A study on the Input-Output System for evaluation of infrastructure development in Vietnam

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Chapter 1

Introduction

1.1 Background

The last 20 years has been very positive, as Vietnam's economy has consistently experienced economic growth. Influences of Vietnam on the global economy have rapidly increased, while regional disparity has become one of the crucial topics not only for academic researchers but also for policy makers. This has prompted recent interest in measuring the total economic impacts [on production, employment, income, environment] on our country's regional economies. In related literature of studies in Vietnam, many researchers have started investigating not only the extent of regional disparity, but also whether it has diverged or converged. It should be noted, however, that few studies look at the aspects of "Space economy"

More specifically, even if one region developing faster, and assuming that development of other regions remains stationary, regeional economic system may change; and hence, this change may also impact on the economic activity of other region though inter-regional transactions among various industries. This implies that the economy & industrial linkage between regional(National) economies will be expanded through international trade , foreign direct investments and technology transfer in the future. So, when public sector makes development plans, consideration should be given to both inter-sectoral as well as inter-regional (National) dependencies.

In order to clarify the above stated National/Regional development problems in Vietnam, particularly within the context of economics, there is the need for efforts to improve planning methodsin the are of "the compilation and utilization of integrated database for policy modeling based on "Input Output System （"IOS"）. This kind of database will support analysis of inter-industrial interdependency, intra-regionally(Nationally) and inter-regionally(Nationally) alike.

“IOS” is the one of representative framework which capture the revolving structure of national economy based on “Activity by Activity”. This model introduces the concept of Leontief inverse matrix and enlarged Leontief matrix and Keynes multipliers, which can analyze the relationship between income groups and consumer groups, respectively. IOS was developed by Professor Wassily Leontief in the last 1930s, in recognition which he receipted Nobel Prize in Economic Science in 1973. “IOT“ is also an intergral part of System of National Account. They play an important role as basic framework (or consistency analysis) for both compiling GDP at producer-side, income side and expenditure-side in an integrated approach. "IOT" consitute the centre piece of the internationally compatible accounting framework for systematic and detailed description of the economcy, its various compontents on the supply and demand side and its relation to other economies.

“IOS” is not only useful for consistency analysis and impact analysis but also useful for database of “Computable General Equibrium (CGE) modeling” and “Social Account Matrix (SAM)” for policy analysis. These extension IO models were built and applied by most countries in the world for analyzing and forecasting the economy. There are many different uses on this model such as IO analysis, SAM analysis and CGE model.

There have been two streams of critical issue of "IOT", **First issue** is how to make harmonized consistency with SNA. There have been several historical background of IO compilation in the world. IOT was involved by Richard Stone to System of National Account (SNA) version 1968 and he also receipted Nobel prize in 1984, he is first put forward the approach for compiling IOT throat “Make and Use Matrixes”. So, “the Make and Use Matrixes” were presented in the 1968 System of National Accounts (1968-SNA) as intermediate step for compiling IOT. When many countries started to compile IOT based on Stone’s recommendation, they faced on technical bottleneck which is baed on region’s original condition. One of the most critical issue was “the gap adjustment of data treatment within theoritical framework and practical data compilation under limitation. Among them, Treatment for adjusting gap of sector classification (“Acticity-by-Activity” vs “Producty-by-Product[or Commodity-by-Commodity”] vs “Industry-by-Industry”) and bi-product (single product, bi-product) have been one of the most traditional and critical issue. In order to implement, two main streams has established by each country; “Direct approarch” or “Practical approach”.

In USA or Europ counries, due to the serious difficulty to implement data collection and processing for IO compilation to keep quality (in 1968SNA), they developed practical approarch of IO compilation (“Suppy and Use Table framework[SUTf]”) . When 1993 the System of National Accounts were established, “the Make and Use Matrixes” under 1968-SNA moved to “Supply and Use Tables (SUTs)” and then the name of IOT seems to disappear System of National accounts, 1993. In many Asian countries, they have been compiled “Commodity by Commodity type” IOT. They had higher priority to keep consistency with “activity by activity framework” than compatibility with difficulty of data collection, or they did not have enough experience of Practical approach (SUT-IOT compilation), except for Vietnam and other few Asian countries.

