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**ESSAM General Equilibrium Model:
Estimation of 2005/06 Input-Output Tables**

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Abstract

This paper describes the compilation of a preliminary input-output table for 2005/06 for use in the ESSAM (Energy Substitution, Social Accounting Matrix) general equilibrium model. A more accurate update is expected to be undertaken in 2009/10 with the envisaged release by Statistics New Zealand of an official set of input-output tables for 2005/06. The last official set of input-output tables produced by SNZ relates to 1995/96.

The updating process comprised four main phases:

1. Analysis in the SNA Data Laboratory
2. Balancing of the input-output table
3. Re-aggregation of industries
4. Update to 2005/06

Associated data tables are available for download from <http://www.motu.org.nz/files/datasets/IO2005-06.xls> Please advise info@motu.org.nz when you download this data.

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Contents

1	Introduction	1
2	Data Laboratory	1
3	Table Balancing	2
4	Re-aggregation of Industries	3
5	Update to 2005/06	4
6	Energy.....	4
	Appendix A : Aggregated Supply and Use Table Industries	5

1 Introduction

This paper describes the compilation of a preliminary input-output table for 2005/06 for use in the ESSAM (Energy Substitution, Social Accounting Matrix) general equilibrium model. A more accurate update is expected to be undertaken in 2009/10 with the envisaged release by Statistics New Zealand of an official set of input-output tables for 2005/06. The last official set of input-output tables produced by SNZ relates to 1995/96.

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2 Data Laboratory

SNZ provided me with confidential access in their Datalab to two commodity-by-industry tables relating to 2003/03; one 'Use' table which shows the use of about 300 commodities by about 100 industries and final demand, and one 'Supply' table which shows the industries (plus imports) that supply these commodities. I combined these two tables to produce an industry-by-industry input-output (IO) table, aggregated to about 50 industries in order to accommodate confidentiality restrictions. The industry list is given in Appendix A.¹

Producing the IO table involved the following key steps:

1. Allocation of the retail and wholesale trade margins to purchasing industries.
2. Identifying and removing major inconsistencies in the supply and use tables, with SNZ's assistance.
3. Changing the way oil refining, aluminium production, and food processing by co-operatives are treated in the supply and use tables, from a financial flow approach to a product flow approach.

¹ Confidentialised supply and use tables have subsequently been released by SNZ.

4. Estimation of an import IO table, being the disaggregation of imports by industries and final demand into goods and services classified by ANZSIC.

3 Table Balancing

The core IO table produced in the Datalab, while having no major imbalances, did not balance exactly. The industry row/column differences were all well under 1% except in six industries; other farming, forestry, textiles, wood, fertilizer etc and industrial wholesale. Forestry was by far the largest at about 8%. This inconsistency was present in the original SNZ supply and use tables. SNZ attribute it to stock change measurement issues – that is the value of growing trees. Balance was achieved through equal but opposite adjustment of profits and stock change as it is impossible to say which side of the account was in error.

The next largest imbalance was in fertilizer at 2.7%. In the remaining industries the imbalances were 1-2%. Again these reflect discrepancies in the underlying supply and use tables, except for the case of industrial wholesale where the discrepancy was attributable to uncertainty in adjusting the supply and use tables to correspond to the product flow method instead of the money flow method, as outlined above.

Balancing was achieved by the RAS iterative proportional fitting technique.

Apart from the caveats implicit in the above methodology, the following should be noted:

- While the dairy and meat processing industries balance, the profit estimates in these industries may not be accurate. This difficulty stems from the combination of the co-operative structure of these industries and the process of extracting parts of these industries from industrial wholesaling.

- Exports of tourism and education do not fully adjust for some retail spending that should be attributed to tourists and students, rather than local households. With some more time this could be changed.
- SNZ estimates negative imports (approximately \$36m in 2003/03) of services to finance, insurance and pension funding, which is assumed to represent net premium payments by overseas agents to New Zealand, presumably indicating policy pay-outs such as for natural disasters. These imports have been allocated to industries and final demand in proportion to all use of services to finance, insurance and pension funding.
- Excise duty on imported goods (alcohol) is included with import tariffs, but excise on domestically produced goods are in commodity taxes. This is SNZ's procedure – based on who collects the duty.

