NOTA TEKNIKAL
TECHNICAL NOTES

Concepts and Definition

The concepts and definition used to compile the I-O Tables are based on the System of National Accounts (SNA) 2008, United Nations.

Coverage and Scope

The compilation of I-O Tables uses the Malaysia Standard Industrial Classification (MSIC) 2008 which conforms to the Standard Industrial Classification of All Economic Activities (ISIC) Rev. 4. Meanwhile, the commodity classification is based on the Malaysia Classification of Products by Activity (MCPA) 2009 which is in line with the Central Product Classification (CPC) Ver. 2.0. The detailed classifications are shown in ***Appendix 1****.*

Methodology

The methodology used in the I-O Table compilation adopts the Handbook on Supply, Use and Input-Output tables with Extensions and Applications (2018) and Eurostat Manual of Supply, Use and Input-Output Tables (2008 Edition).

Framework of I-O Tables

The I-O tables are updated using the commodity structure for output and input of Input-Output Table 2015. The table is compiled by 124 commodities and 124 industries. The Supply Table shows the supply of domestic goods and services, imports and net taxes on products while the Use Table shows the usage of domestic goods & services as well as exports in the economy.

The I-O Tables are compiled based on a Non-Competitive Type framework. The Use framework consists of three quadrants namely intermediate input, final use and primary input. The intermediate input quadrant records the consumption of various inputs used by industries to meet the needs of their production activities.

The final use quadrant records the commodities consumed by domestic and external uses. Domestic use comprises of private consumption, government consumption, gross fixed capital formation and changes in inventories. Meanwhile, the external use records the transactions of Malaysia's exports.

The primary input quadrant records payments to factors of production such as value added, taxes on products and subsidies. The basic structure of the I-O tables is shown in ***Figure 1****.*

Figure 1: Basic Structure of Input-Output Tables

FROM \ TO	Activity/Commodity		Activity/Commodity	INTERMEDIATE USE												FINAL USE							
				1 Agriculture, Fishing & Forestry	2 Mining & Quarrying	3 Manufacturing	4 Utilities	5 Construction	6 Wholesale & Retail Trade	7 Accommodation and Food & Beverages	8 Transportation & Storage and Information & Communication	9 Finance & Insurance	10 Real Estate & Ownership of Dwellings	11 Business & Private Services	12 Government Services	TOTAL INTERMEDIATE USE	Private Consumption	Government Consumption	Gross Fixed Capital Formation	Changes in Inventories	DOMESTIC USE	Exports	TOTAL FINAL USE	TOTAL OUTPUT
INTERMEDIATE INPUT	Agriculture, Fishing & Forestry	1																					
	Mining & Quarrying	2																					
	Manufacturing	3																					
	Utilities	4																					
	Construction	5																					
	Wholesale & Retail Trade	6																					
	Accommodation and Food & Beverages	7																					
	Transportation & Storage and Information & Communication	8																					
	Finance & Insurance	9																					
	Real Estate & Ownership of Dwellings	10																					
	Business & Private Services	11																					
	Government Services	12																					
	TOTAL INTERMEDIATE INPUT																						
PRIMARY INPUT	Imported Commodities																						
	Taxes on Products																						
	Subsidies on Products																						
	Gross Value Added																						
	Compensation of Employees																						
	Other Net Taxes on Production																						
	Operating Surplus, Gross																						
	Consumption of Fixed Capital																						
	Operating Surplus, Net																						
TOTAL INPUT																							

QUADRANT 1
INTERMEDIATE INPUT

QUADRANT 2
FINAL USE

QUADRANT 3
PRIMARY INPUT

Valuation

i. Basic prices + taxes on products - subsidies on products = producers' prices; and

ii. Producers' prices + trade margin + transport margin = purchasers' prices

The two main price concepts applied in I-O tables are:

*i. The **purchasers' prices** are the amount paid by the purchasers for the goods and services at the time and place required by the purchasers. It includes any trade and transport margins; dan taxes less subsidies on product and transport charges paid separately by the purchasers; and*

*ii. The **basic prices** are the amount received by the producers for every unit of a goods and services produced as output, excluding any tax payable and including any subsidy receivable on the product. It also excludes any trade and transport margins; and delivery charges invoiced separately by the producers.*

In I-O analysis, all transactions must be valued in the same price. The purchase of one unit of a particular commodity in the I-O analysis is assumed to stimulate demand to the same amount. The preference for basic prices is based on the following considerations:

i. Basic prices provide the most homogeneous valuation along the rows because taxes, and purchasers' prices are differ depending on the consuming sector; and

ii. Basic prices record the income received by the producers.

