). For short run analyses, the Industries Assistance Commission assumes that owner-operators in the Rural workers occupation are immobile (Lawson, (1983)). The wage bill matrix U and the occupation shares of total employment are adjusted accordingly, with imputed returns to farm owner-operators being transferred to the V vector using information provided in Cox (1984). The short run and long run occupation shares for 1977-78 are given in Appendix Table A.5.

10. Details are in Alaouze (1976, 1977b) and Alaouze, Marsden and Zeitsch (1977).

11. Details are in Alaouze, Marsden and Zeitsch (1977).

12. Since the database is at the four digit ASIC level, which is more detailed than the IO classification, it might be possible to allow different substitution elasticities for different end-uses within an IO category if (i) the ASIC composition of the import flows to different end-uses is known and (ii) substitution elasticities for several ASICs within the given IO category have been estimated.

13. The results are reported in Alaouze, Marsden and Zeitsch (1977) and Alaouze (1977a).

14. It is assumed that domestically produced goods are delivered half a

quarter after ordering.

15. "Local" industries are those for which there are negligible volumes of interstate and international trade (e.g., industry 90, Retail trade). Setting the Armington elasticities to zero is a requirement of the ORANI Regional Equation System and, as such, it was judged to be appropriate to incorporate these "local" commodity characteristics into the standard database. The standard set of local commodities is {9, 23, 26, 27, 60, 86-92, 97-103 and 106-111}. This set was under review at the time of writing because commodity 100, Investment is a substantial exporter in the 1977-78 database (it was only a marginal local commodity before) and commodity 105, Defence, exhibits the structural characteristics of a local commodity.

16. For the three multiproduct agricultural industries, it was originally hoped to derive estimates of input (primary and intermediate) substitution elasticities from the complete CRESH/CRETH input demand and product supply system of equations (Dixon, Vincent and Powell, (1976)). However, the time series on which the econometric analysis was based exhibits relatively little variation in the input mix and input prices and the likelihood surface for the reduced form CRESH/CRETH system was extremely flat with respect to the input-substitution parameters. This led to the abandoning of estimation of the CRESH side of the system (see Vincent, Dixon and Powell,(1977)). Within the IMPACT project, different pairwise elasticities of substitution between labour, land and capital have been estimated for the agricultural sector as a whole. See Vincent (1977) and Ryland and Vincent (1978). These results suggest low values for the factor substitution elasticities (less than 0.2) at the aggregate (single industry) level.

17. Caddy has added an Australian study to cross-sectional literature; see Caddy (1977). This work was based on cross-sectional data spanning 35 manufacturing industries at the three-digit ASIC level for 1968-69 [see Commonwealth Bureau of Census and Statistics (CBCS), (1973)]. His results confirm that 1.0 is a reasonable estimate for the long run elasticity of substitution between capital and labour in Australian manufacturing.

18. The failure of the CRESH system for Australian agricultural industries has already been noted. The interested reader is referred also to the CES literature, starting with Arrow et al.

(1961). By far the most popular approach, in terms of the volume of literature, is to use one or other of the necessary first-order optimizing conditions which are generated when firms are assumed to be cost minimizers under conditions of competitive factor markets.

19. These zones contain the cereals-livestock grazing complex of Australian agriculture. They produced about 58 per cent of domestic agricultural sector output in 1977-78.

20. Full details of the econometric procedure followed are provided in Dixon et al. (1976) and Vincent et al. (1977). Summarised versions appear in Dixon et al. (1983) and Vincent et al. (1980).

21. Details are given in Tulpulé and Powell (1978, p. 18).

22. See, for example, the papers and discussions in IAC (1984).

23. The Υ_j's which appear in (19.10) are provided by the input-output file (see Table 27.1 of Dixon et al. (1982)).

24. The rates of return are net of depreciation and company taxes.

REFERENCES

ABS (Australian Bureau of Statistics) (1980). Census of Mining Establishments: Details of Operations by Industry Class, Australia: 1977-78, Cat. No. 8402.0.

ABS (1983) Australian National Accounts, Input-Output Tables 1977-78, Cat. No. 5209.0.

Adams, P.D. (1984) "The Typical Year Data Base for the Agricultural Sector of ORANI 78", IMPACT Preliminary Working Paper No. OP-45.

Alaouze, C.M. (1976) "Estimation of the Elasticity of Substitution between Imported and Domestically Produced Intermediate Inputs", IMPACT Preliminary Working Paper No. OP-07, 32pp.

Alaouze, C.M. (1977a) "Estimates of the Elasticity of Substitution between Imported and Domestically Produced Goods Classified at the Input-Output Level of Aggregation", IMPACT Working Paper No. O-13, 33pp.

Alaouze, C. M. (1977b) "A Disaggregated Measure of Pressure of Demand: Its Use in Import Demand Estimation", IMPACT Preliminary Working Paper No. OP-16, 40pp.

Alaouze, C.M., J.S. Marsden and J. Zeitsch (1977) "Estimates of the Elasticity of Substitution between Imported and Domestically Produced Commodities at the Four Digit ASIC Level", IMPACT Working Paper No. O-11, 66pp.

Arrow, K.J., H.B. Chenery, B.S. Minhas and R.M. Solow (1961) "Capital-Labor Substitution and Economic efficiency", Review of Economics and Statistics, 43, August, pp. 225-250.

BAE (Bureau of Agricultural Economics) (1981) Australian Dairy Industry Survey 1976-77 and 1977-78, AGPS, Canberra.

BAE (1983) Australian Agricultural and Grazing Industries Survey 1976-77 and 1977-78, AGPS, Canberra.

Betancourt, R. (1973) "Household Behaviour in a Less Developed Country: An Econometric Analysis of Cross-Sectional Data", mimeo, University of Maryland.

Brooks, C. and J. Stevenson (1981) "GOS Splits for all Industries (excluding Agriculture, Forestry and Fishing) and Investment Parameters for 1974-75", IMPACT Research Memorandum No. OA-113, ORANI Module, mimeo, Canberra, February.

Bruce, I. (1984) "The Industries Assistance Commission's ORANI 78 Input-Output and Parameter files for 1977-78", IMPACT Research Memorandum No. OA-239, ORANI Module, mimeo, Melbourne, August.

Caddy, V. (1976) "Empirical Estimation of the Elasticity of Substitution: A Review", IMPACT Preliminary Working Paper No. OP-09, 43pp.

Caddy, V. (1977) "The Application of a Random Coefficient Model to the Problem of Estimating Aggregate Production Parameters", IMPACT Preliminary Working Paper No. OP-10, 29pp.

Clements, K.W. and M.D. Smith (1983) "Extending the Consumption Side of the ORANI Model", IMPACT Preliminary Working Paper No. OP-38, 42pp.

Commonwealth Bureau of Census and Statistics (1973) "Economic Census: 1968-69, Manufacturing Establishments, Selected Items of Data Classified by Industry and Employment Size", Ref. No. 12.18.

Cox, A. (1984) "GOS Splits and Investment Parameters for the 1977-78 ORANI database", IMPACT Research Memorandum No. OA-224, ORANI Module, mimeo, 35pp., IAC, Canberra, March.

