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Updating the GTAP 1996-97 Australian data base

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Abbreviations

ABS	Australian Bureau of Statistics
CGE	Computable general equilibrium (model)
GDP	Gross Domestic Product
GDP(E)	Gross Domestic Product (Expenditure)
GDP(I)	Gross Domestic Product (Income)
GSC2	GTAP sectoral classification, revision 2
GTAP	Global Trade Analysis Project (Purdue University)
GTAP 5	GTAP version 5 database
IO	Input output
IOPC	Input-output product classification
MF	Imports vector (free of duty)
OP	Output / Production vector at market prices
SNA68	System of National Accounts, revised 1968
SNA93	System of National Accounts, revised 1993
UF	Use matrix, pre-commodity tax
UN	United Nations
UP	Use matrix, post-commodity tax

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The Australian component of the GTAP version 6 data base was constructed from key input-output tables supplied by the Australian Bureau of Statistics and some supporting tables estimated from other data sources. The data provided covers the Australian financial year ended 30 June 1997. The data were cleaned and transformed to meet GTAP's requirements and homogeneity assumptions were used to convert the data from 106 'multi-product' sectors to 'single-product' sectors. Finally, the data tables were reclassified and re-balanced to provide the matrices required by GTAP.

This paper describes the construction of the Australian component of the data base for version 6 of the Global Trade Analysis Project (GTAP) model. The provision of the data for Australia was undertaken as part of the Productivity Commission's commitment as a member of the GTAP consortium.

In line with GTAP requirements, as outlined in Huff, McDougall and Walmsley (2000), the data for Australia were provided in four matrices:

- the supply and use of the 57 GTAP products and three primary factors of production (land, labour and capital) *without* product taxes (GTAP matrix UF);
- the supply and use of the 57 GTAP products and three primary factors *with* product taxes (GTAP matrix UP);
- output of the 57 GTAP products (GTAP vector OP); and
- imports of the 57 GTAP products (GTAP vector MF).

Because data definitions and classifications of input-output information available to undertake the update do not match precisely with the requirements of GTAP, a 'building block' approach has been adopted. Under this approach, available information was first adjusted or reclassified according to GTAP requirements. When this processing was complete, the individual building blocks so derived were assembled according to the structure of the GTAP data base as defined by the GTAP tables UF, UP, OP and MF.

Section 1 describes the key data sources used, while section 2 outlines the processing of source data into a form corresponding to GTAP requirements. Section 3 describes how these data were brought together into the GTAP format. Section 4 notes key conceptual differences and sensitivities between this version and the Australian component of version 5 of the GTAP data base. Section 5 notes key diagnostics tests applied to the data base before its distribution.

1 Source data

The primary data sources used to construct the Australian data base were electronic versions of the 1996-97 input-output (IO) tables made available by the Australian Bureau of Statistics for the Australian financial year ended 30 June 1997.¹ The ABS tables contain detailed data on the supply and use of 106 products in Australia and the associated product tax payments (see table 1 for a list of tables of supply, use and derived tables provided in electronic format for the input-output 106 sector Australian product classification).

Two versions of the 1996-97 input-output tables were made available by the ABS. The versions differed with respect to the treatment of transport margin activities.² The first version recorded such margin service flows differently depending on whether the buyer or seller was invoiced for the cost of transportation and goods traded. This treatment accorded with the recommended treatment of transport margins set out in the System of National Accounts, 1993 edition (Commission of European Communities et al. 1993). The second version recorded transport margin service flows on a common basis — as a cost to the buyer regardless of who was actually invoiced for the transport service (whether the buyer or seller). This treatment of transport services accorded with the treatment set out in the 1968 edition of the System of National Accounts (UN 1968) and the treatment applied in the Australian input-output tables for the financial year 1993-94 — the reference year for the Australian tables submitted for version 5 of the GTAP data base.

The recording of transport margin service flows on a SNA68 basis has significant advantages for economic analysis using input-output tables (Aspen 2001 and

¹ ABS (2000) describes the concepts, sources and methods used in compiling the Australian input-output tables.

² The ABS defines margin activities to be the difference between the price received by producers (basic prices) and the price paid by the purchaser of a good or service (purchasers' prices). Margin activities fall into two broad groups — mark-ups and taxes. Mark-ups primarily increase the value of goods without otherwise transforming them and include wholesale and retail trade margins and transport margins. Tax margins are taxes or subsidies levied on products and include sales taxes, excise taxes, customs duties (tariffs) and, since July 2000, the goods and services tax.

Gretton, Bobbin and Horridge 2004). The GTAP secretariat indicated a preference for the data base to be prepared on an SNA68 basis (McDougall, R., GTAP, Purdue University, pers. comm., 9 September 2003). Consequently, the primary data sources used to construct the Australian component of the GTAP version 6 data base was the electronic version of key input-output tables compiled by the ABS according to SNA68.³

A third potential data source was also considered — the 1996-97 MONASH model data base (Horridge 2002). However, this source was derived from the ABS input-output tables that included the SNA93 treatment of transport margin services. Thus, while the MONASH data base provided operational advantages for the compilation of the GTAP data base, it suffered from the same limitations as the ABS tables on which it was based, and accordingly was not used in the current exercise.

Some secondary data sources referenced in this document were used to fill gaps in the primary source data. These gaps arose either because the ABS restricted the release of certain statistics to preserve confidentiality or because some of the supporting tables needed to construct the GTAP data base were not provided by the ABS on an SNA68 basis.⁴ Any missing SNA68 supporting tables required, such as the duty and commodity tax tables, were estimated from data in the SNA68 tables supplied supplemented with data from the corresponding SNA93 tables.

2 Processing of the source data

The ABS data, although similar to the format of the GTAP data requirements, did not fully satisfy all aspects of the GTAP requirements as set out in Huff, McDougall and Walmsley (2000) without adjustment. The main adjustments applied to the ABS data were:

- the removal of negative value flows;
- the reconciliation of basic price and producer price flows;
- the re-coding of imports, from the generic ABS category of complementary imports to disaggregated GTAP products;

³ The SNA68 *Use table* supplied by the ABS also contained some revisions. In 60 of the 106 IOPC commodities, mainly in the mining and manufacturing sectors, SNA68 *Total supply* (col. T6) was lower than published under SNA93. Most revisions were modest (less than 2 per cent). As a result, *Total intermediate usage* (row T1) was only 0.7 per cent lower. *Australian production* (row T2) and *Total usage* (row T3) were, respectively, also 0.5 per cent and 0.4 per cent lower. *Gross domestic product* and *Gross value added* were unchanged.

⁴ To preserve confidentiality, the ABS restricts the release of statistics where the disclosure of the statistics would enable the identification of data supplied by individuals or firms.