Data Source

*The technique used in this updating is a non-survey method for the input and output matrix based on national account statistics which covers Agriculture, fishing & forestry, Mining & quarrying, Construction, Manufacturing and Services. While the other components are compiled based on current data. Other sources of data are obtained from secondary data of various government agencies. The details on the data source are given in **Appendix 2**.*

Explanatory Notes for The Tables

The tables published consist of:

Table 1 and 13: Supply and Use Tables of Goods and Services at Purchasers' Prices

This table is a summary for the components of supply and use in the Malaysian economy valued at purchasers' prices. It is divided into two parts. The supply shows the components of domestic production and imports which are valued at basic prices. To arrive at the value of purchasers' prices, the domestic production and imports have to be added together with trade margins, transport margins and taxes less subsidies on products.

The use shows various uses of commodities, that are, intermediate input and final use (private consumption, government consumption, gross fixed capital formation, changes in inventories and exports) which are valued at purchasers' prices.

Table 2 and 14: Domestic Production at Basic Prices, Activity by Commodity

This table shows the domestic production of goods and services at basic prices. The rows show various activities (industries) while columns show the commodity of goods and services produced by the respective industries. The diagonal entry in the matrix represents the industry's production of principal products. The main products will be shown diagonally in the matrix while the secondary products scattered non-diagonally.

Table 3 and 15: Domestic Use Table at Basic Prices

Along the column, the table shows the input required for a particular industry's total production. The first part (rows and columns 1-124) shows the intermediate input requirement of domestically produced goods and services. Row 129 shows the imported goods and services while row 130 the taxes paid on inputs (domestically produced and imported). At row 132, the value added at basic prices is shown. The Value Added includes compensation of employees and gross operating surplus. Row 129-137 together constitutes the Primary Inputs.

The row entries show the different uses of the commodities. The first 124 columns of the table show the use of the commodities as intermediate inputs, and the column 125-131 shows their use in different categories of final demand. The sum of the rows give the total domestic production of the commodities valued at basic prices.

Table 4 and 16 : Imports Use Table at Basic Prices

This table presents the uses of imported goods and services in the economy. This matrix is a detailed table on imported commodities which represented as a single line in Table 3 .

Table 5 and 17 : Use Table at Purchasers' Prices

This table shows the uses of domestically and imported commodities in different industries as well as final demand valued at purchasers' prices i.e including taxes and margins allocated to the commodities to which they relate.

Table 6, 7 & 10

These tables have the same content as Tables 2 and 5. The difference is that Tables 6 & 7 and Table 10 are converted from basic table (commodity by activity) to symmetric table (commodity by commodity and activity by activity).

Table 8 & 11

These tables show the input required for producing different commodities in the form of coefficients. The table is derived from Table 6 & 10 by dividing the cells into respective column-total.

Table 9 & 12

These tables are the Inverse Matrix derived from Table 8 & 11.

Symmetric Tables

Domestic production at basic prices (A) table and Domestic use at basic prices table (C) are used to derive symmetric tables (activity by activity and commodity by commodity). C_1 *is input coefficient matrix of Table A, obtained by dividing each cell to the column-total. Meanwhile,* C_2 *is the output coefficient matrix of Table C, obtained by dividing each cell to the row-total.*

The symmetric table A_a *(activity by activity) matrix is obtained through the following matrix multiplication:*

$$A_a = C_1 * A$$

where, A_a *is use domestic matrix, activity by activity*

A *is use domestic matrix, commodity by activity*

C_1 *is input coefficient domestic production matrix*

$C_1 = \frac{x_{ij}}{X_j}$ *is value of each cell (* x_{ij}*) for use domestic matrix dividing with the output column-total (* X_j*)*