Dixon, P.B., B.R. Parmenter, A.A. Powell and D.P. Vincent (1983) "The Agricultural Sector of ORANI 78: Theory, Data and Application." Pp. 237-274 in Kelley, A.C., W.C. Sanderson and J.G. Williamson (eds), Modeling Growing Economies in Equilibrium and Disequilibrium. Proceedings of an IIASA Meeting, November 1980, Duke Press Policy Studies, Durham.

Dixon, P.B., B.R. Parmenter, J. Sutton and D.P. Vincent (1982) ORANI: A Multisectoral Model of the Australian Economy. Contributions to Economic Analysis No. 142, North-Holland Publishing Co., Amsterdam.

Dixon, P.B., D.P. Vincent and A.A. Powell (1976) "Factor Demand and Product Supply Relations in Australian Agriculture: The CRESH/CRETH Production System", IMPACT Preliminary Working Paper No. OP-08, 41pp.

Fallon, J. (1981) "Export Demand Elasticities for the 1974-75 Based ORANI Models", IMPACT Research Memorandum No. OA-143, ORANI Module, mimeo, 34pp,. Canberra, December.

Fitzgibbon, W. (1983) "1977-78 Household Demand Parameters", IMPACT Research Memorandum No. OA-196, ORANI Module, mimeo, 7pp., Canberra, August.

Freebairn, J.W. (1978) "Protection of Australia's World Trade Opportunities: Mid and Late Nineteen Eighties", IMPACT Working Paper No. I-07, 88pp.

Frisch, R. (1959) "A Complete Scheme for Computing all Direct and Cross Elasticities in a Model with Many Sectors", Econometrica, 27, April, pp. 177-196.

Higgs, P.J. (1985) "Implementation of Adams' Typical Year for the Agricultural Sector in the ORANI 1977-78 Data Base", IMPACT Preliminary Working Paper No. OP-49, 172pp.

Higgs, P.J., D.J. Parham and B.R. Parmenter (1981) "Occupational Wage Relativities and Labour-Labour Substitution in the Australian Economy: Applications of the ORANI Model", IMPACT Working Paper No. OP-30, 45pp., Melbourne.

Hourigan, M.A. (1980) "Estimation of an Australian Capital Stock Matrix for the IMPACT Project", IMPACT Working Paper No. I-11, 212pp.

IAC (Industries Assistance Commission) (1984) "The ORANI Trade Parameters", Papers and proceedings of a workshop held at the IAC in April 1983, IMPACT General Paper No. G-58, 134 pp., Canberra.

Lawson, T. (1983) "1977-78 ORANI 77 Short-Run and Long-Run Databases", IMPACT Research Memorandum No. OA-212, ORANI Model, mimeo, 11pp., Canberra, November.

Lawson, T. (1984) "ORANI Industry Tariff Rates 1977 to 1981-82", IMPACT Research Memorandum No. OA-235, ORANI Model, mimeo, Canberra, February.

Lawson, T. (1985) "A 1977-78 Capital Stocks Matrix for the ORANI Models",

IMPACT Research Memorandum No. OA-249, ORANI Model, mimeo, 24pp., Canberra, January.

Lluch, C., A. Powell and R. Williams (1977) Patterns in Household Demand and Savings, Oxford University Press, New York.

Mannion, R. and J. Fallon (1981) "A Review of Econometric Estimates of Import Substitution Elasticities in ORANI", IMPACT Research Memorandum No. OA-145, ORANI Module, mimeo, 85pp,. Canberra, December.

Marsden, J.S. and L.F. Milkovits (1977) "The Construction of Price and Quantity Indexes for Australian Trade Flows", IMPACT Preliminary Working Paper No. IP-03, 76pp.

Parmenter, B.R. (1976) "Input-Output Accounting and the ORANI Module", IMPACT Preliminary Working Paper No. OP-05, 48pp.

Powell, A.A. and F.H. Gruen (1967) "The Estimation of Production Frontiers: The Australian Livestock Cereals Complex", Australian Journal of Agricultural Economics, 11, June, pp. 63-81.

Ryland, G.J. and D.P. Vincent (1978) "Empirical Estimation of CRESH Production Functions", IMPACT Working Paper No. O-12, mimeo, 15pp.

Stevenson, J. (1981) "Gross Operating Surplus Splits for the Agricultural Forestry and Fishing Industries for 1974-75", IMPACT Research Memorandum No. OA-112, ORANI Module, mimeo, Canberra, January.

Stevenson, J. and T. Lawson (1981) "A 1974-75 Capital Stocks Matrix for the ORANI 78 Model", IMPACT Research Memorandum, No. OA-154, ORANI Module, mimeo, 20pp., Canberra, August.

Sutton, J. (1982) "Documentation of the ORANI 78 Large Change Computer Programs: Creation of the Condensed Infinite Diagram", IMPACT Research Memorandum No. CA-77, Computer System, mimeo, 39pp., Canberra, March.

Tulpulé, A. and R. Mannion (1983) "Estimation of 1977-78 Labour Matrices", IMPACT Research Memorandum No. OA-206, ORANI Module, mimeo, 29pp. Canberra, September.

Tulpulé, A. and A.A. Powell (1978) "Estimates of Household Demand Elasticities for the ORANI Module", IMPACT Preliminary Working Paper No. OP-22, 46pp.

Vincent, D.P. (1977) "Factor Substitution in Australian Agriculture", Australian Journal of Agricultural Economics, 21, August, pp. 119-129.

Vincent, D.P., P.B. Dixon and A.A. Powell (1977) "Estimates of the CRETH Supply System in Australian Agriculture", IMPACT Preliminary Working Paper No. OP-17, 51pp.

Vincent, D.P., P.B. Dixon and A.A. Powell (1980) "The Estimation of Supply Response in Australian Agriculture: The CRESH/CRETH Production System", International Economic Review, 21, February, pp. 221-242.

Williams, R. (1978) "The Use of Disaggregated Cross-Section Data in Explaining Shifts in Australian Consumer Demand Patterns Over Time", IMPACT Preliminary Working Paper No. SP-13, 41pp.