-
- the removal of ‘re-exports’ from imports and exports;
 - the re-classification of the ABS primary factor inputs to GTAP input categories;
 - the aggregation of the ABS investment categories to the single GTAP investment category;
 - the treatment of other taxes less subsidies on production;
 - the transformation of industries from a multi-product to a single-product structure;
 - the re-classification of flows classified by ABS industry categories to GTAP categories; and
 - the final balancing of the data base.

The process for creating the GTAP version 6 data base for Australia is illustrated in figure 1. Details of each process are outlined below.

2.1 Removal of negative value flows

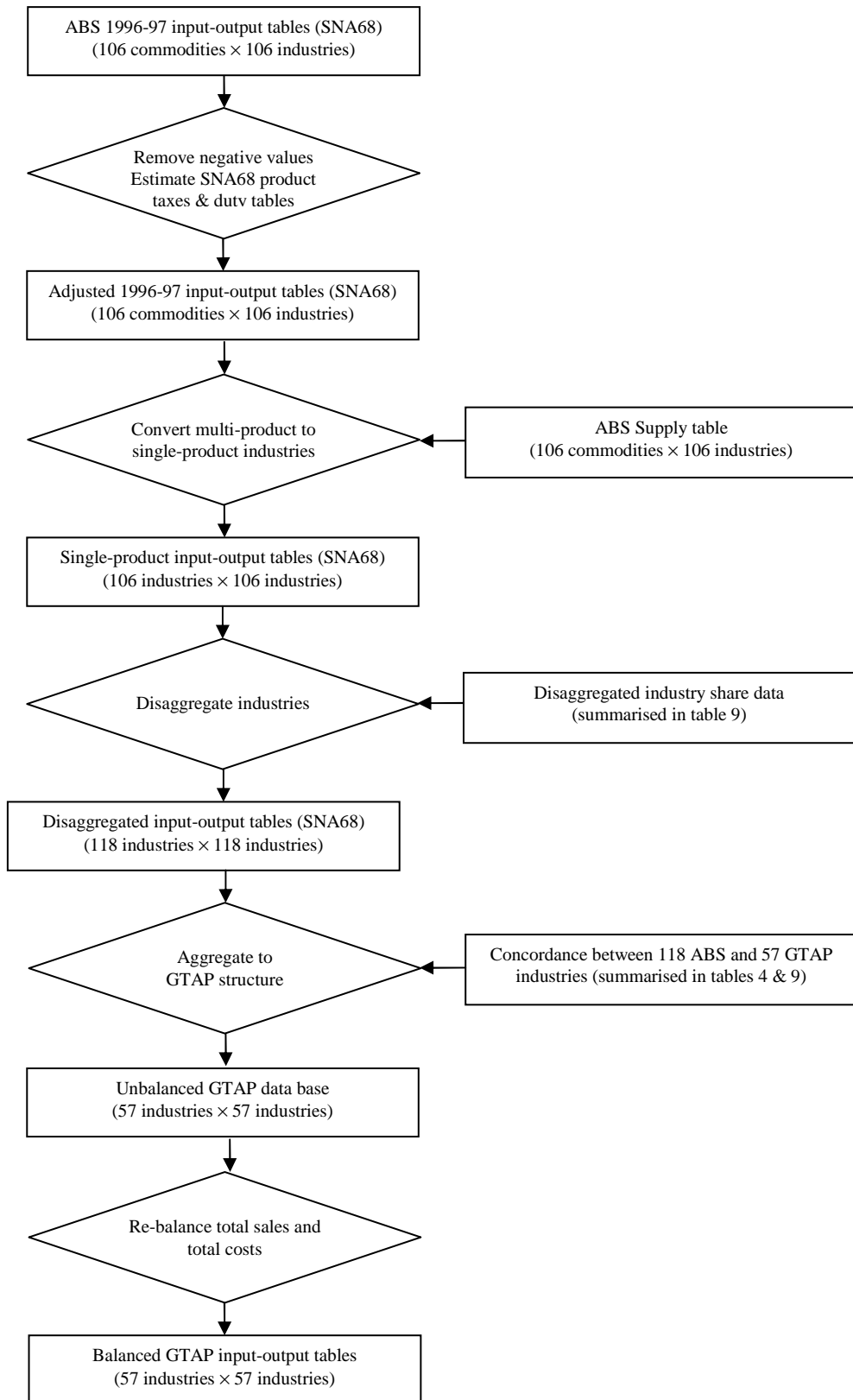
Negative value flows were found to exist for definitional and data reasons.

The main reason for the negative value flows was the recording of imports on a ‘net basis’ in the ABS input-output tables. Under this convention, the net value of imports transportable goods was reported as the value of goods imported *less* the cost of any Australian transport services incurred in bringing those goods to Australia. To balance the supply and use of relevant flows, the cost of any Australian transport services were deducted from industry and final users’ consumption of relevant transport services. Consequentially, usage of imports of water transport and air transport was set to zero for 88 industries and exports of water transport and air transport services were increased by an identical amounts (see table 5).

In a similar vein, the reported negative of A\$135.7 million for household consumption of imported water transport was increased to +\$A25.7 million on the basis of benchmark information provided in the 1993-94 input-output tables (ABS 1997).⁵ Household consumption of domestically produced water transport was reduced by A\$161.4 million to offset the adjustment to imports and maintain aggregate household consumption at its initial level. Exports of water transport services were increased to balance supply and use.

⁵ Household final consumption of imported *water transport* in 1996-97 was set to 4 per cent of total intermediate usage, the same share as in the 1993-94 input-output tables (ABS 1997).

Figure 1 **Process for creating the GTAP version 6 Australian data base**



Negative value flows also occurred when the estimated use of imports exceeded total use of a product. This statistical relationship implied that input of domestic production by certain users was negative (table 6). These negatives were removed by increasing intermediate usage of domestically produced products to zero and total use by the same amount. To maintain the balance between total costs and sales, imports and exports of these commodities were reduced by 50 per cent of the original negative value.

2.2 Reconciling basic price and producer price flows

GTAP requires that data on usage of products be reported at basic prices (matrix UF) and at producers' prices (matrix UP) with the difference between the two matrices being taxes on products.

The ABS provided data at basic prices together with a matrix of the impost on users of aggregate taxes on products (ABS IO table 33) and matrices on the components:

- sales tax by commodity and category of use (ABS IO table 34);
- import duty by commodity and category of use (ABS IO table 35);
- other taxes on products by commodity and category of use (ABS IO table 36); and
- (less) subsidies on products by commodity and category of use (ABS IO table 37).

In principle, the table at producers' prices required by GTAP could have been obtained by simple aggregation of the basic price flows and taxes on these flows. However, revised variants of the relevant tax tables were not available at basic prices with the SNA68 treatment of transport margins service flows (see table 2).