Second issue is Regionalization of IOT which is estimating regional and Interregional Input-Output multiplier. "Input Output Table (IOT)" is table based on “IOS” which provides information on inputs and outputs of goods and services among industries, final demand and value added. Domestic trade flows and foreign trade flows, the flows of goods and services between various economic sectors within each region and among different regions must be estimated as these flows are not reflected in the “National Input Output Table(NIOT)”. These flows are the attributes differentiating an “Inter-Regional Input Output (IRIO)” model from a single-region model. An IRIO model includes IO models of each region within the larger inter-regional structure. The intermediate and final demand structure of each region allows the user to calculate the differences underlying production and consumption structure among regions.

Many regional economist in Vietnam and other Asian countries have just done the descriptive analysis on regional development problem when they approach this topic. One reason is the IO analysis is still not popular method for understanding regional ecomoic feature and other is that it is difficult to approach to regional IO data for regional economic analysist. Under the limitation of access to regional IO for many economist in Vienam and outside Vietnam in Asian, it is meaningful to consider how to estimate IO data from existence of data. In current international society (espessilaly Asian-Pasific region), now is the important time to re-consider technical compatibility of statistic harmonization for policy analysis of international integration.

1.2 Overview of Economic Statistics in Vietnam

1.2.1 Institutional strucutre of Government Gtatitisic administaration

Just after sometimes of victory of revolution with many difficulties of the time to oppose enemies and aggressor, President Ho Chi Minh, Interim President of Democratic Republic of Vietnam in May 6th,1946 signed Edict No 61/SL to assign the organization system of Ministry of National Economy including departments, sections, bureaus in which had Bureau of Vietnam Statistics. In order to fully remember the great achievement of Uncle Ho with the contribution and development of statistics, in order to follow historical events, and to be allowed by Prime Minister of Social Democratic Republic of Vietnam, The Statistics named May 6th is the day of foundation.

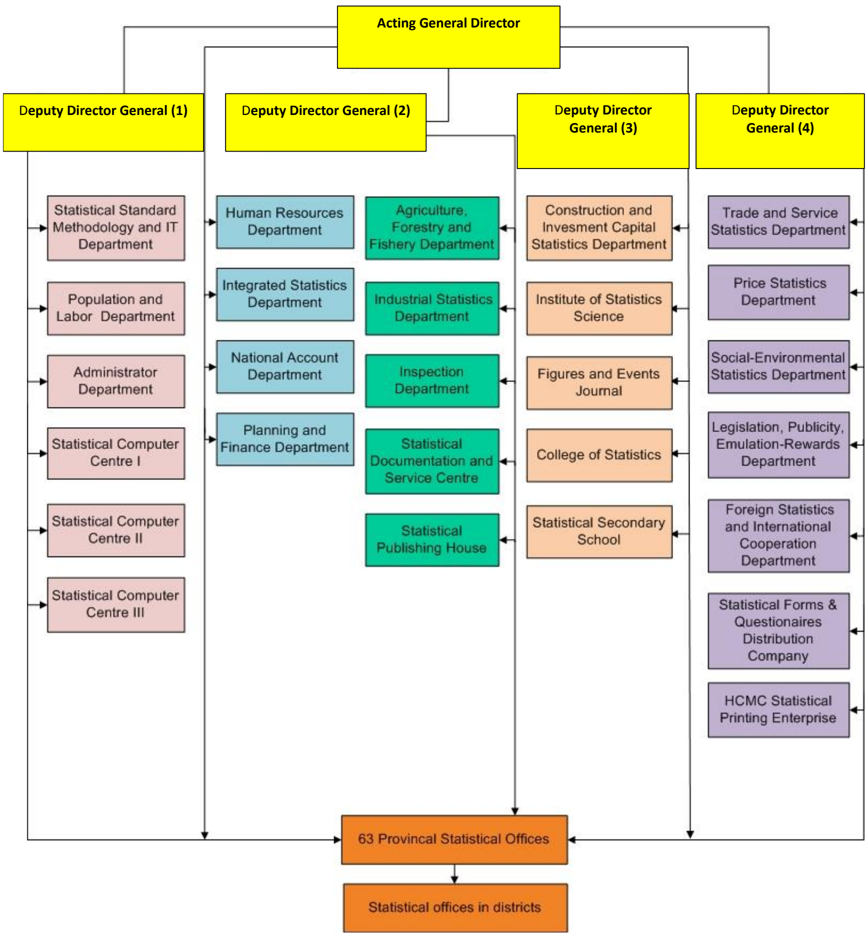


Fig 1.1 Organizational Structure (http://www.gso.gov.vn)