TABLE A.1: INDUSTRY AND COMMODITY OUTPUTS AND INPUT SHARES: 1977-78, BALANCED WITH TYPICAL AGRICULTURE

Industry No.	Code	Description	Mnemonic	Value of Industry Output	Industry Input Shares					
					Materials	Mark-ups and Taxes	Wages and Salaries	Returns to Fixed Capital	Returns to Land	Other Costs
				$m	%	%	%	%	%	%
Agriculture, Forestry, Fishing and Hunting										
1		Pastoral zone	ER	514.1(a)	18.4	1.6	40.3	16.6	18.8	4.2
2		Wheat-sheep zone	ER	2380.7(a)	24.6	3.3	30.0	13.0	25.3	3.7
3		High rainfall zone	ER	1187.5(a)	26.4	2.1	37.0	8.3	23.4	2.9
4		Northern beef	ER	208.1(a)	27.7	0.3	33.9	12.9	23.1	2.1
5		Milk cattle and pigs	ER	958.4(a)	27.8	4.4	38.3	7.4	19.3	3.0
6		Other agriculture (sugar cane, fruits and nuts)	ER	1247.7(a)	26.8	3.6	44.1	7.2	13.5	4.8
7		Other agriculture (vegetables, cotton, oilseeds and tobacco)	IC	853.1(a)	33.2	4.5	44.9	4.6	8.3	4.5
8	01.05	Poultry	ER	400.4	53.1	10.8	15.0	10.1		11.0
9	02.00	Services to agriculture		363.0	14.4	2.0	65.5	13.4		4.7
10	03.00	Forestry and logging	NT	336.3	36.4	7.8	44.2	6.5		5.2
11	04.00	Fishing and hunting	E	275.8	39.6	7.3	32.8	16.7		3.7
Mining										
12	11.01	Ferrous metal ores	E	980.3	38.4	6.8	17.5	25.5		11.9
13	11.02	Non-ferrous metal ores	E	1351.6	28.8	4.1	25.5	24.3		17.3
14		Black coal	E	1696.6	29.6	4.1	26.5	23.4		16.5
15		Oil, gas and brown coal	IC	807.6	23.2	1.7	6.2	54.6		14.3
16	14.00	Other minerals	NT	484.6	36.0	6.0	22.1	23.2		12.6
17	16.00	Services to mining	X ER	485.2	60.1	2.4	31.0	2.8		3.7
Food, Drink and Tobacco										
18	21.01	Meat products	E	4059.9	67.9	9.8	15.9	3.4		2.8
19	21.02	Milk products	NT	1484.1	75.2	7.5	11.4	3.4		2.4
20	21.03	Fruit and vegetables	NT	563.6	61.0	10.7	19.2	3.4		5.6
21	21.04	Margarine, oils and fats nec	IC	332.0	75.5	8.5	10.8	2.6		2.5
22	21.05	Flour mill and cereal food products	E	549.4	69.0	7.0	14.4	6.2		3.4
23	21.06	Bread, cakes and biscuits	NT	810.7	51.0	6.1	32.1	6.5		4.3
24	21.07	Confectionery and cocoa products	IC	294.2	51.7	6.8	25.4	7.7		8.3
25	21.08	Other food products	E	1887.7	73.2	8.9	10.0	3.9		4.0
26	21.09	Soft drinks, cordials and syrups	NT	447.0	61.4	7.3	17.7	8.8		4.8
27	21.10	Beer and malt	NT	625.9	55.2	7.1	16.8	13.6		7.4
28	21.11	Other alcoholic beverages	IC	264.6	61.3	7.0	15.8	10.4		5.5
29	22.01	Tobacco products	IC	340.1	64.1	6.7	18.5	2.7		8.1

TABLE A.1: INDUSTRY AND COMMODITY OUTPUTS AND INPUT SHARES: 1977-78, BALANCED WITH TYPICAL AGRICULTURE (continued)

Industry No.	Code	Description	Mnemonic	Value of Industry Output	Industry Input Shares: Materials	Mark-ups and Taxes	Wages and Salaries	Returns to Fixed Capital	Returns to Land	Other Costs
				$m	%	%	%	%	%	%
Textiles, Clothing and Footwear										
30	23.01	Cotton ginning, wool scouring, etc.	E	266.4	77.5	12.8	6.8	1.1		1.7
31	23.02	Man-made fibres, yarns, fabrics	IC	247.9	51.7	13.3	28.4	2.5		4.1
32	23.03	Cotton yarns, fabrics, textiles	IC	295.6	54.7	11.2	27.2	2.6		4.4
33	23.04	Worsted and woollen yarns	IC	143.6	53.1	11.2	31.1	1.5		3.1
34	23.05	Textile finishing	IC	295.4	70.5	15.7	10.5	1.2		2.0
35	23.06	Textile floor coverings	IC	240.0	58.2	14.0	18.8	3.9		5.1
36	23.07	Other textile products	IC	202.9	47.0	10.6	27.1	6.5		8.7
37	24.01	Knitting mills	IC	433.6	49.7	10.8	28.6	3.3		7.7
38	24.02	Clothing	IC	1254.9	49.8	10.0	31.7	2.5		6.0
39	24.03	Footwear	IC	291.5	50.5	5.6	35.5	2.5		5.9
Wood and Wood Products										
40	25.01	Sawmill products	IC	776.8	48.3	8.7	26.4	8.8		7.8
41	25.02	Veneers and manufactured wood boards	IC	209.5	50.4	10.1	26.3	7.0		6.2
42	25.03	Joinery and wood products nec	NT	605.4	49.2	11.3	27.4	6.3		5.9
43	25.04	Furniture and mattresses	NT	768.8	49.3	10.9	28.4	5.5		5.9
Paper and Printing										
44	26.01	Pulp, paper and paperboard	IC	495.5	56.4	6.5	29.1	2.1		5.9
45	26.02	Bags, fibreboard containers	NT	571.7	60.2	7.1	21.8	6.5		4.4
46	26.03	Paper products nec	IC	199.8	51.1	9.2	22.5	10.6		6.6
47	26.04	Publishing, printing	IC	939.7	44.7	4.2	36.1	7.7		7.4
48	26.05	Paper stationery, printing etc	NT	1069.4	45.4	5.5	34.3	7.7		7.2
Chemicals										
49	27.01	Chemical fertilisers	ER	389.0	66.2	9.2	12.8	7.2		4.5
50	27.02	Other basic chemicals	IC	1190.1	57.3	10.2	17.5	9.1		5.9
51	27.03	Paints	NT	308.5	59.0	8.7	23.0	3.4		5.9
52	27.04	Pharmaceutical products	IC	591.7	49.9	13.0	21.4	6.6		9.2
53	27.05	Soap and other detergents	NT	304.1	57.0	7.9	19.8	10.0		5.3
54	27.06	Cosmetic and toilet preparations	IC	203.2	56.7	5.2	23.2	6.5		8.4
55	27.07	Other chemical products	IC	298.1	53.9	7.8	24.6	5.9		7.9
56	27.08	Petroleum and coal products		2447.2	68.8	24.4	3.6	2.5		0.7

TABLE A.1: INDUSTRY AND COMMODITY OUTPUTS AND INPUT SHARES: 1977-78, BALANCED WITH TYPICAL AGRICULTURE (continued)