Therefore, to complete the data set, estimates of product taxes had to be imputed. This was done by imputing the 'ad valorem' duty, tax or subsidy rate implied by the basic price and product tax tables with the SNA93 treatment of transport services. This ad valorem rate was then applied to the revised use or imports tables at basic prices, as appropriate, to derive revised product tax tables showing (net) product taxes and imports duty. Finally, the results so derived for each industry were scaled to ensure that total product taxes paid by each industry matched comparable totals provided by the relevant benchmark ABS data (ie row P3 in the in the *Use table* — ABS IO table 2 (SNA68)).

2.3 Re-coding of complementary imports

The use and imports tables supplied by the ABS (ABS IO tables 2 and 3, respectively) distinguished between imports of goods produced in Australia (*Competing imports*, row P6) and those that are not (*Complementary imports*, row P5). Complementary imports in 1996-97 mostly comprised motor cycles (A\$250.8 million) and natural rubber (A\$78.8 million) (ABS 2001a, p. 92). Competing imports accounted for 99.7 per cent of Australian imports in 1996-97.

The GTAP data base assigns all imports to specified industry of origin products and makes no provision for complementary imports defined from the perspective of an individual country. In order to conform to GTAP accounting conventions, *Complementary imports* were allocated to each industry's use of competing imports.

2.4 Removal of re-exports

The imports table supplied by the ABS (ABS IO table 3) contained information on 're-exports' — goods temporarily brought into Australia that are subsequently exported (row 9909). Re-exports accounted for 2 per cent of Australian imports in 1996-97.

As re-exports are not included in the GTAP data base, re-export flows were identified and subtracted from total exports and imports. Handling and distribution services provided by Australian firms and associated with re-exports were retained and classified as an export of a transport or distribution service in accordance with the convention adopted in source data tables provided by the ABS.

2.5 Reclassification of primary factors of production

The use table supplied by the ABS (ABS IO table 2) provided data on the inputs of two primary factors of production — *Compensation of employees* (row P1) and *Gross operating surplus & mixed income* (row P2) — by each industry. These categories overlap with the three primary input categories — land, labour and capital — specified in the GTAP data base.

To complete the GTAP data base, the ABS categories were reclassified to GTAP categories using the primary factor shares adopted in the MONASH model data base (table 7). Horridge (2002) describes the derivation of the primary factor shares from the underlying published input-output tables.

2.6 Aggregation of investment

The ABS provided data on commodity sales to each category of final demand — final consumption expenditure disaggregated to private and government; gross fixed capital formation disaggregated to private, public enterprises and general government; changes in inventories; and exports (table 8).

The categorisation is similar to that applied in GTAP, with the exception that the ABS categories of *Gross fixed capital formation — Private* (column Q3 of ABS IO tables 2 and 3); *Gross fixed capital formation — Public enterprises* (column Q4); and *Gross fixed capital formation — General Government* (column Q5) provide a more detailed breakdown than required for GTAP. To complete the GTAP data base, these categories were aggregated to form the GTAP final demand category *Investment*.

2.7 Treatment of other taxes less subsidies on production

The ABS definition of total sectoral usage (row T2 in ABS IO table 2) includes ‘other taxes less subsidies on production’ whereas the GTAP definition of total usage does not (matrices UF and UP). The estimated total value of these taxes less subsidies was A\$22 650 million in 1996-96.⁶

2.8 Converting multi-product industries to single-product industries

The basic input-output tables provided by the ABS are ‘multi-product’ in nature — that is, each industry produces commodities characteristic of that industry and can also produce commodities characteristic of other industries (eg the ABS *Dairy products* industry primarily produced *Dairy products* but also produced some *Meat and meat products*).

The GTAP model (and hence its data base) on the other hand is ‘single product’ in nature — that is, each ‘industry’ is defined as producing only one ‘commodity’ and each ‘commodity’ is produced by only one ‘industry’.

⁶ The ABS defines ‘other taxes on production’ as ‘all taxes that enterprises incur as a result of engaging in production, except taxes on products’ and includes: payroll taxes; recurrent taxes on land, buildings or other structures; some business and professional licences; stamp duties; taxes on pollution; and taxes on international transactions. Likewise, the ABS defines ‘other subsidies on production’ as ‘all subsidies, except subsidies on products, which resident enterprises may receive as a consequence of engaging in production’ and includes employment subsidies (ABS 2000, *Australian National Accounts: Concepts, Sources and Methods*, Cat. no 5216.0).

The multi-product ABS input-output tables were converted to single-product, or symmetric, tables by applying the industry technology assumption, whereby all products produced by an industry were assumed to be produced with the same input-output structure. It also was assumed that an industry supplied each user of products it produced in proportion to its market share for that product. Market share information needed for the application of these assumptions was derived from the supply table provided by the ABS (ABS IO table 1).

The application of these assumptions enables the ‘commodity by industry’ tables supplied by the ABS to be converted to ‘industry by industry’ tables.

2.9 Mapping ABS products to their GTAP counterparts

The Australian input-output tables have 106 sectors compared to the 57 in the GTAP version 6 data base (these are listed in tables 2 and 3, respectively). To complete the data base on a 57 sector basis, a concordance was established between the two classifications (table 4) and used to map the input-output data from the 106 ABS sectors to the 57 GTAP sectors.

The concordance shows that 93 ABS sectors can be linked directly to one of the GTAP sectors without adjustment. However, it also shows that 13 ABS sectors were linked to more than one GTAP sector.⁷ For example, the ABS sector *Grains* is linked to the GTAP sectors *Paddy rice*, *Wheat*, *Oil-seeds* and *Cereal grains*.

The process for mapping information on the use of sector outputs (rows) and sector inputs (columns) (and associated product taxes) involved, for each relevant ABS sector, a decomposition of the relevant rows and columns into building block categories that could be linked directly or re-aggregated to a GTAP sector.

Inputs to production and sector outputs were estimated for each building block sector by reference to detailed sector-specific information contained in the MONASH model data base. Where such information was not available (ie where the sectors in MONASH did not correspond to the sectors needed to compile the GTAP data base), the ABS input and output structures were apportioned according to ABS output shares (table 9).

2.10 Balancing the data base

Once all adjustments were completed, the GTAP data base was balanced to ensure that total sales aligned with total costs for each sector and that the income and

⁷ The data used are too detailed to present here in full and is available from the authors on request.

expenditure components of GDP aligned with estimates published by the ABS taking into account any adjustments associated with meeting GTAP's requirements.

3 Data base supplied to GTAP

The above steps provided a series of 'building block' tables that met GTAP classificatory and data requirements, but did not conform to the data base structure outlined by Huff, McDougall and Walmsley (2000).