Whereas, the symmetric table A_c *(commodity by commodity) is obtained through the following matrix multiplication:*

$$A_c = A * C_2$$

where, A_c *is use domestic matrix, commodity by commodity*

A *is use domestic matrix, commodity by activity*

C_2 *is output coefficient domestic production matrix*

$C_2 = \frac{x_{ij}}{X_i}$ *is value of each cell (*x_{ij}*) for use domestic matrix dividing with the output row -total (* X_i*)*

Leontief Inverse Matrix

Leontief Inverse Matrix is known as the total requirement coefficients matrix which measures the dependency of sector j *on the output of sector* i *when final demand for its goods or services increase by RM1.*

$$Leontief\ Inverse\ Matrix = (I - A)^{-1}$$

where, I *is identity matrix*

$A = \frac{x_{ij}}{X_j}$ *input coefficient for use matrix, activity by activity or commodity by commodity and also known as direct requirement coefficients.*

Output Multiplier

An output multiplier for a sector j is defined as the total value of production in all sectors of the economy that is necessary for all stages of production in order to produce one unit of product j for final use. It can be defined as:

$$O_j = \sum_i^n l_{ij}$$

where, O_j *is the output multiplier of sector* j

l_{ij} *is the* ij *element of Leontief inverse matrix*

n *is the number of sectors*

Value Added Multiplier

Value added multiplier can be defined as:

$$V = B(I - A)^{-1}$$

where, V *is the value added multiplier*

B *is the vector of input coefficients of value added*

I *is the identity matrix*

A *is the matrix of input coefficients for domestic production*

Backward and Forward Linkages

Backward linkage is used to determine the interdependence between one sector and other sectors involved in purchasing inputs. The forward linkage is used to indicate the interdependence of a particular sector with other sectors that involves in selling of output.

Backward linkage formula can be defined as:

$$BL_j = \sum_{i=1}^n l_{ij}$$

where, BL_j *is the backward linkage of sector* i

l_{ij} *is the* ij *element of Leontief inverse matrix*

n *is the number of sectors*

Forward linkage formula can be defined as:

$$FL_i = \sum_{j=1}^n g_{ij}$$

where, FL_i *is the forward linkage of sector* j

g_{ij} *is the ij element of Gosh inverse matrix*

n *is the number of sectors*

Normalised Backward and Forward Linkages

The normalised backward and forward linkages are used to identify key sectors, given its high dependence on both upstream and downstream sectors.

Normalised backward linkage formula can be defined as:

$$NBL_j = \frac{\sum_{i=1}^{n} l_{ij}}{\frac{1}{n^2}\sum_{i=1}^{n}\sum_{j=1}^{n} l_{ij}}$$

where, NBL_j *is the normalised backward linkage of sector* j

l_{ij} *is the* ij *element of Leontief inverse matrix*

n *is the number of sectors*

Normalised forward linkage formula can be defined as:

$$NFL_i = \frac{\sum_{j=1}^{n} g_{ij}}{\frac{1}{n}\sum_{i=1}^{n}\sum_{j=1}^{n} g_{ij}}$$

where, NFL_i *is the normalised forward linkage of sector* i

g_{ij} *is the* ij *element of Gosh inverse matrix*

n *is the number of sectors*

Strategic Sector

The output produced by one sector of the economy is widely used to support the production of other sectors. The growth of the strategic sector will benefit and spillover effect to the downstream sectors in its supply chain.

Key Sector

The sector that earns input and sells its output exceeds the average sector in the economy. Investments in this sector will give an advantage to the growth of the sector and other sectors involved in the economic chain.

Independent Sector

The sector that earns input and sells its output is less than the average of all sectors in the economy. This sector is an established sector in its own ecosystem and its spillover to other sectors of the supply chain is minimal.

Driven Sector

The sectors that obtain input from other sectors that have an average of more than the average of all sectors in the economy.