Insitutute of Statistic Administration in Vietnam is a summarized in Fig 1.1. System of central statistics office permanently included General statistics, Agricultural Statistics, Industrial Statistics, Basic Infrastructure Statistics, Commercial and Financial Statistics, Culture, education, health, population and labor Statistics.

Organizationally, GSO was organized into direct line from central down to local levels. Its structure consisted of The Central GSO headquarter(GSO), Provincial Statistics Offices(PSO) , District Statistics Offices(DSO).

1.2.2 Current status of National Accounts and I-O Account in Vietnam

1.2.2.1 National Accounts

Table 1.1 present the Vietnam SNA situation. In Vietnam, the before 1975 the Vietnam country has two countries, the north of Vietnam was applied the material balance product system (MPS) and South of Vietnam was applied System of National Accounts (SNA). After 1975 the Vietnam aggregated and general of Vietnam applied the MPS system.

The SNA has been conducted in Vietnam since 1989 under the sponsorship of UNDP but the decree 183/TTG about the replacement of MPS by the SNA had not been signed by the prime minister until 1992. Thus from 1989 the National Accounts are compiled based on a system of national account (SNA) approach, replaced the material products balance system (MPS) approach used by Vietnam Statistics before 1989. Hence the 1989 Input Output table was the first IO table compiled in Vietnam and covers not only material products but also non-material products in the intermediate input.

Table 1.1 Vietnam SNA situations

	1989	…..	1993	….	2000	…..	2008
GDP	**x** *Sponsored by UN*	**x**	**x** *Issued decision by VN Govt.*	**x**	**x**	**X**	**x**
Quarterly GDP					**x**	**X**	**x**
GRDP by province					**x**	**X**	**x**
NDI	**x**	**x**	**x**	**x**	**x**	**x**	**x**
Saving	**x**	**x**	**x**	**x**	**x**	**x**	**x**

From 1993, SNA in Vietnam is compiled at the level of calculating some integrated indicators such as GDP, a balancing amount of production account; Gross National Income (GNI), National Disposable Income (NDI), saving as balancing amounts of Income and Redistribution income account and accumulation account.

In Vietnam, GDP is basically calculated by production approach, in the benchmark year when the I-O table is compiled, GDP was estimated by production, income and expenditure approach; the classification used in calculating the integrating indicators of the VSNA is prescribed at the one-digit level of “the Vietnam System of Industry Classification (VSIC)”. Specifically, it presents an in-depth articulation of the varying techniques and procedures that are currently being adopted in the calculation of such vital GDP indicators as sector Gross Output, Intermediate input and value added.

1.2.2.2 Input Output Account

Official National IO table

The first National input output table of Vietnam was compiled in 1989 by Vietnam General Statistics Office, this project was sponsored by United Nation. The all of these input-output tables is commodities based table with competitive-import type, and the concepts and definitions followed were those recommended in the 1968 and 1993 SNA in Table 1.2.

Table 1.2 Benchmark National IO Table (IOT) for Vietnam

Reference Year	Size of IOT (commodities-by commodities)	Type/Price	Methodology
1989	54x54	Competitive/Current price	Direct full survey, compiled from Make and Use Matrices
1996	97x97	Competitive/Current price	Direct full survey, compiled from Make and Use Matrices
2000	112x112	Competitive/Current price	Direct full survey, compiled from Supply and Use Table (SUT)
2007	138x138	Competitive/Current price	Direct full survey, compiled from Supply and Use Table (SUT)

(Source) Asian Development Bank (ADB) 2012, Supply and Use Tables for seleted Economics in Asia and the Pasific:A Research Study

Input-Output extension: Social Accounting Matrix (SAM)

In 2000 the National Social Accounting Matrix (SAM) 2000 was compiled by Central Institute Economic Management (CIEM under Ministry of Planning and Investment) and National Account Department (GSO) with 112 sectors.In 2005 the Vietnam SAM was updated by consultant group of Vietnam Ministry of Finance with 112 sectors.