Assembly of the final tables involved:

- for the matrix UF, merging the domestic usage of domestic production, imported supplies and primary inputs by sector and category of final demand, evaluated at basic prices into a single array.
- for the matrix UP, aggregating estimated product taxes (net) by sector and category of use with estimates of usage at basic prices (matrix UF) to provide estimates of usage of domestic production and imported supplies at producer prices.
- for the vector OP, transferring estimated output by sector from the building block tables to a single array. The value of output is estimated at basic prices and, as such, is inclusive of all domestically produced and imported inputs, and product taxes on those inputs (matrix UP) plus other taxes and subsidies on production (such as payroll and land taxes) (not included in matrix UF or UP).
- for the vector MF, transferring the total value of imports by sector (single product industry basis) from the building block tables to a single array.

4 Comparability with previous GTAP data bases

The starting point for the GTAP version 5 data base for Australia was the MONASH model data base for the reference year 1993-94. That data base was benchmarked to ABS input-output tables for that year; however, it had the advantage of commodity and industry disaggregations needed to provide information according to the GTAP sectoral classification.

The starting point for the GTAP version 6 data base was a special version of the input-output tables compiled by the ABS on request from the Productivity Commission. This version differed from the published tables for 1996-97 with respect to the treatment of transport margin services (as outlined above).

Although this treatment is aligned to the treatment of transport services in the 1993-94 MONASH data base (and supporting input-output tables), the treatment has not been carried forward to the most recent MONASH data base, at this stage.

More generally, the version 6 data base provided has been compiled according to the statistical standards promulgated in the SNA93, whereas the version 5 data base provided by Mastoris, Travis and Welsh (2002) was based on data compiled according to the statistical standards promulgated in the SNA68. Details of the changes to the Australian national accounts and supporting output tables associated with the new standards are provided in ABS (1997).

5 Diagnostics

The Australian GTAP data base was checked to ensure that:

- (a) there were no negative values (other than where appropriate);
- (b) the pre- and post disaggregation value of costs and sales balanced;
- (c) total sales equalled total costs in total and by sector;
- (d) the values for GDP, GDP(I) and GDP(E) were correct;
- (e) that the components of GDP(I) and GDP(E) were correct; and
- (f) the GTAP entropy input-output cost shares appeared correct.⁸

⁸ The entropy input-output cost shares used measure the difference in cost shares for each industry in the Australian data base compared to a representative GTAP data base and highlight any unusual cost shares (Walmsley and McDougall 2001).

Annex

Table 1 **1996-97 input-output data available electronically**

<i>Grouping</i>	<i>Table</i>	<i>Description</i>	
Basic tables	1†	Supply table — supply by product group by industry and imports	
	2†*	Use table — input by industry and final use category and supply by product group	
	3†*	Imports table — input by industry and final use category and supply by product group	
	4	Reconciliation of flows at basic prices and at purchasers' prices by product	
Industry by industry tables (basic prices, recording intra-industry flows)^a			
107 Industries		Direct allocation of competing imports	
	5	Flow matrix	
	6	Direct requirements coefficients from Table 5	
	7	Total requirements coefficients from Table 6	
		Indirect allocation of competing imports	
	8	Flow matrix	
	9	Direct requirements coefficients from Table 8	
	10	Total requirements coefficients from Table 9	
	Primary input tables	17	Primary input content (total requirements) per \$100 of final use by industry
		18	Primary input content by industry of each category of final use
Other tables	19	Specialisation and coverage ratios by industry	
	20	Employment by industry	
	21	Composition of supply of product groups containing margin products	
	22	Output multipliers, direct allocation of competing imports	
Margin matrices^b	23	Wholesale trade (4501, part)	
	24	Retail trade (5101, part)	
	25	Restaurants, hotels and clubs (5701, part)	
	26	Road transport (6101, part)	
	27	Rail transport (6201, part)	
	28	Pipeline transport (6201, part)	
	29	Water transport (6301, part)	
	30	Air transport (6401, part)	
	31	Port handling (6601, part)	
	32	Marine insurance (7401, part)	
	33†	Taxes on products (net)	
	34	Sales tax	
	35†	Duty	
	36	Other taxes on products	
	37	Subsidies on products	

* Also supplied by the ABS on an SNA68 basis. † used in constructing the GTAP data base. ^a Similar tables are available at the 35 industry level (ABS IO tables 11 to 16). ^b Supply of margin by product group to which the margin applies and input of margin by industry and final use category.

Source: ABS 2001a (*Input-Output Tables, Australia, 1996-97*, Cat. no. 5209.0, p. 93).

Table 2 ABS input-output product classification, 1996-97

<i>No.</i>	<i>IOPC</i>	<i>Description</i>	<i>No.</i>	<i>IOPC</i>	<i>Description</i>
1	0101	Sheep	39	2402	Publishing, recorded media etc
2	0102	Grains	40	2501	Petroleum & coal products
3	0103	Beef cattle	41	2502	Basic chemicals
4	0104	Dairy cattle	42	2503	Paints
5	0105	Pigs	43	2504	Pharmaceuticals
6	0106	Poultry	44	2505	Soap & detergents
7	0107	Other agriculture	45	2506	Cosmetics & toiletries
8	0200	Services to agriculture ^a	46	2507	Other chemical products
9	0300	Forestry & logging	47	2508	Rubber products
10	0400	Commercial fishing	48	2509	Plastic products
11	1100	Coal, oil & gas	49	2601	Glass & glass products
12	1301	Iron ores	50	2602	Ceramic products
13	1302	Non-ferrous metal ores	51	2603	Cement, lime & concrete slurry
14	1400	Other mining	52	2604	Plaster & other concrete products
15	1500	Services to mining	53	2605	Other non-metallic mineral products
16	2101	Meat & meat products	54	2701	Iron & steel
17	2102	Dairy products	55	2702	Basic non-ferrous metals
18	2103	Fruit & vegetable products	56	2703	Structural metal products
19	2104	Oils & fats	57	2704	Sheet metal products
20	2105	Flour & cereal foods	58	2705	Fabricated metal products
21	2106	Bakery products	59	2801	Motor vehicles & parts etc
22	2107	Confectionery	60	2802	Ships & boats
23	2108	Other food products	61	2803	Railway equipment
24	2109	Soft drinks, cordials & syrups	62	2804	Aircraft
25	2110	Beer & malt	63	2805	Scientific etc equipment
26	2111	Wine & spirits	64	2806	Electronic equipment
27	2112	Tobacco products	65	2807	Household appliances
28	2201	Textile fibres, yarns etc	66	2808	Other electrical equipment
29	2202	Textile products	67	2809	Agricultural, mining etc machinery
30	2203	Knitting mill products	68	2810	Other machinery & equipment
31	2204	Clothing	69	2901	Prefabricated buildings
32	2205	Footwear	70	2902	Furniture
33	2206	Leather & leather products	71	2903	Other manufacturing
34	2301	Sawmill products	72	3601	Electricity supply
35	2302	Other wood products	73	3602	Gas supply
36	2303	Pulp, paper & paperboard	74	3701	Water, sewerage & drainage
37	2304	Paper containers & products	75	4101	Residential building
38	2401	Printing & services to printing	76	4102	Other construction