4 Re-aggregation of Industries

SNZ's confidentiality restrictions – restrictions that did not exist at the time the 1995/96 IO tables were released – led to major compromises with respect to industry detail. Some industries that are of particular interest in the context of energy and climate research had to be aggregated before SNZ was willing to release data from the Datalab. Restrictions apply particularly to industries such as transport, dairy processing, oil and gas production, oil refining, and electricity production and distribution. Hence the estimated IO tables required some disaggregation and re-aggregation.

Fortunately much of the important data could be obtained from MED's Energy Data File (EDF), although this does not have the required degree of industrial disaggregation for all energy types. Consequently other sources and estimation processes were required. Mostly this involved using companies' published Annual Reports with linear interpolation and scaling to conform to exogenous IO totals.

There are conceptual differences between IO tables and the EDF. The main difference here is that the latter classifies private use of motor vehicles as part of the transport industry or sector, whereas in the IO tables it is part of private consumption. Also, not all energy is used directly as fuel. Some is used as an intermediate input, such as in the production of bitumen from oil and methanol from gas.

Finally the EDF itself does not fully reconcile the demand and supply side of the accounts.

5 Update to 2005/06

The re-aggregated 2002/03 IO table was updated to 2005/06 on the basis of employment by industry data (from the 2006 Census), SNZ's national accounts data for 2005/06, and the EDF for 2005/06.²

The final set of tables for 2005/06, to be used in the ESSAM model, is given in the file *IO2005-06.xls*. This file is available for download from <http://www.motu.org.nz/files/datasets/IO2005-06.xls>. Please advise info@motu.org.nz when you download this data.

6 Energy

While not specifically part of the process of estimating a 2005/06 IO table, the Energy Data File produced by the Ministry of Economic Development proved valuable in helping to disaggregate the energy industries. Also, the ESSAM model requires energy flows to be expressed in both dollar terms and physical units (petajoules). The table is given in *IO2005-06.xls*.

² I am thankful for the assistance of Business & Economic Research Ltd with this update.

Appendix A: Aggregated Supply and Use Table Industries

Industry grouping	National Accounts working industries
Horticulture and fruit growing	A011
Livestock and cropping farming	A021
Dairy and cattle farming	A031
Other farming	A041
Services to agriculture, hunting and trapping	A051, A052
Forestry and logging	A061, A062
Fishing	A071
Mining and quarrying	B011, B012, B019
Oil and gas	B021, B022, C101, C102, D021
Meat and dairy manufacturing	C011, C021
Other food manufacturing	C031
Beverage, malt and tobacco manufacturing	C041, C051
Textiles and apparel manufacturing	C061, C062
Wood product manufacturing	C071
Paper and paper product manufacturing	C081, C082
Printing, publishing and recorded media	C091
Fertiliser and other industrial chemical manufacturing	C103
Rubber, plastic and other chemical product manufacturing	C111, C112, C113
Non-metallic mineral product manufacturing	C121
Basic metal manufacturing	C131
Structural, sheet and fabricated metal product manufacturing	C141
Transport equipment manufacturing	C151, C152
Machinery and other equipment manufacturing	C161, C162, C163
Furniture and other manufacturing	C171, C172, C173
Electricity generation and transmission	D011
Water supply	D031
Sewerage, drainage and waste disposal services	Q015, Q016
Residential construction	E011, E012
Other construction	E013, E014, E015
Industrial goods wholesaling	F011, F012, F013, F014, F015
Other wholesale trade	F016, F017, F022, F023, F025
Retail trade	G011, G012, G013, G014, G015, G016

Accommodation, restaurants and bars	H011, H012
Road freight transport	I011
Road passenger transport	I012
Rail, water, air transport and transport services	I021, I031, I041, I091
Communication services	J011, J012
Finance	K011, K012
Insurance	K021, K022, K023, K024
Services to finance and services	K031
Real estate	L011, L012, L013
Equipment hire and investors in other property	L031, L032
Ownership of owner-occupied dwellings	L021
Scientific research and computer services	L041, L042
Other business services	L043, L049
Central government administration and defence	M011, M012, M013
Pre-school, primary and secondary education	N011, N012, N013
Other education	N014, N015
Local government administration	M021
Hospitals and nursing homes	O011
Other health and community services	O012, O013, O014
Cultural and recreational services	P011, P012, P013
Personal and other community services	Q011, Q012, Q013, Q014

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