Industry No.	Code	Description	Mnemonic	Value of Industry Output	Industry Input Shares: Materials	Mark-ups and Taxes	Wages and Salaries	Returns to Fixed Capital	Returns to Land	Other Costs
				$m	%	%	%	%	%	%
Non-Metallic Mineral Products										
57	28.01	Glass and glass products	IC	271.9	37.9	5.9	33.2	14.4		8.6
58	28.02	Clay products and refractories	NT	384.7	39.8	7.4	38.5	9.0		5.3
59	28.03	Cement	NT	214.8	44.9	10.3	22.7	15.2		6.9
60	28.04	Ready-mixed concrete	NT	406.6	56.5	24.4	8.7	6.9		3.5
61	28.05	Concrete products	NT	328.7	42.5	11.4	28.3	11.6		6.1
62	28.06	Other non-metallic mineral products	IC	388.2	46.6	11.0	27.5	9.7		5.1
Metals, Metal Products										
63	29.01	Basic iron and steel	IC	2914.3	54.7	11.5	25.9	4.6		3.4
64	29.02	Basic non-ferrous metals	E	2583.4	64.3	5.8	12.3	8.8		8.8
65	31.01	Structural metal products	NT	1067.0	60.5	5.7	23.6	4.8		5.5
66	31.02	Sheet metal products	NT	1053.2	57.8	5.8	26.1	4.4		5.9
67	31.03	Other metal products	IC	1404.4	48.5	5.5	31.8	6.6		7.6
Transport Equipment										
68	32.01	Motor vehicles and parts	IC	3640.4	68.0	5.4	22.9	1.2		2.5
69	32.02	Ships and boats	NT	358.4	39.1	5.6	46.5	4.0		4.9
70	32.03	Railway rolling stock	NT	392.5	33.9	2.6	58.2	2.3		3.0
71	32.04	Aircraft	IC	296.4	34.8	0.8	54.0	5.1		5.3
Machinery and Household Appliances										
72	33.01	Photographic, scientific equipment	IC	289.0	43.9	8.1	32.3	7.5		8.2
73	33.02	Electronic equipment	IC	680.4	49.4	10.6	31.1	3.1		5.7
74	33.03	Household appliances	IC	811.1	58.5	7.4	27.1	2.3		4.8
75	33.04	Other electrical equipment	IC	1081.3	51.5	7.1	31.1	3.6		6.8
76	33.05	Agricultural machinery	ER	364.5	48.2	8.9	33.5	3.0		6.4
77	33.06	Construction machinery	IC	333.6	52.7	8.8	30.2	2.3		6.1
78	33.07	Other machinery and equipment	IC	1487.7	47.9	6.5	34.1	3.6		7.9
Leather, Rubber and Plastic Products										
79	34.01	Leather products	IC	192.8	57.3	9.8	22.2	4.0		6.8
80	34.02	Rubber products	IC	484.4	49.8	9.1	29.7	4.2		7.3
81	34.03	Plastic and related products	IC	1183.0	53.3	7.8	25.2	6.2		7.4
82	34.04	Signs, writing equipment	IC	137.6	45.4	5.5	31.6	5.7		11.9
83	34.05	Other manufacturing	IC	319.4	40.1	6.1	23.4	10.3		20.1

TABLE A.1: INDUSTRY AND COMMODITY OUTPUTS AND INPUT SHARES: 1977-78, BALANCED WITH TYPICAL AGRICULTURE (continued)

Industry No.	Code	Description		Mnemonic	Value of Industry Output	Industry Input Shares: Materials	Mark-ups and Taxes	Wages and Salaries	Returns to Fixed Capital	Returns to Land	Other Costs
					$m	%	%	%	%	%	%
Electricity, Gas and Water											
84	36.01	Electricity	X	NT	3081.7	45.1	3.6	23.2	21.5		6.5
85	36.02	Gas	X	NT	335.2	34.6	6.6	28.9	23.1		6.8
86	37.01	Water, sewerage and drainage	X	NT	1087.5	22.2	2.4	32.1	36.4		6.9
Building and Construction											
87	41.01	Residential building construction		NT	4759.5	48.3	10.3	18.5	12.8		10.1
88	41.02	Other construction		NT	9204.1	42.4	7.8	38.9	5.2		5.8
Trade, Transport and Communication											
89	47.01	Wholesale trade	M	NT	9438.5	27.1	2.0	38.0	11.3		21.8
90	48.01	Retail trade	M	NT	8327.8	36.7	2.1	40.2	9.4		11.6
91	49.01	Mechanical repairs		NT	1628.3	29.1	10.9	37.8	10.7		11.4
92	49.02	Other repairs		NT	639.5	36.0	8.6	35.5	9.6		10.3
93	51.01	Road transport	M	ER	4111.6	35.4	13.0	42.9	2.9		5.9
94	52.01	Rail, other transport, storage	M	X ER	2098.4	43.4	2.9	51.2			2.5
95	52.01	Water transport	M	NT	1851.9	49.6	3.1	31.3	10.5		5.5
96	54.01	Air transport	M	IC	1649.3	51.0	8.4	29.6	6.3		4.7
97	56.01	Communication		NT	2526.2	12.8	0.9	50.7	27.5		8.0
Finance, etc.											
98	61.01	Banking		NT	2412.9	19.7	0.7	50.1	21.6		7.8
99	61.02	Non-bank finance		NT	1788.1	27.5	1.0	21.0	42.8		7.8
100	61.03	Investment		NT	264.2	35.2	1.6	15.3	33.1		15.0
101	61.04	Insurance, services to insurance	M	NT	1765.3	30.9	1.2	37.8	10.8		19.3
102	61.05	Other business services		NT	6263.6	25.0	1.5	35.8	19.3		18.5
103	61.06	Ownership of dwellings	X	NT	8867.5	27.6	1.2		63.1		8.2

TABLE A.1: INDUSTRY AND COMMODITY OUTPUTS AND INPUT SHARES: 1977-78, BALANCED WITH TYPICAL AGRICULTURE (continued)

Industry No.	Code	Description	Mnemonic	Value of Industry Output	Industry Input Shares: Materials	Mark-ups and Taxes	Wages and Salaries	Returns to Fixed Capital	Returns to Land	Other Costs
				$m	%	%	%	%	%	%
Government, Private Services										
104	71.01	Public administration	X NT	3767.7	33.9	1.6	63.6			0.9
105	72.01	Defence	X NT	2213.1	45.2	3.1	51.3			0.4
106	81.01	Health	X NT	5674.7	23.9	4.1	63.5	4.1		4.4
107	82.01	Education, museums, libraries	X NT	5290.7	16.6	2.7	78.2	1.0		1.5
108	83.01	Welfare and religious institutions	X NT	2636.0	28.1	2.6	64.3	1.5		3.4
109	91.01	Entertainment, recreation	NT	2330.6	40.9	5.2	32.3	8.3		13.3
110	92.01	Restaurants, hotels and clubs	M NT	2731.3	26.8	2.2	49.0	10.6		11.4
111	93.01	Personal services	X NT	797.7	28.8	2.7	38.5	14.9		15.0
112		Non-competing imports	X	0.001	18.8		81.2			

E endogenous export commodity; ER export-related industry; IC import competing industry; M margin industry; NT non-traded good; X exogenous investment industry.

(a) Commodity sales for the outputs of the multi-product industries were: Wool $1508.7m; Sheep $578.7m; Wheat $921.1m; Barley $176.5m; Other grains $161.6m; Meat cattle $803.6m; Milk cattle and pigs $985.0m; Other farming (sugar cane, fruit and nuts) $1257.7m and Other farming (vegetables, cotton, oilseeds and tobacco) $956.6m. Of these, Wool, Sheep, Wheat, Barley and Other grains are endogenous export commodities. For all the other (single product) industries, total costs were set equal to total commodity sales in the balancing process described in section 2.4.