(Continued next page)

Table 2 (continued)

<i>No.</i>	<i>IOPC</i>	<i>Description</i>	<i>No.</i>	<i>IOPC</i>	<i>Description</i>
77	4501	Wholesale trade	92	7701	Ownership of dwellings
78	5101	Retail trade	93	7702	Other property services
79	5401	Mechanical repairs	94	7801	Scientific research etc
80	5402	Other repairs	95	7802	Legal, accounting etc services
81	5701	Accommodation, cafes & restaurants	96	7803	Other business services
82	6101	Road transport	97	8101	Government administration
83	6201	Rail transport ^b	98	8201	Defence
84	6301	Water transport	99	8401	Education
85	6401	Air transport ^c	100	8601	Health services
86	6601	Services to transport ^d	101	8701	Community services
87	7101	Communication services	102	9101	Motion picture, radio etc
88	7301	Banking	103	9201	Libraries, museums & the arts
89	7302	Non-bank finance	104	9301	Sport, gambling etc
90	7401	Insurance	105	9501	Personal services
91	7501	Services to finance etc	106	9601	Other services

^a Services to agriculture, hunting & trapping. ^b Rail, pipeline & other transport. ^c Air & space transport. ^d Services to transport, storage.

Source: ABS 2001a (*Input-Output Tables, Australia, 1996-97*, Cat. no. 5209.0).

Table 3 GTAP sectoral classification (GSC2)

<i>No.</i>	<i>Code</i>	<i>Description</i>	<i>No.</i>	<i>Code</i>	<i>Description</i>
1	pdr	Paddy rice	30	lum	Wood products
2	wht	Wheat	31	ppp	Paper products, publishing
3	gro	Cereal grains nec	32	p_c	Petroleum, coal products
4	v_f	Vegetables, fruit, nuts	33	crp	Chemical, rubber, plastic products
5	osd	Oil-seeds	34	nmm	Mineral products nec
6	c_b	Sugar cane, sugar beet	35	i_s	Ferrous metals
7	pfb	Plant-based fibers	36	nfm	Metals nec
8	ocr	Crops nec	37	fmp	Metal products
9	ctl	Bovine cattle, sheep & goats, horses	38	mvh	Motor vehicles & parts
10	oap	Animal products nec	39	otn	Transport equipment nec
11	rmk	Raw milk	40	ele	Electronic equipment
12	wol	Wool, silk-worm cocoons	41	ome	Machinery & equipment nec
13	for	Forestry	42	omf	Manufactures nec
14	fsh	Fishing	43	ely	Electricity
15	col	Coal	44	gdt	Gas manufacture, distribution
16	oil	Oil	45	wtr	Water
17	gas	Gas	46	cns	Construction
18	omn	Minerals nec	47	trd	Trade
19	cmt	Bovine cattle, sheep & goat, horse meat products	48	otp	Transport nec
20	omt	Meat products nec	49	wtp	Water transport
21	vol	Vegetable oils & fats	50	atp	Air transport
22	mil	Dairy products	51	cmn	Communication
23	pcr	Processed rice	52	ofi	Financial services nec
24	sgr	Sugar ^a	53	isr	Insurance
25	ofd	Food products nec	54	obs	Business services nec
26	b_t	Beverages & tobacco products	55	ros	Recreational & other services
27	tex	Textiles	56	osg	Public administration & defense, education, health services
28	wap	Wearing apparel	57	dwe	Dwellings
29	lea	Leather products			

^a Refined sugar.

Source: Huff, McDougall and Walmsley 2000, pp. 12–3.

Table 4 Concordance between ABS and GTAP products

<i>IOPC</i>	<i>ABS product</i>	<i>GTAP product</i>	<i>GTAP no.</i>
0101	Sheep	Bovine cattle, sheep & goats, horses	9
		Wool, silk-worm cocoons	12
0102	Grains	Paddy rice	1
		Wheat	2
		Cereal grains nec	3
		Oil-seeds	5
0103	Beef cattle	Bovine cattle, sheep & goats, horses	9
0104	Dairy cattle	Bovine cattle, sheep & goats, horses	9
		Raw milk	11
0105	Pigs	Animal products nec	10
0106	Poultry	Animal products nec	10
0107	Other agriculture	Vegetables, fruit, nuts	4
		Sugar cane, sugar beet	6
		Plant-based fibers	7
		Crops nec	8
		Bovine cattle, sheep & goats, horses	9
		Animal products nec	10
		Forestry	13
		0200	Services to agriculture
Wheat	2		
Cereal grains nec	3		
Vegetables, fruit, nuts	4		
Oil-seeds	5		
Sugar cane, sugar beet	6		
Plant-based fibers	7		
Crops nec	8		
Bovine cattle sheep & goats, horses	9		
Animal products nec	10		
Raw milk	11		
Wool, silk-worm cocoons	12		
0300	Forestry & logging		
0400	Commercial fishing	Fishing	14
1100	Coal, oil & gas	Coal	15
		Oil	16
		Gas	17
1301	Iron ores	Minerals nec	18
1302	Non-ferrous metal ores	Minerals nec	18
1400	Other mining	Minerals nec	18
1500	Services to mining	Oil	16
		Minerals nec	18
2101	Meat & meat products	Animal products nec	10
		Bovine cattle, sheep & goat, horse meat products	19
		Meat products nec	20
2102	Dairy products	Dairy products	22

(Continued next page)

Table 4 (continued)

