

Malaysia

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1. Introduction

This document describes the adaptation of the 2005 Malaysian input-output (I-O) table for input to the Global Trade Analysis Project (GTAP). The paper is organised as follows. Section 2 briefly describes the source data. Section 3 discusses strengths and limitations of the published input-output (I-O) data. Section 4 discusses the processing to correct anomalies in the raw data. Section 5 presents the mapping between the 121 Malaysian I-O sectors, 57 GTAP sectors, and the more aggregated 46 sectors of the submitted table.

2. Data Sources

The primary raw input was 120-sector input-output data published by the Malaysian Department of Statistics (DOS)².

The 2005 I-O data was measured in thousands of 2005 Malaysian ringgit. We converted this to millions of ringgit by dividing all values by 1000.

Prima facie, the 2005 DOS raw input-output data satisfy the sectoral balance condition, and contain most of the data ready for conversion to the GTAP format. These data include:

1. Supply and Use tables at purchasers' prices for 120 sectors. The Supply table shows the total outputs of 120 domestic commodities, total imports, transport and trade margins, and taxes on domestic and imported goods, by commodity. The Use table shows the demand for those commodities by industries, private households, government, investment, changes in inventories, and exports.
2. A MAKE matrix of domestic production at basic prices, commodity by activity. The matrix shows the output of 120 activities by 120 commodities. This matrix is symmetric, because commodities are the same as industries. However, it is not diagonal. Many industries produce more than one commodity, and many commodities are produced by more than one industry.
3. An Absorption matrix at basic prices showing the use of 120 domestically-produced commodities by 120 industries and by five final users (private consumption, government consumption, investment, exports, and changes in stocks). The matrix also contains the values of compensation of employees and operating surplus, by industry.
4. An Absorption matrix at basic prices showing the use of 120 imported commodities by 120 industries and by five final users (private consumption, government consumption, investment, exports, and changes in stocks).
5. An Absorption matrix of domestic production at market prices, commodity by activity.

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² *Input-output tables Malaysia 2005*, Department of Statistics, Malaysia, March 2010.

In addition, we have the following data from the Department of Statistics:

1. Two matrices for trade and transport margins on domestic and imported commodities, 2005.
2. Two matrices of commodity taxes on domestic and imported commodities, 2005.
3. Detailed government revenues by revenue sources for the year 2005³.
4. Data on the composition of the workforce, by type of employment (namely, wage workers, own-account workers, and non-paid family members), 2005.
5. Data on depreciation, land rentals and capital rentals for ten aggregate sectors, 2005.

3. *Strengths and Limitations of the Original Input-Output Data*

We have conducted a number of checks on the data. They include checks of the non-negativity condition and the balancing conditions of the tables. We also check the plausibility of tax rates, margin rates implied in the data, and the structure of industries' costs and sales. This section discusses the strengths and limitations of the data. The procedures that we used to address these limitations are discussed in the next section.

3.1 *Strengths*

1. As can be seen from the previous section, the original data contain detailed supply and use data for 121 commodities and activities. They provide most of the data needed for MyAGE. Specifically: (a) There are separate domestic and import matrixes at basic values; (b) There are separate trade and transport margins on domestic and imported commodities; and (c) There are separate tax data for domestic and imported commodities.
2. The tables are balanced.

3.2 *Limitations*

1. There are some very small negative non-inventory flows in the use matrix (e.g. the use of -1 thousand ringgit of Motor vehicles by the carpentry industry).
2. There are non-zero flows for changes in inventories of services, and there are margins and taxes on them. Generally, these flows should be zeros, because services cannot be stored.
3. There are non-zero exports flows in the imported good matrix for most of merchandised goods. That is, there are re-exports of these commodities. We do not believe that Malaysia acts as en-trepot as Hong Kong or the Netherlands, and hence the re-export flows may be a data error.
4. Some tax rates, as implied in the tax matrices and the corresponding commodity flows in the absorption matrix, seem implausible. The rates of commodity taxes on some goods consumed by households seem too high, and the rates on domestic goods are often higher than that for imported goods. For example, the tax rates are 869% and 0.62% respectively for domestic and

³ These data are reported in the "Estimates of Federal Government's Revenue for the year 2007", Ministry of Finance, Malaysia, 2006.

imported soap and detergent products⁴. The rates are 465% and 22% respectively for domestic and imported wine and spirit. Because of these issues, we will recreate the tax margins based on tax legislation and government reported tax revenues.