1.3 Other extention of Input Output Account

1.3.1 Regional wide IO table in Vietnam

At the regional level, compilation of IO tables has not yet been developed officially in Vietnam, although a few IO-based research studies have been recently conducted by private organizations/institutions. Regarding Intra-IO table (Single region), Hochi Minh City (HCM research institute,1996), Hanoi(AREES, 2000), Danang(AREES,2000), Haphoing(AREES, 2000), Cantro(AREES,2005). Regarding Inter-Regional Input-Output table(IRIO), Bilateral IRIO (HoChiMinh city and Rest of Vietnam, 1996) was first IRIO in Vietnam, this framework was compiled by AREES sponsored by NISSAN Science Foundation with 48 sectors and then in 2000, the multi inter-regional input-output table between Mega cities(Hanoi, Danang) and the rest of Vietnam with 48 sectors, and 7-8 region's inter regional input-output table have been compiled by AREES sponsored by NISSAN Science Foundation, and other research project in Japan.

1.3.2 Other IO table in Indochina countries (including Regarding cross national wide (international/regional) input-output framework):

Table.1.3 shows an inventory of latest I-O data availability by country. It can be observed that, of the 5 Indochina countries, 2 countries (Thailand, Vietnam and Cambodia) have produced official national I-O tables, with CY 2007 as their latest reference years, and 3 countries have produced unofficial IOT by research team. AREES has worked with National Institute of Statistics (NIS) to update Cambodia's (unofficial) 2000 IOT, and conpiled updated IOT in Lao PDR, and Myanmar for construction of a fully-covered Indochina IRIOT.

Table 1.3 Inventory of Latest Available IOT in The Indochina Region
(at December.2014)

Area Coverage	Cambodia	Thailand	Vietnam	Lao PDR	Myanmar
1. National Benchmark	- 2000 IO - (22x22) - Com/Noncom - Non-survey - AREES/NIS -2007 SUT -NIS	- 2000 IO - (180x180) - Com/Noncom - Survey (not-based-on-SUT) - NESDB/IDE	- 2007 IO - (138x138) - Com - Survey (based-on-SUT) - GSO	N/A	N/A
2. National Update	- 2005 IO - ONGOING (AREES/NIS)	- 2005 IO - ONGOING (NESDB/IDE)	-2005 IO -112X112	-2003 (AREES)	-2005 (AREES)
3. Regional (Intra or Inter-regional IO)	N/A	N/A	1) 2000/2005 MRIRIO (7-8region) 2) 1996/2000 Bi-2region IRIO (HCMC, Hanoi, Danang)	N/A	N/A
5. Provincial (Intra or Inter-regional IO)	N/A	2003 Mukdahan Provincial - 20x20 - Non-survey - ADB	1) 2000 Hanoi 2) 2000 HCMC 3) 2000 Danang 4) 2000 Haiphong 5) 2000 Quangtri -ADB/AREES/HRI	2003Savannakhet Provincial - 20x20 - Survey - ADB	N/A
5.Inter national (Cross border inter regional)		**1) 2003 Mukdahan-Savannakhet Inter-Provincial IO Table 20 x 20 sectors (ADB)** **2) 2000 Thailand- Vietnam International IO talbe (AREES)** **3) 2003 Thailand-Laos International IO table (AREES)**			

(Source) Proceeding of the 3rd AREES International Joint Conference, "Compilation & Utiliztion of an Integrated Database for Cross Border Economies in the Indochina Region: Econometric Analysis for Future of Global and Regional Economy Integration in Asian countries", Kunmming city, Yunnan Province, China.

1.4 Objective

The aim of this dissertation is to present compilation and utilization of macroeconomic data of the Vietnam arranged in Social Accounting Matrix (SAM), accompanied with Supply and Use tables, and notes on how to build a symmetrical or Leontief-type of Input-Output (IO) table in National wide and regional wide.