<i>IOPC</i>	<i>ABS product</i>	<i>GTAP product</i>	<i>GTAP no.</i>
2103	Fruit & vegetable products	Food products nec	25
2104	Oils & fats	Vegetable oils & fats	21
2105	Flour & cereal foods	Processed rice	23
		Food products nec	25
2106	Bakery products	Food products nec	25
2107	Confectionery	Food products nec	25
2108	Other food products	Sugar	24
		Food products nec	25
2109	Soft drinks, cordials & syrups	Beverages & tobacco products	26
2110	Beer & malt	Beverages & tobacco products	26
2111	Wine & spirits	Beverages & tobacco products	26
2112	Tobacco products	Beverages & tobacco products	26
2201	Textile fibres, yarns etc	Textiles	27
2202	Textile products	Textiles	27
2203	Knitting mill products	Textiles	27
		Wearing apparel	28
2204	Clothing	Wearing apparel	28
2205	Footwear	Leather products	29
2206	Leather & leather products	Leather products	29
2301	Sawmill products	Wood products	30
2302	Other wood products	Wood products	30
2303	Pulp, paper & paperboard	Paper products, publishing	31
2304	Paper containers & products	Paper products, publishing	31
2401	Printing & services to printing	Paper products, publishing	31
2402	Publishing, recorded media etc	Paper products, publishing	31
2501	Petroleum & coal products	Petroleum, coal products	32
2502	Basic chemicals	Chemical, rubber, plastic products	33
2503	Paints	Chemical, rubber, plastic products	33
2504	Pharmaceuticals	Chemical, rubber, plastic products	33
2505	Soap & detergents	Chemical, rubber, plastic products	33
2506	Cosmetics & toiletries	Chemical, rubber, plastic products	33
2507	Other chemical products	Chemical, rubber, plastic products	33
2508	Rubber products	Chemical, rubber, plastic products	33
2509	Plastic products	Chemical, rubber, plastic products	33
2601	Glass & glass products	Mineral products nec	34
2602	Ceramic products	Mineral products nec	34
2603	Cement, lime & concrete slurry	Mineral products nec	34
2604	Plaster & other concrete products	Mineral products nec	34
2605	Other non-metallic mineral products	Mineral products nec	34
2701	Iron & steel	Ferrous metals	35
2702	Basic non-ferrous metals	Metals nec	36
2703	Structural metal products	Metal products	37
2704	Sheet metal products	Metal products	37
2705	Fabricated metal products	Metal products	37

(Continued next page)

Table 4 (continued)

<i>IOPC</i>	<i>ABS product</i>	<i>GTAP product</i>	<i>GTAP no.</i>
2801	Motor vehicles & parts etc	Motor vehicles & parts	38
2802	Ships & boats	Transport equipment nec	39
2803	Railway equipment	Transport equipment nec	39
2804	Aircraft	Transport equipment nec	39
2805	Scientific etc equipment	Machinery & equipment nec	41
2806	Electronic equipment	Electronic equipment	40
2807	Household appliances	Machinery & equipment nec	41
2808	Other electrical equipment	Machinery & equipment nec	41
2809	Agricultural, mining etc machinery	Machinery & equipment nec	41
2810	Other machinery & equipment	Machinery & equipment nec	41
2901	Prefabricated buildings	Manufactures nec	42
2902	Furniture	Manufactures nec	42
2903	Other manufacturing	Manufactures nec	42
3601	Electricity supply	Electricity	43
3602	Gas supply	Gas manufacture, distribution	44
3701	Water, sewerage & drainage	Water	45
4101	Residential building	Construction	46
4102	Other construction	Construction	46
4501	Wholesale trade	Trade	47
5101	Retail trade	Trade	47
5401	Mechanical repairs	Trade	47
5402	Other repairs	Trade	47
5701	Accommodation, cafes & restaurants	Trade	47
6101	Road transport	Transport nec	48
6201	Rail transport	Transport nec	48
6301	Water transport	Water transport	49
6401	Air transport	Air transport	50
6601	Services to transport	Transport nec	48
		Water transport	49
		Air transport	50
7101	Communication services	Communication	51
7301	Banking	Financial services nec	52
7302	Non-bank finance	Financial services nec	52
7401	Insurance	Insurance	53
7501	Services to finance etc	Financial services nec	52
		Insurance	53
7701	Ownership of dwellings	Dwellings	57
7702	Other property services	Business services nec	54
7801	Scientific research etc	Business services nec	54
7802	Legal, accounting etc services	Business services nec	54
7803	Other business services	Business services nec	54
8101	Government administration	Public administration & defense, education, health	56
8201	Defence	Public administration & defense, education, health	56

(Continued next page)

Table 4 (continued)

<i>IOPC</i>	<i>ABS product</i>	<i>GTAP product</i>	<i>GTAP no.</i>
8401	Education	Public administration & defense, education, health	56
8601	Health services	Public administration & defense, education, health	56
8701	Community services	Public administration & defense, education, health	56
9101	Motion picture, radio etc	Recreational & other services	55
9201	Libraries, museums & the arts	Recreational & other services	55
9301	Sport, gambling etc	Recreational & other services	55
9501	Personal services	Recreational & other services	55
9601	Other services	Public administration & defense, education, health	56

Source: Estimates based on Huff, McDougall and Walmsley 2000 and ABS 1995 (*Central Product Classification*).

Table 5 Intermediate use of imported *Water transport* and *Air transport*

<i>Measure</i>	<i>Units</i>	<i>Water transport (6301)</i>	<i>Air transport (6401)</i>
Negative elements	No. of cells	83	5
Total value of negative imports	A\$ million	-50.0	-129.8
Total value of imports	A\$ million	686.8	1497.3
Negatives' share	Per cent	7.3	8.7

Source: ABS 2001a (*Input-Output Tables, Australia, 1996-97*, Cat. no. 5209.0, SNA68 unpublished).

Table 6 Negative cells in the ABS *Domestic use table*^a
A\$ million, 1996-97, Basic prices

<i>Commodity</i>	<i>Using industry</i>	<i>Value</i>
2806 Electronic equipment	0106 Poultry	-0.00050
0104 Dairy cattle	2106 Bakery products	-0.00004
0104 Dairy cattle	2108 Other food products	-0.00002
0104 Dairy cattle	5701 Accommodation, cafes & restaurants	-0.00118
7702 Other property services	7801 Scientific research etc	-0.13875
0104 Dairy cattle	8201 Defence	-0.00001
2805 Scientific equipment	9501 Personal services	-0.16554
Total		-0.30604

^a Derived by subtracting SNA68 *Imports table* (ABS IO table 3) from the SNA68 *Use table* (ABS IO table 2).

Source: ABS 2001a (*Input-Output Tables, Australia, 1996-97*, Cat. no. 5209.0, SNA68 unpublished).