5. The share of payment to labour in total factor payment is only 28.7%, too low by international standard. At the industry level, 39 out of 120 sectors in the IO tables 2005 have labour share of less than 20%. Some examples include fruit and vegetable preservation and processing, dairy products, oils and fats, confectionery, etc. Discussions with DOS reveal that one of the reasons for the low shares is that the labour payment only includes payment to employed workers, not those on self-employment, or unpaid family workers. We will use additional data on these workers to reallocate value added in the economy. We also reduce the level of variability of the industry factor shares.
6. There are no separate values for capital and land rentals. They are grouped in only one vector of operating surplus.
7. There are no data on production taxes.
8. There are no separate data for tariffs or export taxes.
9. There is a value for household consumption of “domestic services,” but these services are not listed as a commodity or an industry. We will have to create a new commodity and an industry to represent them.

4. Data Processing

In this section we discuss the adjustments procedures, the additional data sources, and the assumptions that we adopted to address the data issues described in the previous section.

1. With regard to some negative values in the tables: because they are very small, we replaced them with zeros.
2. We removed all the non-zeros values of inventories of services in the basic, tax and margin tables. Inventories, taxes and margins for other commodities would be scaled in a later RAS to restore the aggregate inventories, tax and margin values in the original I-O tables.
3. We set the entire export column in the absorption matrix for imports to zeros, and then deduct the same amount from the export column of the absorption matrix for domestically produced goods⁵. This procedure ensures that the balance of trade remains unchanged. Again, other exports and imports will be scaled later in a RAS to restore their aggregate values in the original I-O tables.
4. We created a new commodity and a corresponding industry named “Domestic Service” to accommodate the value of 942.58 RM million of domestic service commodity consumed by households in the original I-O tables. As this industry essentially represents services by domestic servants, we use the following assumption to create the industry’s sales and costs structure: (a) All output of the sector is consumed by households (942.58 RM m); (b) 95% of

⁴ This seems implausible for two reasons. First, under the regulations of the World Trade Organisation, of which Malaysia is a member, there must be no discriminatory treatment for imports. Second, taxation regimes, as a rule, would not favour imports over domestic goods.

⁵ This procedure is recommended in the *Handbook of Input-Output Table Compilation and Analysis*, United Nations, New York, 1999.

costs in the sector is payment to labour, and 5% of costs are intermediate inputs. The inputs used in the sectors include soap and detergents, rubber gloves, textile products, motor vehicle, land transport, air transport, business services, public administration, education, and health. They are used in the same proportion as in household consumption bundle.

5. We adjusted the labour payment data for each sector to account for the income of the own account workers and unpaid family workers (non-wage labour). In the original I-O tables, this income of non-wage labour – normally a mix of capital and labour income – was treated as a form of business income. This means that the values of compensation of employees are underestimated, while the values of capital rentals are overestimated. One of the remedies that can be employed in addressing this problem is to impute labour compensation for those workers who are self-employed. To do that, we use the data on sectoral composition of the workforce in Malaysia in 2005, as reported in Table 1. The data is classified into 17 board sectors.

Table 1 shows that self-employed and unpaid family members comprise over a fifth of the workforce. The shares of self-employed and unpaid family members can be as high as over 70% in the Fishing sector, and more than a half in Agriculture and Forestry sectors. Therefore, there is clearly a need to impute the payment to them to correctly account to the contribution of labour in industry value added.