1.5 Structure of dissertation

In this dissertation I combine several sterams of literature. This dissertation includes 9 chapters, chapter 1 is introduction on general history of Vietnam statistics, National accounts and input-output accounts and Vietnam economy situation; chapter 2 presents Feasible compilation of Vietnam's I-O Table by Survey & Hybrid Approach; chapter 3 presents the approach to compile and utilization of national SAM in Vietnam; chapter 4 presents structural change comparison of interactions analysis between manufacturing & non manufacturing industries: "Application to Vietnam economy after renovation based on input-output tables 1989, 1996, 2000"; chapter 5 presents analysing the relationship between income groups & final demand based on extended input-output framework; chapter 6 presents economic-environmental impact analysis based on a bi-regiona interregional I-O model for Vietnam, between Hochiminh City and the Rest of Vietnam, 2000; chapter 7 presents multi-interregional economic impact analysis based on multi-interregional input-output model consisting of 7 regions of Vietnam 2000; chapter 8 presents economic integration and trade deficit: A case of Vietnam; chapter 9 is conclusions

Chapter 2

Feasible Compilation of Input Output Table by Survey & Hybrid Approach

2.1 Introduction

Input Out Table(IOT) is the one of representative statistic framework which capture the revolving structure of national economy based on "**activity by activity**". IOT is an intergral part of System of National Account which aims to not only record transaction structure of goods and services but also production technology at the same time. They play an important role as basic framework (or consistency analysis) for both compiling GDP at producer-side, income side and expenditure-side in an integrated approach. "IOT" consitute the centre piece of the internationally compatible accounting framework for systematic and detailed description of the economcy, **its various compontents** on the supply and demand side and its relation to other economies. IOT is not only useful for impact analysis but also useful for database of CGE modeling for policy analysis. IOT also revolve around a matrix of technical coefficient.

On the other hand, Practically, IOT is very complicated account to keep theoretical consistency (Condition-I in Table.2.1) and realistics of economc structure (Condition II in Table 2-1) due to practical constrain of data collection and compilation.

Table 2.1 Type of IOT and Technical Conditions

<table>
<tr><td colspan="2" rowspan="5">【Condition I】
【Condition II】</td><td>I. Level of Consistency with Input Output Table (IOT) Compilation</td></tr>
<tr><td>(1) Level of consistentcy with input output structure
(Intra-regional wide, Inter-regional wide)</td></tr>
<tr><td>(2) Level of treatment of secondary product adjustment for estimation</td></tr>
<tr><td>(3) Level of consistency with SNA</td></tr>
<tr><td>(4) Level of hamonized sector classification (CPC, ISIC)</td></tr>
<tr><td rowspan="4">II. Level of Using original information</td><td>(1) Using survey based data for all of the component</td><td rowspan="4">【Type of IOT】
(1) Approach: Full survey vs Non-survey vs Hybrid
(2) Matrix: Symetric vs Rectangrar</td></tr>
<tr><td>(2) Using survey based data for main component</td></tr>
<tr><td>(3) Bollowing processing data from other sources for main component</td></tr>
<tr><td>(4) Bollowing processing data and coefficient from other sources for all of the component</td></tr>
</table>

This Chapter is aims to overview critical issue for feasible compilation of IOT by Survey & Hybrid Approach.

2.2 National IO table

2.2.1 IO model

The first is the Leontief IO model, which was initially formulated by Wassily Leonfief in the 1930s, the work for which he received the Nobel Prize in Economics in 1973. In the Leontief model, which is also referred to as the symmetric model, each industry produces only one Product (or commodity), and each product (or commodity) is produced by only one industry. The Leontief model includes an intermediate transaction table (Z), which is a square matrix, a final demand vector (Y), and a value added vector (V) in Fig 2.1. The Leontief model includes an intermediate transaction table (Z), which is a square matrix, a final demand vector (Y), and a value added vector (V) by sector (N[n,m]). Total output (X) can be obtained by either adding intermediate output and final demand (X=Zi+Y), or by adding intermediate inputs and value added (X=^{t}Zi+^{T}V).