Table 7 Primary factor shares^a
Per cent

No.	<i>IOPC</i>	<i>ABS industry</i>	<i>Land</i>	<i>Labour</i>	<i>Capital^b</i>
1	0101	Sheep	39.7	39.5	20.8
2	0102	Grains	41.5	36.0	22.5
3	0103	Beef cattle	37.6	42.5	19.9
4	0104	Dairy cattle	36.9	49.5	13.6
5	0105	Pigs	32.3	55.4	12.3
6	0106	Poultry	0.0	47.0	53.0
7	0107	Other agriculture	31.4	49.7	18.8
8	0200	Services to agriculture	0.0	85.4	14.6
9	0300	Forestry & logging	0.0	81.6	18.4
10	0400	Commercial fishing	0.0	67.5	32.5
11	1100	Coal, oil & gas	0.0	22.3	77.7
12	1301	Iron ores	0.0	24.7	75.3
13	1302	Non-ferrous metal ores	0.0	29.0	71.0
14	1400	Other mining	0.0	21.4	78.6
15	1500	Services to mining	0.0	53.5	46.5
16	2101	Meat & meat products	0.0	82.4	17.6
17	2102	Dairy products	0.0	45.9	54.1
18	2103	Fruit & vegetable products	0.0	48.1	51.9
19	2104	Oils & fats	0.0	54.6	45.4
20	2105	Flour & cereal foods	0.0	38.2	61.8
21	2106	Bakery products	0.0	66.0	34.0
22	2107	Confectionery	0.0	65.0	35.0
23	2108	Other food products	0.0	57.6	42.4
24	2109	Soft drinks, cordials & syrups	0.0	50.2	49.8
25	2110	Beer & malt	0.0	21.6	78.4
26	2111	Wine & spirits	0.0	26.9	73.1
27	2112	Tobacco products	0.0	25.1	74.9
28	2201	Textile fibres, yarns etc	0.0	71.7	28.3
29	2202	Textile products	0.0	71.9	28.1
30	2203	Knitting mill products	0.0	74.1	25.9
31	2204	Clothing	0.0	81.0	19.0
32	2205	Footwear	0.0	84.5	15.5
33	2206	Leather & leather products	0.0	88.9	11.1
34	2301	Sawmill products	0.0	48.0	52.0
35	2302	Other wood products	0.0	66.7	33.3
36	2303	Pulp, paper & paperboard	0.0	44.3	55.7
37	2304	Paper containers & products	0.0	55.3	44.7
38	2401	Printing & services to printing	0.0	62.3	37.7
39	2402	Publishing, recorded media etc	0.0	54.0	46.0
40	2501	Petroleum & coal products	0.0	23.7	76.3
41	2502	Basic chemicals	0.0	48.3	51.7
42	2503	Paints	0.0	44.0	56.0
43	2504	Pharmaceuticals	0.0	48.8	51.2
44	2505	Soap & detergents	0.0	54.9	45.1
45	2506	Cosmetics & toiletries	0.0	68.4	31.6

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Table 7 (continued)

<i>No.</i>	<i>IOPC</i>	<i>ABS industry</i>	<i>Land</i>	<i>Labour</i>	<i>Capital^b</i>
46	2507	Other chemical products	0.0	50.7	49.3
47	2508	Rubber products	0.0	62.0	38.0
48	2509	Plastic products	0.0	57.5	42.5
49	2601	Glass & glass products	0.0	62.0	38.0
50	2602	Ceramic products	0.0	53.3	46.7
51	2603	Cement, lime & concrete slurry	0.0	42.6	57.4
52	2604	Plaster & other concrete products	0.0	51.1	48.9
53	2605	Other non-metallic mineral products	0.0	59.1	40.9
54	2701	Iron & steel	0.0	55.6	44.4
55	2702	Basic non-ferrous metals	0.0	42.5	57.5
56	2703	Structural metal products	0.0	69.0	31.0
57	2704	Sheet metal products	0.0	65.3	34.7
58	2705	Fabricated metal products	0.0	71.4	28.6
59	2801	Motor vehicles & parts etc	0.0	49.7	50.3
60	2802	Ships & boats	0.0	66.6	33.4
61	2803	Railway equipment	0.0	79.5	20.5
62	2804	Aircraft	0.0	80.1	19.9
63	2805	Scientific etc equipment	0.0	68.9	31.1
64	2806	Electronic equipment	0.0	55.8	44.2
65	2807	Household appliances	0.0	72.8	27.2
66	2808	Other electrical equipment	0.0	70.1	29.9
67	2809	Agricultural, mining etc machinery	0.0	80.4	19.6
68	2810	Other machinery & equipment	0.0	73.6	26.4
69	2901	Prefabricated buildings	0.0	43.1	56.9
70	2902	Furniture	0.0	73.8	26.2
71	2903	Other manufacturing	0.0	58.6	41.4
72	3601	Electricity supply	0.0	26.5	73.5
73	3602	Gas supply	0.0	36.0	64.0
74	3701	Water, sewerage & drainage	0.0	23.7	76.3
75	4101	Residential building	0.0	65.7	34.3
76	4102	Other construction	0.0	86.7	13.3
77	4501	Wholesale trade	0.0	75.5	24.5
78	5101	Retail trade	0.0	92.6	7.4
79	5401	Mechanical repairs	0.0	70.3	29.7
80	5402	Other repairs	0.0	58.9	41.1
81	5701	Accommodation, cafes & restaurants	0.0	63.7	36.3
82	6101	Road transport	0.0	71.8	28.2
83	6201	Rail transport	0.0	79.1	20.9
84	6301	Water transport	0.0	44.6	55.4
85	6401	Air transport	0.0	71.8	28.2
86	6601	Services to transport	0.0	43.6	56.4
87	7101	Communication services	0.0	45.5	54.5
88	7301	Banking	0.0	61.4	38.6
89	7302	Non-bank finance	0.0	47.3	52.7
90	7401	Insurance	0.0	78.7	21.3
91	7501	Services to finance etc	0.0	31.3	68.7

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Table 7 (continued)

No.	IOPC	ABS industry	Land	Labour	Capital ^b
92	7701	Ownership of dwellings	0.0	0.0	100.0
93	7702	Other property services	0.0	72.4	27.6
94	7801	Scientific research etc	0.0	71.4	28.6
95	7802	Legal, accounting etc services	0.0	72.7	27.3
96	7803	Other business services	0.0	72.7	27.3
97	8101	Government administration	0.0	85.9	14.1
98	8201	Defence	0.0	90.3	9.7
99	8401	Education	0.0	88.5	11.5
100	8601	Health services	0.0	89.7	10.3
101	8701	Community services	0.0	87.3	12.7
102	9101	Motion picture, radio etc	0.0	54.6	45.4
103	9201	Libraries, museums & the arts	0.0	75.6	24.4
104	9301	Sport, gambling etc	0.0	46.5	53.5
105	9501	Personal services	0.0	49.8	50.2
106	9601	Other services	0.0	84.8	15.2

^a Primary factor shares implicit in the 1996-97 MONASH model data base excluding complementary imports. The shares were applied to the total value of *Compensation of employees* (P1) and *Gross operating surplus & mixed income* (P2) to map to the GTAP primary factors: *land*, *labour* and *capital*. ^b Capital and Other costs.