Table 1. Composition of Malaysian workforce in 2005 (unit: thousand persons)

Sector	Wage workers		Non-wage workers		Share of non-wage workers In total workforce
	Employer	Employee	Own Account Worker	Unpaid Family Worker	
Agriculture, Hunting & Forestry	14.2	544.1	579.2	217.6	58.8%
Fishing	2.4	30.9	73.1	8.8	71.1%
Mining & Quarrying	0.5	34.5	0.7	0.4	3.0%
Manufacturing	31.4	1819.2	119.9	18.9	7.0%
Electricity, Gas & Water Supply	0.1	56.2	0.3	0	0.5%
Construction	59.2	692.6	145.6	7	16.9%
Wholesale & Retail Trade	121.1	1054.2	338.6	106.4	27.5%
Hotels & Restaurants	41.7	386.6	160.5	83.1	36.3%
Transport, Storage & Communications	10.2	434.8	96.4	3.3	18.3%
Financial Intermediation	1.9	234.1	11.2	0.1	4.6%
Real Estate, Renting & Business activities	25.2	403	28.1	2.7	6.7%
Public Admin & Defence	3.1	720.9	4.2	0.3	0.6%
Education	5.2	588.4	12.8	0.7	2.2%
Health & Social Work	6.6	193	12.2	0.9	6.2%
Oth Community & Personal Serv Activities	13.2	186.8	32.9	2	14.9%
Private Households	1	202.6	56	1	21.9%
Extra Territorial Organisations & Bodies	0	1.7	0	0	0.0%
Total	337.0	7583.6	1671.7	453.2	21.2%

(Source: Department of Statistics, Malaysia)

The adjusted compensation of employees of each sector can be implemented via the following formula⁶:

$$Adjusted\ COE_i = Original\ COE_i \times \frac{TW_s}{NOE_s}$$

where COE_i is the compensation of employees in industries i within sector s ;

NOE_s is the number of wage employees in sector s , calculated from Table 1;

TW_s is the total workforce in sector s , calculated from Table 1.

In the above formula, TW_s / NOE_s is the ratio of the total number of workers to the number of wage workers in sectors. We recalculate the COE values of I-O industries by assuming that:

- a) All industries within each sector have the same TW_s / NOE_s ratio; and
- b) The average wage rate of non-wage workers is the same as that for the wage workers.

Assumption (b) was later relaxed for eight IO industries for which the formula led to labour payment values that exceeded the industries' total value added. The industries included paddy, food crops, vegetables, fruits, oil palm, flower plants, and restaurants. For these industries, we assumed that the share of capital in total value added was half of their original share in the I-O tables, and recalculated the wage rate of the non-wage workers. This led to the result that non-wage workers received about 60-80% of wage workers in these sectors, which seems plausible.

We adopted the new labour payment figures for manufacturing and services industries, and then recalculated the payment to capital as the difference between the industries value added and payment to labour.

1. For primary industries (i.e. agriculture and mining industries), we split the value added not only to labour and capital, but also to land. The concept of land includes not only cultivated land area, forest land, and water surface for aquaculture, but also natural resources, such as mines and oil fields. Therefore, all the primary industries (i.e. agriculture, forestry, fishery, and mining) must have non-zero values for land. The Malaysian Department of Statistics (DOS) has provided us with data for capital rental and land rental for all industries. However, in our model, we recognise as land users only agricultural and mining industries. As a result, we allocated operating surplus to land rentals only in those industries. For some sectors, DOS data contain unconvincing shares for capital and land. For example, capital comprises only 7% of operating surplus in the Paddy sector, and natural resources comprises only 0.3% and 3.4% of operating surplus in Other Mining and Crude oil and gas industries respectively. As a result, for paddy and mining industries, we adapted GTAP's world average factor shares⁷. For the remaining sectors we used the adjusted labour payment and DOS shares.
2. Because of the implausibility of many commodity tax rates, and because there is no data on production taxes in the original I-O tables, we used additional data on government revenues⁸ and tax legislation to re-create matrices for 6 types of commodity taxes and 2 types of production taxes⁹. The main procedure is: for each of the tax type,

⁶ This formula was adapted from Nagaraj, Shyamala and Goh, Kim-Leng (2006). *Share of labour and capital in national income of Malaysia: estimates for 1960-2004*, Working paper 2006-1, Faculty of Economics & Administration, University of Malaya.

⁷ Hertel, T. W. and M. Tsigas (2002), 'Primary factor shares', *Global Trade, Assistance, and Production: The GTAP 5 Data Base*, Ed. B. V. Dimaranan and R. A. McDougall, Center for Global Trade Analysis, Purdue University, West Lafayette.

⁸ Ministry of Finance Malaysia (2006), *Estimates of Federal Government's Revenue for the year 2007*, Ministry of Finance Malaysia, Putrajaya.