<table>
<tr><td colspan="2" rowspan="2"></td><td colspan="3">Intermediate Demand (ID)</td><td rowspan="2">Final Demand (FD)</td><td rowspan="2">Import (M)</td><td rowspan="2">Total Output</td></tr>
<tr><td>Sector 1</td><td>· · ·</td><td>Sector N</td></tr>
<tr><td rowspan="3">Intermediate Input (II) (by Sector)</td><td>Sector 1</td><td colspan="3" rowspan="3">Z (Zc or ZA)
Intermediate Demand/Input Matrix (Symmetric Matrix)
(Product-by-Product, or Industry-by-Industry)</td><td rowspan="3">Y (Yc or YA)
Sector-by-Final Demand Matrix</td><td rowspan="3">M (Mc or MA)
Sector-by-Final Import Matrix
[Column vector]</td><td rowspan="3">X (Xc or XA)
Total Output by sector
[Column vector]</td></tr>
<tr><td>· · ·</td></tr>
<tr><td>Sector N</td></tr>
<tr><td rowspan="3">Value Added</td><td>CE</td><td colspan="3" rowspan="3">V (Vc or VA)
Value Added</td><td colspan="3" rowspan="4"></td></tr>
<tr><td>OS</td></tr>
<tr><td>Other</td></tr>
<tr><td colspan="2">Total Input</td><td colspan="3">^{t}X (^{t}Xc, or ^{t}XA)
Total Output by sector
[Raw vector]</td></tr>
</table>

Fig 2.1 Layout of IO Table (Competitive import type)

Where;

$$Z_c = \begin{bmatrix} z^c_{11} & z^c_{12} & \cdots & z^c_{1n} \\ z^c_{21} & z^c_{22} & \cdots & z^c_{2n} \\ \vdots & \ddots & \ddots & \vdots \\ z^c_{n1} & z^c_{n2} & \cdots & z^c_{nn} \end{bmatrix}, \quad Z_A = \begin{bmatrix} z^A_{11} & z^A_{12} & \cdots & z^A_{1m} \\ z^A_{21} & z^A_{22} & \cdots & z^A_{2m} \\ \vdots & \ddots & \ddots & \vdots \\ z^A_{m1} & z^A_{m2} & \cdots & z^A_{mm} \end{bmatrix}, \quad Y_c = \begin{bmatrix} y^{c1}_1 & y^{c2}_2 & \cdots & y^{cr}_1 \\ y^{c1}_2 & y^{c2}_2 & \cdots & y^{cf}_2 \\ \vdots & \ddots & \ddots & \vdots \\ y^{c1}_n & y^{c2}_n & \cdots & y^{cf}_n \end{bmatrix}, \quad Y_A = \begin{bmatrix} y^{A1}_1 & y^{A2}_2 & \cdots & y^{Ar}_1 \\ y^{A1}_2 & y^{A2}_2 & \cdots & y^{Af}_2 \\ \vdots & \ddots & \ddots & \vdots \\ y^{A1}_n & y^{A2}_n & \cdots & y^{Af}_n \end{bmatrix},$$

$$V_C = \begin{bmatrix} v^1_1 & v^1_{12} & \cdots & v^1_n \\ v^2_1 & v_2 & \cdots & v^1_n \\ \vdots & \ddots & \ddots & \vdots \\ v^v_1 & v^v_2 & \cdots & v^v_n \end{bmatrix}, \quad V_A = \begin{bmatrix} v^1_1 & v^1_{12} & \cdots & v^1_m \\ v^2_1 & v_2 & \cdots & v^1_m \\ \vdots & \ddots & \ddots & \vdots \\ v^v_1 & v^v_2 & \cdots & v^v_m \end{bmatrix}, \quad X_c = \begin{bmatrix} X_{c1} \\ \vdots \\ X_{cn} \end{bmatrix}, \quad X_A = \begin{bmatrix} X_{A1} \\ \vdots \\ X_{Am} \end{bmatrix}, \quad {}^{t}X_c = \begin{bmatrix} \overbrace{X_{c1} \quad \cdots \quad X_{cn}}^{n} \end{bmatrix},$$

$$ {}^{t}\mathbf{X}_{A} = \left[\overbrace{\mathbf{X}_{A1} \quad \cdots \quad \mathbf{X}_{Am}}^{m} \right] $$