TABLE A.2: SALES SHARES AND IMPORT COMPETITION: 1977-78, BALANCED WITH TYPICAL AGRICULTURE

Commodity No.	Code	Commodity Sales Shares: Mark-ups	Intermediate Usage	Capital Expenditure	Private Consumption	Other Demand	Exports	Imports: Market Share	Nominal Protection Rate(a)
		%	%	%	%	%	%	%	%
Agriculture, Forestry, Fishing and Hunting									
A1	Wool		12.3				87.7	0.2	
A2	Sheep		56.3		3.2		40.5	0.1	
A3	Wheat		24.1				75.9		
A4	Barley		17.0				83.0		
A5	Other grains		58.4		3.0		38.6	14.0	1.2
A6	Meat cattle		98.0		1.2	0.1	0.8	0.2	
A7	Milk cattle and pigs		94.7		4.9	0.1	0.3		
A8	Other agriculture (sugar cane, fruits and nuts)		74.5		16.5	0.1	8.9	3.1	9.1
A9	Other agriculture (vegetables, cotton, oilseeds and tobacco)		55.4		36.1		8.4	9.6	9.1
8	Poultry		55.7		43.7		0.6		
9	Services to agriculture		76.2		2.2	21.5		0.2	
10	Forestry and logging		63.1	25.0	2.0	9.6	0.3	1.4	
11	Fishing and hunting		16.0		32.3	1.8	50.0	24.5	0.7
Mining									
12	Ferrous metal ores		16.0				84.0	0.7	
13	Non-ferrous metal ores		63.1				36.8	1.0	
14	Black coal		30.6		0.1		69.3	0.1	
15	Oil, gas and brown coal		84.9		1.2		13.8	55.5	
16	Other minerals		88.3		0.1		11.6	20.5	0.1
17	Services to mining		56.0	39.1		4.9			
Food, Drink and Tobacco									
18	Meat products		14.5		54.1		31.4	0.4	1.8
19	Milk products		24.0		61.0		15.0	2.1	2.6
20	Fruit and vegetables		14.7		75.9		9.4	12.7	9.4
21	Margarines, oils and fats nec.		43.4		49.3		7.3	21.6	8.2
22	Flour mill and cereal food products		50.3		32.3		17.4	1.4	14.2

TABLE A.2: SALES SHARES AND IMPORT COMPETITION: 1977-78, BALANCED WITH TYPICAL AGRICULTURE (continued)

Commodity No.	Code	Commodity Sales Shares: Mark-ups	Intermediate Usage	Capital Expenditure	Private Consumption	Other Demand	Exports	Imports: Market Share	Nominal Protection Rate(a)
		%	%	%	%	%	%	%	%
23	Bread, cakes and biscuits		7.8		91.4		0.9	1.7	4.4
24	Confectionery and cocoa products		17.0		79.6		3.4	13.6	14.4
25	Other food products		32.6		39.2		28.2	11.5	
26	Soft drinks, cordials and syrups		25.2		72.8		2.0	0.8	5.2
27	Beer and malt		9.7		83.9		6.4	0.1	21.2
28	Other alcoholic beverages		4.5		93.0		2.5	21.3	34.2
29	Tobacco products		6.5		92.3		1.1	7.0	17.6
	Textiles, Clothing and Footwear								
30	Cotton ginning, wool scouring etc.		40.1				59.9	23.9	1.8
31	Man-made fibres, yarns, fabrics		88.9	1.6	8.3		1.2	54.2	43.6
32	Cotton yarns, fabrics, textiles		52.6	0.8	44.2		2.4	50.6	28.7
33	Worsted and woollen yarns		64.7	0.5	33.6		1.2	18.6	23.9
34	Textile finishing		59.4	0.2	40.3			0.1	42.4
35	Textile floor coverings		22.2	12.6	64.4		0.8	27.5	25.2
36	Other textile products		68.9	5.0	23.3		2.9	23.5	12.6
37	Knitting mills		38.9		60.8		0.2	20.5	56.2
38	Clothing		15.3	0.5	83.5		0.8	19.0	89.8
39	Footwear		29.0	0.3	69.7		1.0	30.1	88.1
	Wood and Wood Products								
40	Sawmill products		86.9		2.4		10.7	19.8	6.7
41	Veneers and manufactured wood boards		92.9		6.1		1.0	16.0	19.8
42	Joinery and wood products nec.		85.0	3.9	10.9		0.2	6.5	11.0
43	Furniture and mattresses		18.0	14.5	67.4		0.1	8.2	14.1
	Paper and Printing								
44	Pulp, paper and paperboard		96.9		0.4		2.6	41.7	6.9
45	Bags, fibreboard containers		99.4		0.1		0.5	3.9	20.0
46	Paper products nec.		73.6		23.6		2.7	15.5	18.9
47	Publishing, printing		75.3	1.0	21.6		2.1	19.6	2.1
48	Paper stationery, printing etc.		92.0		6.9		1.1	2.5	24.5

TABLE A.2: SALES SHARES AND IMPORT COMPETITION: 1977-78, BALANCED WITH TYPICAL AGRICULTURE (continued)

Commodity No.	Code	Commodity Sales Shares: Mark-ups	Intermediate Usage	Capital Expenditure	Private Consumption	Other Demand	Exports	Imports: Market Share	Nominal Protection Rate(a)
		%	%	%	%	%	%	%	%
Chemicals									
49	Chemical fertilisers		97.0		2.7		0.3	4.8	1.1
50	Other basic chemicals		91.4	0.6			7.9	39.1	11.3
51	Paints		95.4		2.9		1.7	5.7	12.7
52	Pharmaceuticals		58.9		30.9	5.3	4.9	16.1	5.2
53	Soap and other detergents		30.9		66.8		2.4	6.0	10.5
54	Cosmetic and toilet preparations		16.4		81.1		2.5	8.6	16.6
55	Other chemicals products		83.8		11.5		4.7	27.6	12.3
56	Petroleum and coal products		63.1		26.5		10.4	18.2	5.8
Non-Metallic Mineral Products									
57	Glass and glass products		91.0	0.8	6.5		1.7	25.9	5.7
58	Clay products and refractories		95.5	0.3	3.2		1.0	26.1	4.9
59	Cement		99.5		0.3		0.2	3.4	2.5
60	Ready-mix concrete		100.0						
61	Concrete products		99.3	0.4	0.2			0.1	5.6
62	Other non-metallic mineral products		95.9	1.5	1.3		1.3	8.9	10.2
Metals, Metal Products									
63	Basic iron and steel		85.2	0.2	0.1		14.5	10.5	10.0
64	Basic non-ferrous metals		44.7	0.2			55.2	4.4	4.3
65	Structural metal products		84.5	10.6	3.0		1.9	2.2	17.7
66	Sheet metal products		73.3	21.9	3.7		1.0	4.7	26.4
67	Other metal products		78.6	12.6	5.3		3.5	19.1	18.0
Transport Equipment									
68	Motor vehicles and parts		40.1	25.7	31.6		2.6	30.7	54.8
69	Ships and boats		50.1	31.3	11.7		6.9	33.2	8.6
70	Railway rolling stock		64.0	30.9		4.4	0.7	3.9	25.8
71	Aircraft		64.7	21.2			14.1	54.9	0.7

TABLE A.2: SALES SHARES AND IMPORT COMPETITION: 1977-78, BALANCED WITH TYPICAL AGRICULTURE (continued)

