

The Supply and Use tables: The approach for conversion to input-output table

Bui Trinh¹, Kiyoshi Kobayashi² and Kwang Moon Kim³

Abstract

In this paper we focus on presenting on supply and use tables and the approach in order to convert supply and use tables to input-output table and some comments on the assumption for converting from supply and use tables to input – output table.

JEL classification numbers: I32, I31, C43

Keywords: activity, industry, input-output, matrix, product, supply, table, use, vector

1 Introduction

Before time, the Make and Use matrixes were presented in the 1968 System of National Accounts (SNA) as intermediate step for compiling input-output table.

¹ Vietnam National Accounts Department, e-mail: buitrinhcan@gmail.com

² Kyoto University, e-mail: kobayashi.kiyoshi.6n@kyoto-u.ac.jp

³ Kyoto University, e-mail: kimkwangmoon@toshi.kuciv.kyoto-u.ac.jp

When 1993 System of National Accounts were established, the make and use matrixes moved to supply and use tables (S.U.T) and then input-output table seems to disappear. Actually, almost Asia countries still regard the input-output analysis as important tool for economic analysis.

In this paper we focus on presenting on supply and use tables and the approach in order to convert supply and use tables to input-output table and some comments on the assumption for converting from supply and use tables to input – output table.

2 The supply and use tables

Make matrix (Supply matrix): This matrix shows the domestic production of goods and services at basic value, the rows of this matrix present the different activities (industries), and the columns show the goods and services (commodities) produced by the respective industries. Reality most establishments also engage in secondary activities, so the make matrix reflects this situation as shown by the products of off-diagonal entries in addition to the principal products on the diagonal (in the case make matrix is square matrix). We call make matrix S - and we have:

$$S \cdot I = X_A$$

$$I \cdot S = X_C$$

Where: I is identify vector, X_A is vector domestic output by industry at basic price and X_C is vector domestic output by commodity at basic price.

Use matrix: This table shows intermediate input by column and intermediate demand by row. Follow the recommendation of SNA 1993, the goods of intermediate input (demand) are at purchase price, so that means row vectors of trade and transportation equal “zero”. Call this matrix is U , we have:

$U \cdot I$ is intermediate demand vector and $I \cdot U$ is intermediate input vector (where I is identify vector).

Value added matrix: This matrix shows factors of value added by row and that of industry by column. The factors of value added include:

- Compensation of employees
- Tax on production plus subsidies (excludes tax on products)
- Depreciation
- Operating Surplus

Call this matrix is V : $I' \cdot V$ is value added vector by industry (I' is identified vector with 4 elements).

So:

$$I' \cdot U + I' \cdot V = S' \cdot I = X_A$$

Final demand matrix: This matrix shows component of final demand by column and commodity by row. The component of final demand includes:

- Household consumption expenditure
- Government consumption expenditure
- Fixed capital formation
- Changes in inventories
- Export

Call this matrix is Y and $Y \cdot I$ is vector of total final demand by commodity. So:

$$U \cdot I + Y \cdot I = X_{CP}$$

Where: X_{CP} is vector of gross output by commodity at purchase price, and

$$X_C + T_D + T_T + T_P + M = X_{CP}$$

Where: T_D is trade margin vector (by commodity);

T_T is transportation margin vector;

T_P is vector of tax on products and M is vector of imported.

Supply and use framework:

	<i>Activity</i>	<i>Product</i>		
<i>Activity</i>		S		X_A
<i>Product</i>	U		Y	X_{CP}
	Value added			
		T_D		
		T_T		
		T_P		
		M		
	X_A	X_{CP}		

3 Conversion of make and use matrixes to input-output table

In order to convert the make and use matrixes to input-output table the first step is convert the use matrix at purchase price to basic value, because the make matrix is basic value.



Use matrix at producer price

				USE TABLE at PURCHASER'S PRICE	-	TRADE MARGINS TABLE	TRANSPORT MARGINS TABLE	=
				Totals = TdM _i		Totals = TdM _i		
TO				INTERMEDIATE DEMAND	FINAL DEMAND			
FROM				INDUSTRY	HOUSEHOLDS			
I	C	1	Quadrant I	Quadrant II	X _i			
N	O	2			at			
T	M	:			Prod			
E	M	:			Prices			
R	G	:			X _{cp}			
M	O	:			X _{cp}			
E	T	:			X _{cp}			
D	Y	22			X _{cp}			
P	I	I	Quadrant III	Quadrant IV				
R	N	:	VALUE ADDED	VALUE ADDED				
I	P	p	V _{pi}					
M	U	:	Purch price = Prod price					
	T	4						
GI				X _i at PRODUCERS' PRICES	F _i at PRODUCERS' PRICES			

There are two the assumption in order to convert from make and use matrixes to input-output table; these are the commodity technology and the industry technology.