The one-to-one relationship between industries and commodities (or product) defined by this framework implies that the direct-input-coefficient matrix $\mathbf{A} = \mathbf{Z}\hat{\mathbf{X}}^{-1}$ ($\mathbf{A_c} = \mathbf{Z_c}\hat{\mathbf{X}}_{\mathbf{C}}^{-1}$, or $\mathbf{A_A} = \mathbf{Z_A}\hat{\mathbf{X}}_{\mathbf{A}}^{-1}$)and the total requirements matrix $[\mathbf{I} - \mathbf{A}]^{-1}$ ($[\mathbf{I} - \mathbf{A_c}]^{-1}$ or $[\mathbf{I} - \mathbf{A_A}]^{-1}$)produce both commodity-by-commodity (cxc)) matric($\mathbf{A_c}$) and industry-by-industry (ixi) matric ($\mathbf{A_A}$). Where;

$$ \hat{\mathbf{X}}_{\mathbf{C}}^{-1} = \begin{bmatrix} 1/x_{c_1} & 0 & 0 & 0 \\ 0 & 1/x_{c_2} & 0 & 0 \\ 0 & 0 & \ddots & 0 \\ 0 & 0 & 0 & 1/x_{c_m} \end{bmatrix}, \quad \hat{\mathbf{X}}_{\mathbf{A}}^{-1} = \begin{bmatrix} 1/x_{A1} & 0 & 0 & 0 \\ 0 & 1/x_{A2} & 0 & 0 \\ 0 & 0 & \ddots & 0 \\ 0 & 0 & 0 & 1/x_{Am} \end{bmatrix}, \quad \mathbf{A_C} = \begin{bmatrix} z^c_{11}/x_{c1} & z^c_{12}/x_{c2} & \cdots & z^c_{1n}/x_{cn} \\ z^c_{21}/x_{c1} & z^c_{22}/x_{c2} & \cdots & z^c_{2n}/x_{cn} \\ \vdots & \vdots & \ddots & \vdots \\ z^c_{n1}/x_{c1} & z^c_{n2}/x_{c2} & \cdots & z^c_{nn}/x_{cm} \end{bmatrix}, \quad \mathbf{A_A} = \begin{bmatrix} z^A_{11}/x_{A1} & z^A_{12}/x_{A2} & \cdots & z^A_{1m}/x_{Am} \\ z^A_{21}/x_{A1} & z^A_{22}/x_{A2} & \cdots & z^A_{2m}/x_{Am} \\ \vdots & \vdots & \ddots & \vdots \\ z^A_{m1}/x_{A1} & z^A_{m2}/x_{A2} & \cdots & z^c_{mm}/x_{Am} \end{bmatrix} $$

That is, there is no distinction between commodities and industries in the Leontief model.

2.2.2 Supply and Use Table (SUT)

2.2.2.1 Background

An IO matrix of technical coefficients (A matrix) generally depicts either the director requirement of “commodity I” needed to produce on physical unit of “commodity j” or alternatively, the direct inputs from industry i needed to produce one physical unit of industry j. The former is built up with commodity by commodity IO table and the latter, with an industy by industry IO table.

Units for input-output survey: The establishment is defined as a business unit engages in one business activity in - in a single location. In the case of multi-activity business unit, the activities are broken down into establishment according to the engaged activities.

When an establishment produces commodities which are not its principal products, these activities are classified either as secondary or as ancillary: (1) A secondary activity is an activity carried out within a single establishment in addition to the principal activity; (2) An ancillary activity is a supporting activity, which is undertaken in order to create the conditions in which the activities of an establishment can be carried out. The value of products of ancillary activities is normally small as compared with that of the principal products, because, they are treated as an integral part of the activities - in which they are associated.

There were **three different problems** identified here. Firstty, producs and industries can not always be classified in the same way. Secondly, in addition to a multitude of input, industries amy also have a multitiude of output. Thirdly, products contained in each row and column of an industry-by-industry table are not homogeneous in terms of production. The make and use system replaces "Leontief IO model" with two matrices, including a make matrix (V table or S table) of outputs and a use matrix (U table) of input under 1968 SNA's recommendation.