Commodity No.	Code	Commodity Sales Shares						Imports	
		Mark-ups	Intermediate Usage	Capital Expenditure	Private Consumption	Other Demand	Exports	Market Share	Nominal Protection Rate(a)
		%	%	%	%	%	%	%	%
Machinery and Household Appliances									
72	Photographic, scientific equipment		30.7	8.8	40.7		19.8	64.3	10.6
73	Electronic equipment		49.2	9.6	38.1		3.1	53.7	21.7
74	Household appliances		28.9	15.5	52.5		3.0	28.9	21.6
75	Other electrical equipment		67.0	20.4	7.9		4.7	27.4	12.6
76	Agricultural machinery		27.7	64.6	0.1		7.5	37.4	14.0
77	Construction machinery		24.9	68.3	0.1		6.8	53.4	23.3
78	Other machinery and equipment		32.6	57.7	2.1		7.6	41.7	16.6
Leather, Rubber and Plastic Products									
79	Leather products		63.0	0.2	23.2		13.6	31.0	13.9
80	Rubber products		77.8	0.5	20.5		1.2	30.3	27.4
81	Plastic and related products		87.5	0.7	10.2		1.6	22.6	22.6
82	Signs, writing equipment		87.7	4.3	5.8		2.2	22.0	16.4
83	Other manufacturing		30.8	0.8	59.6		8.8	43.2	17.6
Electricity, Gas and Water									
84	Electricity		71.3		28.4		0.3	0.3	
85	Gas		48.1		51.9				
86	Water, sewerage and drainage		91.1		3.6	5.2	0.2		
Building and Construction									
87	Residential building construction		9.8	90.2					
88	Other construction		6.5	93.5					
Trade, Transport and Communication									
89	Wholesale trade	95.4	4.3		0.2		0.1		
90	Retail trade	91.7	1.8	0.2	6.3				
91	Mechanical repairs		38.5		61.5				
92	Other Repairs		60.9		38.7		0.4	0.6	
93	Road transport	69.4	10.9		16.5	3.1			
94	Railway, other transport and storage	47.9	21.3		10.0	20.8		1.0	
95	Water transport	27.5	22.1		2.5	0.3	47.7	24.0	
96	Air transport	7.0	27.0		35.0	3.9	27.2	32.6	
97	Communications		67.3		30.7	0.3	1.6	3.6	

TABLE A.2: SALES SHARES AND IMPORT COMPETITION: 1977-78, BALANCED WITH TYPICAL AGRICULTURE (continued)

Commodity No.	Code	Commodity Sales Shares: Mark-ups	Intermediate Usage	Capital Expenditure	Private Consumption	Other Demand	Exports	Imports: Market Share	Nominal Protection Rate(a)
		%	%	%	%	%	%	%	%
Finance, etc.									
98	Banking		79.3		20.7				
99	Non-bank finance		84.7		15.3				
100	Investment		41.8		41.9		16.3	9.1	
101	Insurance, services to insurance	2.2	49.9		45.9	0.3	1.8	3.5	
102	Other business services		83.5	9.2	5.6	0.9	0.7	2.1	
103	Ownership of dwellings		0.1		99.9				
Government, Private Services									
104	Public administration		11.0		3.8	85.2			
105	Defence					98.8	1.2		
106	Health		1.1		47.1	51.8			
107	Education, museums, libraries		0.6		7.3	92.2			
108	Welfare and religious institutions		11.0		27.7	60.7	0.6	0.2	
109	Entertainment, recreation		30.4	0.3	50.1	18.4	0.9	2.6	0.2
110	Restaurants, hotels and clubs	32.3	18.9		48.6	0.1	0.2	1.2	
111	Personal services		16.9		82.1	0.9	0.1	0.3	
112	Non-competing imports		9.9	0.1	0.1	89.9	0.1	100.0	

(a) These are 1981-82 protection rates. For manufactured commodity groups (Nos 18-83), the rates are taken from Lawson (1984). The remaining protection rates were provided by sources within the Industries Assistance Commission.

TABLE A.3: MAJOR PURCHASING INDUSTRIES OF EACH COMMODITY GROUP: 1977-78, BALANCED WITH TYPICAL AGRICULTURE[a]

Commodity Group		Principal Using Industries							
No.	Description	No.	Sales	No.	Sales	No.	Sales	No.	Sales
			%		%		%		%
Agriculture, Forestry, Fishing and Hunting									
A1	Wool	30	9.6						
A2	Sheep	18	56.3						
A3	Wheat	2	6.9	22	6.9				
A4	Barley								
A5	Other grains	22	17.6	21	14.0				
A6	Meat cattle	18	98.0						
A7	Milk cattle and pigs	19	61.9	18	32.6				
A8	Other agriculture (sugar cane, fruits and nuts)	25	56.0						
A9	Other agriculture (vegetables, cotton oilseeds and tobacco)	20	8.1	28	6.4	30	5.9	25	5.7
8	Poultry	18	53.2						
9	Services to agriculture	6	19.1	2	19.0	7	16.2	11	13.2
10	Forestry and logging	40	32.6	44	7.7	14	5.8		
11	Fishing and hunting	25	8.4	18	5.0				
Mining									
12	Ferrous metal ores	12	9.9	63	6.0				
13	Non-ferrous metal ores	64	60.5						
14	Black coal	84	12.5						
15	Oil, gas and brown coal	56	58.3	84	11.5	85	6.3		
16	Other minerals	88	24.2	60	16.0	62	9.1	83	9.5
17	Services to mining	17	32.4	15	17.7				
Food, Drink and Tobacco									
18	Meat products	18	8.8						
19	Milk products	19	19.1						
20	Fruit and vegetables								
21	Margarine, oils and fats nec	21	16.9	23	6.6				
22	Flour mill and cereal food products	23	22.4	22	12.2	18	5.2		
23	Bread, cakes and biscuits								
24	Confectionery and cocoa products	23	7.2						

TABLE A.3: MAJOR PURCHASING INDUSTRIES OF EACH COMMODITY GROUP: 1977-78, BALANCED WITH TYPICAL AGRICULTURE (continued)[a]

Commodity Group		Principal Using Industries							
No.	Description	No.	Sales	No.	Sales	No.	Sales	No.	Sales
			%		%		%		%
25	Other food products	25	8.3	8	8.8				
26	Soft drinks, cordials and syrups								
27	Beer and malt	27	8.1						
28	Other alcoholic beverages								
29	Tobacco products								
Textiles, Clothing and Footwear									
30	Cotton ginning, wool scouring, etc.	33	11.4	35	6.6	34	6.2	36	5.8
31	Man-made fibres, yarns fabrics	38	18.8	37	15.1	80	11.2	31	8.5
32	Cotton yarns, fabrics, textiles	32	18.1	38	10.4	37	5.7		
33	Worsted and woollen yarns	35	22.7	37	16.0	38	13.0		
34	Textile finishing	38	24.2	81	13.1	43	9.8	31	7.8
35	Textile floor coverings	68	5.8						
36	Other textile products	94	8.2	110	8.0	93	6.8	95	6.4
37	Knitting mills	38	21.7	37	9.2				
38	Clothing	38	10.5						
39	Footwear	39	6.8						
Wood and Wood Products									
40	Sawmill products	87	34.8	40	17.5	88	9.5	42	7.7
41	Veneers and manufactured wood boards	42	38.1	43	27.8	41	10.1	88	7.3
42	Joinery and wood products nec	87	41.8	88	18.3				
43	Furniture and mattresses	43	7.0						
Paper and Printing									
44	Pulp, paper and paperboard	45	31.3	48	27.4	47	15.1	44	8.4
45	Bags, fibreboard containers	89	27.0	90	16.2	18	7.5		

TABLE A.3: MAJOR PURCHASING INDUSTRIES OF EACH COMMODITY GROUP: 1977-78, BALANCED WITH TYPICAL AGRICULTURE (continued)[a]