⁹ Because GTAP does not require detailed tax data by tax types, in the submitted data we aggregate them to only one commodity tax and one production tax.

(a) we identify the tax rates and tax payers (tax bases) based on Malaysian tax legislation. For items where no specific tax payers can be identified, such as “other indirect taxes”, all goods and services are assumed to bear the tax;

(b) we multiply the tax rates on the bases (e.g. commodity flows in IO tables) to get the expected value for the tax revenue on each of the commodity flows. Because of compliance issue, the total expected tax revenues often differ from the total actual revenue reported in government revenue book. We then

(c) scale the expected tax revenue so that they sum to the reported actual revenue.

1. After making the above adjustment, we used the RAS procedure to rebalance all sectors and to set GDP expenditure items to the officially published values.

Table 2 reports some summary data from our final input-output table.

Table 2. Macro Aggregates from the 2005 Malaysian IO table

GDP components on the expenditure side			GDP components on the income side		
Item	Levels, MYR		Item	Levels, MYR	
	m	Share (%)		m	Share
1 Consumption	246,838	45.8	1 Labour	228,892	42.5
2 Investment	118,296	22.0	2 Capital	263,342	48.9
3 Government	64,246	11.9	3 Land	28,495	5.3
4 Stocks	23	0.0	4 IndirectTax	17,887	3.3
5 Exports	599,827	111.4			
6 Negative Imports	-490,615	-91.1			
GDP	538,616	100	GDP	538,616	100

5. Converting the Malaysian IO table into GTAP Format

5.1 Converting the IO Table From COM x IND to COM x COM

GTAP prefers commodity by commodity input-output tables. Our initial I-O table is commodity by industry. To convert it to a commodity by commodity table, we use the technology assumption and the procedure described in Horridge *et al.* (2008)¹⁰.

5.2 Putting Margins into Respective Rows for Margin Commodities

There were eight margin services in the initial I-O data. The data contained separate values for direct usage and margin usage of these margin commodities. The GTAP Data Base does not distinguish these uses. Therefore, for each margin commodity, we summed total usage (margin and direct) by each user and allocated that usage to the respective row for the margin commodity.

¹⁰ Horridge, M., Robert, M., Narayanan, B. and Walmsley, T. (2008) Exercises in Contributing I-O Tables to the GTAP Data Base. Available from https://www.gtap.agecon.purdue.edu/resources/res_display.asp?RecordID=2850

5.3 Mapping Between Malaysian I-O Sectors and GTAP Sectors

The 121 sectors of the Malaysia I-O table were aggregated to a set of 46 sectors that best correspond to elements of GTAP's standard 57 commodities. The mappings from 121 and 57 sectors to these 46 sectors are reported in Table 3.

Table 3. Concordance between 121 Malaysia I-O sectors, GTAP 57 sectors and 47 sectors in the Contributed table

46 sectors	57 GTAP sectors	121 Malaysian I-O sectors
1 pdr	1 pdr	1. Paddy rice
2 othAgri	2 wht, 3 gro, 6 c_b, 7 pfb	8. Other agriculture
3 v_f	4 v_f	6. 3. Vegetables
		4. Fruits
4 osd	5 osd	6. Oil palm
5 ocr	8 ocr	2 Food crops
		7. Flower plants
6 Lvstk	9 ctl, 10 oap, 11 rmk, 12 wol	9. Poultry farming
		10. Other livestock
7 frs	13 frs	5. Rubber; 11. Forestry and logging
8 fsh	14 fsh	12. Fishing
9 coa	15 coa	16. Other mining and quarrying
10 oilgas	16 oil, 17 gas	13. Crude oil and natural gas
11 omn	18 omn	14. Metal ore mining,
		15. Stone clay and sand quarrying
		16. Other mining and quarrying
12 cmt_omt	19 cmt, 20 omt	17. Meat and meat production
13 vol	21 vol	21. Oils and fats
14 mil	22 mil	20. Dairy production
15 pcr_ofd	23 pcr 24 sgr, 25 ofd	22. Grain mills
		18. Preservation of sea foods
		19. Preservation of fruits and vegetables
		23. Bakery products
		24. Confectionery
		25. Other Food Processing
		26. Animal Feeds
16 b_t	26 b_t	27. Wine & Spirit
		28. Soft Drink
		29. Tobacco Products
17 tex	27 tex	30. Yarn and Cloth
		31. Finishing of Textiles
		32. Other Textiles
18 wap	28 wap	33. Wearing Apparels
19 lea	29 lea	34. Leather Industries
		35. Footwear