Source: Estimates based on ABS 2001a (*Input-Output Tables, Australia, 1996-97*, SNA68 unpublished), Horridge 2002 and the 1996-97 MONASH model data base (107 commodities × 107 industries).

Table 8 Final demand concordance

Column	ABS category	GTAP category
Q1	Final consumption expenditure — Households	Private household consumption
Q2	Final consumption expenditure — Government	Government consumption
Q3	Gross fixed capital formation — Private	Investment
Q4	Gross fixed capital formation — Public enterprises	
Q5	Gross fixed capital formation — General Government	
Q6	Change in inventories	Change in stocks
Q7	Exports	Exports

Table 9 Mapping of ABS sectors to more than one GTAP sector

<i>IOPC</i>	<i>ABS sector (4 digit)</i>	<i>ABS code</i>	<i>ABS sector (8 digit)</i>	<i>GTAP sector</i>	<i>GTAP no.</i>	<i>Data source used</i>
0101	Sheep	01240010 01240020	Sheep & lambs Wool	Bovine cattle, sheep & goats, horses Wool, silk-worm cocoons	9 12	MONASH 1996-97 data base (115 commodities × 113 industries)
0102	Grains	01210010 01210040 01210060 0102 (nec)	Wheat Rice in the husk Oilseeds Grains nec ^a	Wheat Paddy rice Oil-seeds Cereal grains nec	2 1 5 3	MONASH 1996-97 data base (144 commodities × 144 industries) Total supply shares (ABS 2001b)
0104	Dairy cattle	01300010 01300015	Whole milk Dairy cattle	Raw milk Bovine cattle, sheep & goats, horses	11 9	Total supply shares (ABS 2001b)
0107	Other agriculture	01520010 01530010 01590011 01590020 01610011 01610012 01620010 01690020 01690030 01690040 01690050 01690066 01698300 0107 (nec)	Horse studs Deer farming Honey & beeswax Live animals nec Sugar cane for planting Sugar cane for crushing Cotton ^b Tobacco Hops Grass, lucerne & clover seed Hay, cereal grasses & fodder Agriculture nec Natural rubber Other agriculture nec ^a	Bovine cattle, sheep & goats, horses Animal products nec Sugar cane, sugar beet Plant-based fibers Crops nec Animal products nec Forestry Vegetables, fruit, nuts	9 10 6 7 8 10 13 4	MONASH 1996-97 data base (144 commodities × 144 industries)

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Table 9 (continued)

<i>IOPC</i>	<i>ABS sector (4 digit)</i>	<i>ABS code</i>	<i>ABS sector (8 digit)</i>	<i>GTAP sector</i>	<i>GTAP no.</i>	<i>Data source used</i>
0200	Services to agriculture	02110010	Ginned cotton	Plant-based fibers	7	Total supply shares (ABS 2001b)
		02110020	Cotton seed			
		02120010	Sheep shearing services			
		02200010	Skins			
		0200 (nec)	Services to agriculture nec ^a			
			Paddy rice			
			Wheat			
			Cereal grains nec			
			Vegetables, fruit, nuts			
			Oil-seeds			
			Sugar cane, sugar beet			
			Crops nec			
			Bovine cattle sheep & goats, horses			
			Animal products nec			
			Raw milk			
			Wool, silk-worm cocoons			
1100	Coal; oil & gas	11010010	Black coal	Coal	15	MONASH 1996-97 data base (144 commodities × 144 industries)
		11020010	Brown coal			
		12000011	Crude oil	Oil	16	
		12000023	Liquefied natural gas	Gas	17	
		12000027	Natural gas			
		12000028	Liquefied petroleum gases			
		12001920	Other income	Coal	15	
				Oil	16	
				Gas	17	

(Continued next page)

Table 9 (continued)

<i>IOPC</i>	<i>ABS sector (4 digit)</i>	<i>ABS code</i>	<i>ABS sector (8 digit)</i>	<i>GTAP sector</i>	<i>GTAP no.</i>	<i>Data source used</i>
1500	Services to mining	15110010 15120010 1500 (nec)	Petroleum exploration (own account) Petroleum exploration services nec Services to mining nec ^a	Oil Minerals nec	16 18	Total supply shares (ABS 2001b)
2101	Meat & meat products	21110011 21110070 21120010 21110060 2101 (nec)	Fresh meat Meat for human consumption Poultry ^c Raw hides Meat & meat products nec ^a	Bovine cattle, sheep & goat, horse meat products Animal products nec Meat products nec	19 10 20	Total supply shares (ABS 2001b) MONASH 1996-97 data base (144 commodities × 144 industries)
2105	Flour & cereal foods	21520041 21520042 21520043 21520044 2105 (nec)	Milled rice Husked rice Hulled rice Rice bran Flour & cereal foods nec ^a	Processed rice Food products nec	23 25	Total supply shares & Total imports shares (ABS 2001b)
2108	Other food products	21710010 21710021 21710022 21710031 21710032 2108 (nec)	Raw sugar Refined sugar Golden syrup Icing sugar & molasses Sugar nec Other food products nec ^a	Sugar Food products nec	24 25	MONASH 1996-97 data base (144 commodities × 144 industries)
2203	Knitting mill products	22310010 22320010 2203 (nec)	Hosiery Pullovers & jumpers Knitting mill products nec ^a	Wearing apparel Textiles	28 27	Total supply shares (ABS 2001b)

(Continued next page)

Table 9 (continued)

<i>IOPC</i>	<i>ABS sector (4 digit)</i>	<i>ABS code</i>	<i>ABS sector (8 digit)</i>	<i>GTAP Sector</i>	<i>GTAP no.</i>	<i>Data source used</i>
6601	Services to transport	66110010	Parking services	Transport nec	48	Total supply shares (ABS 2001b)
		66190010	Services to road transport nec			
		66420010	Rail freight forwarding			
		66200010	Margin - services to water transport	Water transport	49	
		66200020	Non-margin - stevedoring & port handling services			
		66200030	Services to water transport nec			
		66300010	Services to air transport	Air transport	50	
		6601 (nec)	Services to transport nec ^a	Transport nec	48	
				Water transport	49	
				Air transport	50	
7501	Services to finance etc	75200010	Services to insurance	Insurance	53	Total supply shares (ABS 2001b)
		7501 (nec)	Services to finance nec ^a	Finance services nec	52	

^a Includes ABS 8-digit items within the 4-digit product group not specified separately above. ^b Excludes ginned cotton. ^c Poultry included as part of Bovine cattle, sheep & goat, horse meat products on the basis of Huff, McDougall and Walmsley (2000, p. 17).

Sources: Estimates based on MONASH model data bases (various) and ABS 2001b (*Input-Output Tables, Product Details, 1996-97, Cat. no. 5215.0*).

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