Commodity Group	Principal Using Industries							
No. Description	No.	Sales	No.	Sales	No.	Sales	No.	Sales
		%		%		%		%
46 Paper products nec	110	16.7	104	5.0				
47 Publishing, printing	90	13.4	107	9.5	102	6.8		
48 Paper stationery, printing etc	90	22.2	89	11.7	104	6.5	48	6.4
Chemicals								
49 Chemical fertilisers	2	26.1	6	13.6	49	12.9	3	12.3
50 Other basic chemicals	50	18.9	81	18.0	51	5.8		
51 Paints	103	24.1	68	14.7	88	14.9	87	14.1
52 Pharmaceuticals	106	23.9	52	14.5				
53 Soap and other detergents	102	6.0	18	5.3				
54 Cosmetic and toilet preparations	111	6.8	106	5.3				
55 Other chemical products	48	9.2	102	7.5	45	5.2		
56 Petroleum and coal products	93	11.6	56	8.1				
Non-metallic Mineral Products								
57 Glass and glass products	89	10.6	19	8.0	26	9.2	28	7.9
58 Clay products and refractories	87	64.1	88	11.6	63	7.3	64	5.4
59 Cement	60	47.5	88	20.4	61	14.7	87	10.9
60 Ready-mixed concrete	88	63.6	87	34.6				
61 Concrete products	88	62.4	87	34.8				
62 Other non-metallic mineral products	87	46.6	88	25.8	62	8.7		
Metal, Metal Products								
63 Basic iron and steel	63	23.5	66	10.9	65	8.7	67	8.3
64 Basic non-ferrous metals	64	14.3	75	5.1				
65 Structural metal products	88	56.7	87	6.8				
66 Sheet metal products	27	10.1	88	8.9	87	7.1	26	6.9
67 Other metal products	88	14.1	68	9.1	65	7.8	87	5.6

TABLE A.3: MAJOR PURCHASING INDUSTRIES OF EACH COMMODITY GROUP: 1977-78, BALANCED WITH TYPICAL AGRICULTURE (continued)[a]

Commodity Group		Principal Using Industries							
No.	Description	No.	Sales	No.	Sales	No.	Sales	No.	Sales
			%		%		%		%
Transport Equipment									
68	Motor vehicles and parts	68	23.3	91	6.1	93	5.2		
69	Ships and boats	95	20.9	105	11.3				
70	Railway rolling stock	94	55.4	70	7.2				
71	Aircraft	96	49.7	105	6.6	71	6.2		
Machinery and Household Appliances									
72	Photographic, scientific equipment	106	12.2						
73	Electronic equipment	88	24.1	109	5.7				
74	Household appliances	87	11.2	74	8.5				
75	Other electrical equipment	88	20.8	75	8.7	74	5.8		
76	Agricultural machinery	76	12.3	2	5.2				
77	Construction machinery								
78	Other machinery and equipment	88	12.0	78	6.4				
Leather, Rubber and Plastic Products									
79	Leather products	39	30.3	79	16.5				
80	Rubber products	93	22.5	68	13.1	80	6.1		
81	Plastic and related products	89	9.3	81	9.1	88	8.1	18	5.0
82	Signs, writing equipment	90	18.8	89	8.4	107	5.6		
83	Other manufacturing	106	10.4						
Electricity, Gas and Water									
84	Electricity	84	25.7						
85	Gas	106	7.0						
86	Water, sewerage and drainage	103	43.6	102	10.8				
Building and Construction									
87	Residential building construction	103	9.8						
88	Other construction								

TABLE A.3: MAJOR PURCHASING INDUSTRIES OF EACH COMMODITY GROUP: 1977-78, BALANCED WITH TYPICAL AGRICULTURE (continued)[a]

Commodity Group		Principal Using Industries							
No.	Description	No.	Sales	No.	Sales	No.	Sales	No.	Sales
			%		%		%		%
Trade, Transport and Communication									
89	Wholesale trade	18	17.2	94	16.6	89	15.6	27	10.7
90	Retail trade	90	8.8						
91	Mechanical repairs	93	13.0						
92	Other repairs	90	28.2	89	5.9				
93	Road transport	107	9.4						
94	Railway, other transport and storage	89	12.0						
95	Water transport	95	15.3	104	6.3				
96	Air Transport	96	5.0						
97	Communications	89	10.5	90	8.9	102	8.8	97	5.0
Finance, etc.									
98	Banking	103	18.5	107	7.8	106	7.2	104	5.4
99	Non-bank finance	103	27.9						
100	Investment								
101	Insurance, services to insurance	101	8.1						
102	Other business services	90	16.7	89	9.0	102	6.0		
103	Ownership of dwellings								
Government, Private Services									
104	Public administration								
105	Defence								
106	Health								
107	Education, museums, libraries								
108	Welfare and religious institutions								
109	Entertainment, recreation	109	6.0						
110	Restaurants, hotels and clubs	89	6.3						
111	Personal services								
112	Non-competing imports								

(a) This table shows the share in total sales of domestically produced commodity groups to intermediate usage by industries for cases where the share is greater than or equal to 5 per cent. Where more than four such shares exist, only the largest four are shown.

TABLE A.4: PRINCIPAL COMMODITIES USED BY EACH INDUSTRY: 1977-78, BALANCED WITH TYPICAL AGRICULTURE[a]

Industry	Principal Commodities Used							
No. Description	No.	Costs	No.	Costs	No.	Costs	No.	Costs
		%		%		%		%
Agriculture, Forestry, Fishing and Hunting								
1 Pastoral zone								
2 Wheat-sheep zone								
3 High rainfall zone								
4 Northern beef								
5 Milk cattle and pigs	25	7.6						
6 Other agriculture (sugar cane, fruits and nuts)	9	5.6						
7 Other agriculture (vegetables, cotton, oilseeds and tobacco)	9	6.9	49	5.3				
8 Poultry	25	41.4						
9 Services to agriculture								
10 Forestry and logging	91	5.7	56	5.4				
11 Fishing and hunting	95	8.1	69	5.6	25	5.5		
Mining								
12 Ferrous metal ores	12	9.9						
13 Non-ferrous metal ores								
14 Black coal								
15 Oil, gas and brown coal	17	10.6						
16 Other minerals	102	6.4						
17 Services to mining	17	32.4						
Food, Drink and Tobacco								
18 Meat products	A6	19.4	18	8.8	A2	8.0	A7	7.9
19 Milk products	A7	41.1	19	19.1				
20 Fruit and vegetables	A9	13.8	66	12.9	A8	10.7		
21 Margarine, oils and fats nec	21	16.9	18	10.3	A5	6.8	81	5.1
22 Flour mill and cereal food products	22	12.2	A3	11.5	A5	5.2	102	5.4
23 Bread, cakes and biscuits	22	15.2						
24 Confectionery and cocoa products								
25 Other food products	A8	37.3	25	8.3				

TABLE A.4: PRINCIPAL COMMODITIES USED BY EACH INDUSTRY: 1977-78, BALANCED WITH TYPICAL AGRICULTURE (continued) [a]