20	lum	30 lum	36. Sawmilling and Planning of Wood 37. Veneer Sheets, Plywood, Laminated and Particle Board 38. Builders' Carpentry and Joinery 39. Wooden and Cane Containers 40. Other Wood Products
21	ppp_furn	31 ppp	41. Paper and Paper Products and Furniture 42. Publishing 43. Printing
22	p_c	32 p_c	44. Petroleum Refinery
23	crp	33 crp	45. Basic Chemicals 46. Fertilizers 47. Paints and Varnishes 48. Pharmaceuticals, Chemicals & Botanical Product 49. Soap, Perfumes, Cleaning & Toilet Preparations 50. Other Chemicals Product 51. Tyres 52. Rubber Processing 53. Rubber Gloves 54. Rubber Products 55. Plastics Products
24	nmm	34 nmm	56. Sheet Glass and Glass Products 57. Clay and Ceramic 58. Cement, Lime and Plaster 59. Concrete & Other Non-Metallic Mineral Products
25	i_s	35 i_s	60. Iron and Steel Products
26	nfm	36 nfm	61. Basic Precious and Non-Ferrous Metals
27	fmp	37 fmp	62. Casting of Metals 63. Structural Metal Products 64. Other Fabricated Metal Products
28	mvh	38 mvh	80. Motor Vehicles
29	otn	39 otn	81. Motorcycles 82. Ships & Boats Building , Bicycles & Invalid Carriages 83. Other Transport Equipment
30	ele	40 ele	69. Office, Accounting and Computing Machinery 74. Semi-Conductor Devices, Tubes and Circuit Boards 75. TV, Radio Receivers & Transmitters & Associated Goods
31	ome	41 ome	65. Industrial Machinery 66. General Purpose Machinery 67. Special Purpose Machinery 68. Domestic Appliances 70. Electrical Machinery and Apparatus 71. Other Electrical Machinery 73. Electric Lamps and Lighting Equipment

			76. Medical, Surgical and Orthopaedic Appliances
			77. Measuring, Checking & Industrial Process Equipment
			78. Optical Instruments and Photographic Equipment
			79. Watches and Clocks
32	omf	42 omf	84. Other Manufacturing
			72. Insulated Wires and Cables
			85. Recycling
33	ely_gdt	43 ely, 44 gdt	86. Electricity and Gas
24	wtr	45 wtr	87. Waterworks
35	cns	46 cns	88. Residential
			89. Non Residential
			90. Civil Engineering
			91. Special Trade Works
36	trd	47 trd	92. Wholesale and Retail Trade
			93. Accommodation
			94. Restaurants
37	otp	48 otp	95. Land Transport
			98. Other Transport Services
			99. Port and Airport Operation Services
			100. Highway, Bridge and Tunnel Operation Services
38	wtp	49 wtp	96. Water Transport
39	atp	50 atp	97. Air Transport
40	cmn	51 cmn	101. Communication
41	ofi	52 ofi	102. Banks
			103. Financial Institution
			105. Other Financial Institution
42	isr	53 isr	104. Insurance
43	obs	54 obs	106. Real Estate
			108. Rental and Leasing
			109. Computer Services
			110. Research and Development
			111. Professional
			112. Business Services
44	osg	56 osg	113. Public Administration
			114. Education
			115. Health
			116. Defence and Public Order
			117. Other Public Administration
			118. Private Non-Profit Institution
45	ros	55 ros	119. Amusement and Recreational Services
			120. Other Private Services
			121. Domestic services
46	dwe	57 dwe	107. Ownership of Dwellings

6. *Checking Sectoral Balance and Non-negativity Conditions*

After converting the Malaysian I-O tables to the format required by GTAP Data Base, we conducted the sectoral balance and non-negativity checks. The new data base passed the sectoral balance check and non-negativity conditions.