3.1. The commodity technology assumption

The commodity technology assumption postulates that a commodity has the same input structure regardless of in which industry it is produced.

We put:

$$S' = C * \widehat{XA} \quad (1)$$

$$U = B * \widehat{XA} \quad (2)$$

Where: S' is transposed matrix of S ; \widehat{XA} is diagonal matrix with elements on diagonal are elements of vector X_A ; C is coefficient matrix of make matrix (S') estimated by *commodity technology assumption* and B is coefficient matrix of use matrix

Other hand we have:

$$X_C = B * \widehat{XA} + Y \quad (3)$$

From (1) we can see:

$$C * X_A = X_C \quad (4)$$

So:

$$X_A = C^{-1} * X_C \quad (5)$$

Due to $\widehat{XA} * I = X_A$ and from (4) and (5) we have:

$$X_C = B * C^{-1} * X_C + Y$$

and:

$$X_C = (I - B * C^{-1})^{-1} * Y \quad (6)$$

and:

$$X_A = (I - C^{-1} * B)^{-1} * C^{-1} * Y \quad (7)$$

$B \cdot C^{-1}$ is direct input coefficient matrix ($A_C = B \cdot C^{-1}$) with dimension is commodity by commodity.

$C^{-1} \cdot B$ is direct input coefficient matrix ($A_I = C^{-1} \cdot B$) with dimension is industry by industry.

We can rewrite as follow:

$$\left\langle \frac{(I - C^{-1} * B)^{-1}}{(I - B * C^{-1})^{-1} * B} \middle| \frac{(I - C^{-1} * B)^{-1} * C}{(I - B * C^{-1})^{-1}} \right\rangle x \begin{Bmatrix} 0 \\ Y \end{Bmatrix} = \begin{Bmatrix} X_A \\ X_C \end{Bmatrix} \quad (8)$$

In equation (8): $A = C^{-1} \cdot B$ is intermediate input matrix with industry by industry type and $A = B \cdot C^{-1}$ is intermediate input matrix with product by product type.

In this case some elements of matrix A appear small negative numbers. We put all of them equal “zero” after that use RAS method for balancing again.

3.2. The industry technology assumption

The industry technology assumption on the other hand, assumes that commodities produced by one industry are all produced with the same input structure. We put:

$$S = D * \widehat{XC} \quad (9)$$

Where: D is coefficient matrix of make matrix (S) calculated by industry technology assumption; \widehat{XC} is diagonal matrix with elements on diagonal are elements of vector X_C .

Same approach with before part, we have:

$$\left\langle \frac{(I - D * B)^{-1}}{(I - B * D)^{-1} * B} \middle| \frac{(I - D * B)^{-1} * C}{(I - B * D)^{-1}} \right\rangle x \begin{Bmatrix} 0 \\ Y \end{Bmatrix} = \begin{Bmatrix} X_A \\ X_C \end{Bmatrix} \quad (10)$$

Where: $B \cdot D$ is direct input coefficient matrix by commodity by commodity; $D \cdot B$ is direct input coefficient matrix by industry by industry.

Commodity technology assumption is better on economic meaning, but many countries do not choose it for converting from supply and use tables to input-output table, because when application the commodity technology assumption may lead to appear some negative number. The RAS method used for balancing again when putting “zero” replace negative number.

In the case make and use matrixes are non-square: The number of row of the supply and use tables of Vietnam compiled in 2007 differ from number of columns. These tables are difficult for converting from make and use matrixes to the input-output table.

We recommend for the country want to use input – output table when compile S.U.T should set up the supply and use matrixes are square.

References

- [1] Bui Trinh, *Input-Output Model and its applications in economic and environmental analyzing and forecasting*, HoChiMinh City Publisher, 2001.
- [2] Handbook of input-output table compilation and analysis / Department of Economic and Social Affairs, Statistics Division, series F, Number 4, New York: United Nations, 1999.
- [3] UN, SNA, 1968.
- [4] UN, SNA 1993