Industry	Principal Commodities Used							
No. Description	No.	Costs	No.	Costs	No.	Costs	No.	Costs
		%		%		%		%
26 Soft drinks, cordials and syrups	66	16.3	25	12.4	57	5.6		
27 Beer and malt	66	17.0	27	8.1	89	7.3		
28 Other alcoholic beverages	A9	23.0	57	8.1				
29 Tobacco products	A9	15.9	109	8.0	45	6.0		
Textiles, Clothing and Footwear								
30 Cotton ginning, wool scouring etc.	A1	54.4	A9	21.1				
31 Man-made fibres, yarns, fabrics	34	9.3	31	8.5	50	7.6		
32 Cotton yarns, fabrics, textiles	32	18.1	31	5.4				
33 Worsted and woollen yarns	30	21.2	A1	14.7				
34 Textile finishing	50	7.9	30	5.6				
35 Textile floor coverings	33	13.6	31	8.2	30	7.4		
36 Other textile products	30	7.6	31	6.8				
37 Knitting mills	37	9.2	31	8.7	33	5.3		
38 Clothing	38	10.5	37	7.5	34	5.7		
39 Footwear	79	20.0	39	6.8	81	5.2		
Wood and Wood Products								
40 Sawmill products	40	17.5	10	14.1				
41 Veneers and manufactured wood boards	41	10.1	10	6.0				
42 Joinery and wood products nec	41	13.2	40	9.8				
43 Furniture and mattresses	41	7.6	43	7.0				
Paper and Printing								
44 Pulp, paper and paperboard	44	8.4	10	5.2				
45 Bags, fibreboard containers	44	27.1						

TABLE A.4: PRINCIPAL COMMODITIES USED BY EACH INDUSTRY: 1977-78, BALANCED WITH TYPICAL AGRICULTURE (continued) [a]

Industry		Principal Commodities Used							
No.	Description	No.	Costs	No.	Costs	No.	Costs	No.	Costs
			%		%		%		%
46	Paper products nec	44	10.8	48	6.4				
47	Publishing, printing	44	8.0	48	6.2				
48	Paper stationery, printing etc.	44	12.7	48	6.4				
Chemicals									
49	Chemical fertilisers	49	12.9	50	5.6				
50	Other basic chemicals	50	18.9						
51	Paints	50	22.3	66	7.3				
52	Pharmaceutical products	52	14.5						
53	Soap and other detergents	48	8.4	18	7.8	50	7.2		
54	Cosmetic and toilet preparations	50	11.1	81	11.2	57	6.2		
55	Other chemical products	50	14.0						
56	Petroleum and coal products	15	19.2	56	8.1				
Non-metallic Mineral Products									
57	Glass and glass products								
58	Clay products and refractories								
59	Cement	16	9.9	63	6.0				
60	Ready-mixed concrete	59	25.1	16	19.1				
61	Concrete products	59	9.6	63	6.0				
62	Other non-metallic mineral products	16	11.4	62	8.7				
Metal, Metal Products									
63	Basic iron and steel	63	23.5	14	5.7				
64	Basic non-ferrous metals	13	31.7	64	14.3				
65	Structural metal products	63	23.7	67	10.3	64	7.5		
66	Sheet metal products	63	30.3						
67	Other metal products	63	17.2	67	5.4	64	5.1		

TABLE A.4: PRINCIPAL COMMODITIES USED BY EACH INDUSTRY: 1977-78, BALANCED WITH TYPICAL AGRICULTURE (continued)[a]

Industry	Principal Commodities Used							
No. Description	No.	Costs	No.	Costs	No.	Costs	No.	Costs
		%		%		%		%
Transport Equipment								
68 Motor vehicles and parts	68	23.3						
69 Ships and boats	67	8.4						
70 Railway rolling stock	63	7.5	70	7.2				
71 Aircraft	71	6.2						
Machinery and Household Appliances								
72 Photographic, scientific equipment								
73 Electronic equipment								
74 Household appliances	74	8.5	63	8.2	75	7.7		
75 Other electrical equipment	64	12.2	75	8.7	50	5.0		
76 Agricultural machinery	76	12.3	63	7.3				
77 Construction machinery	63	12.5	67	6.1				
78 Other machinery and equipment	63	8.3	78	6.4				
Leather, Rubber and Plastic Products								
79 Leather products	79	16.5	18	15.2	A1	8.1		
80 Rubber products	50	8.5	80	6.1	31	5.8		
81 Plastic and related products	50	18.1	81	9.1				
82 Signs, writing equipment	81	11.4						
83 Other manufacturing	16	14.4						
Electricity, Gas and Water								
84 Electricity	84	25.7	14	6.9				
85 Gas	15	15.2	56	5.4				
86 Water, sewerage and drainage								
Building and Construction								
87 Residential building construction	40	5.7	42	5.3	58	5.2		
88 Other construction	65	6.6						

TABLE A.4: PRINCIPAL COMMODITIES USED BY EACH INDUSTRY: 1977-78, BALANCED WITH TYPICAL AGRICULTURE (continued)[a]

Industry		Principal Commodities Used							
No.	Description	No.	Costs	No.	Costs	No.	Costs	No.	Costs
			%		%		%		%
Trade, Transport and Communication									
89	Wholesale trade	102	6.0						
90	Retail trade	102	12.5						
91	Mechanical repairs	68	13.7						
92	Other repairs	78	5.4						
93	Road transport	56	6.9	91	5.2				
94	Rail, other transport, storage	70	10.4	88	8.4				
95	Water transport	95	11.1	102	8.9				
96	Air transport	71	8.9	56	7.0				
97	Communications	97	5.0						
Finance, etc.									
98	Banking	102	7.5						
99	Non-bank finance	102	6.8						
100	Investment	102	12.4						
101	Insurance, services to insurance	102	8.2	101	7.9				
102	Other business services	102	6.0						
103	Ownership of dwellings	99	5.6	86	5.3	87	5.2	98	5.0
Government, Private Services									
104	Public administration	102	5.0						
105	Defence								
106	Health								
107	Education, museums, libraries								
108	Welfare and religious institutions								
109	Entertainment, recreation	109	6.0						
110	Restaurants, hotels and clubs	102	5.4						
111	Personal services	102	5.3						
112	Non-competing imports								

(a) This table shows ranked shares in total industry costs of domestically produced commodity groups purchased for intermediate usage. Shares greater than or equal to 5 per cent are shown. Where more than four such shares exist, only the largest four are shown.

Table A.5: OCCUPATIONAL SHARES OF TOTAL LABOUR EMPLOYED: 1977-78, BALANCED WITH TYPICAL AGRICULTURE[a]

Occupation No.	Name	Short Run Share	Long Run Share
1	Professional White Collar	0.055	0.054
2	Para-professional	0.070	0.068
3	Skilled White Collar	0.070	0.068
4	Semi and Unskilled White Collar	0.284	0.275
5	Skilled Blue Collar - Metal and Electrical	0.096	0.094
6	Skilled Blue Collar - Building	0.031	0.030
7	Skilled Blue Collar - Other	0.025	0.025
8	Semi and Unskilled Blue Collar	0.301	0.290
9	Rural Workers	0.056	0.084
10	Armed Services	0.012	0.012
	TOTAL	1.000	1.000

(a) The distinction between short run and long run employment shares by occupations turns on the treatment of owner-operators in the primary industries (Nos 1-11) - see footnote no. 9 for more detail.

Sources: Higgs (1985, Tables 5.3 and 5.4), Persons matrix in TYAG778CID (position 31).