Supply and Use Tables (Supply and Use Tables:SUT) are in the form of matrices that record how supplies of different kinds of goods and services originate from domestic industries and imports and how those supplies are allocated between various intermediate or final uses, including exports. SUT is the system which made much of securing of consistency of the statistics concept with primary statistics and IO table and SNA . SUT provide the detailed description of transactions with goods and services realised in the year. They show resources (output, import, net taxes on products) and uses (intermediate consumption, final consumption, gross capital formation and export) of goods and services.

The base of construction of supply table and use table is a matrix (commodity by industry of activity) allowing to analyse production of industries and resources of commodities at one side and intermediate consumption and final use on the other side. Moreover you can find income approach to gross domestic product below intermediate consumption matrix. The construction of supply and use tables is based on the two equations (by the same valuation of components of sources and uses):

- Output by industries = Inputs by industries; total output is a sum of intermediate consumption and value added
- Sources by products = Uses by products

Supply (MAKE) and Demand (USE) of commodities were described by industries. This new framework provided a more accurate description of product flows and at the same time, made economist face a new problem in the construction of technical coefficients. Basically, the constrction of technical coefficients was reduced to a matter of treatment of seconday products. Many establishments produce only one group of commodities. However, some establishments produce commodities tha are not among the primary product of the industry to with they are belong. As a result, non-zero off diagonal elements would appear in the make matrix. Alternative treantment of secondary products rest upon the separation of output and inputs of the industry in which the secondary product is a characteristic output. Assumptions on these input structures imply an A matrix of technical coefficients as a function of th use and make matrices. Make matrix (industry by product) is merely the transposition of supply matrix (product by industry) and we may use both indistinctly.

The Make(Supply) and Use(Demand) matrixes were presented in the 1968 System of National Accounts (SNA) as initial & intermediate step for compiling input-output table. The Vietnam General Statistics Office compiled the input-output tables based on this rule. When 1993 System of National Accounts were established, the make and use matrixes moved to Supply and Use Tables (SUT) and then Input-Output Table (IOT) seems to disappear.

2.2.2.2 Make table (Supply table)

Fig.2.2 ilastrates layout of Supply table. This table (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.

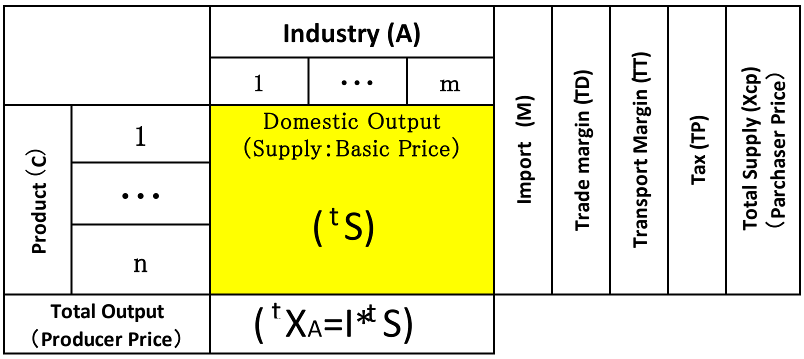


Fig 2.2 Layout of Supply Table

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:

$$S * \iota_n = X_A \tag{2.1}$$

$$^{t}\iota_m * S = {}^{t}X_{Cp} \tag{2.2}$$

where: identify vector, X_A is vector domestic output by industry at basic price(m is number of industry) and ${}^{t}X_{Cp}$ is vector domestic output by commodity at basic price (n is the number of commodity). ι_n is colum vector ($\iota_n = \left[\left. \begin{matrix} 1 \\ \vdots \\ 1 \end{matrix} \right\} n \right]$), $^{t}\iota_m$ is colum vector ($^{t}\iota_m = \left[\overbrace{1 \quad \cdots \quad 1}^{m} \right]$)

2.2.2.3 Use table (Demand table)

Fig.2.3 ilastrates layout of Use table. This table (or Matrix) 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*I is intermediate demand vector and I*U is intermediate input vector (where I is identify vector).

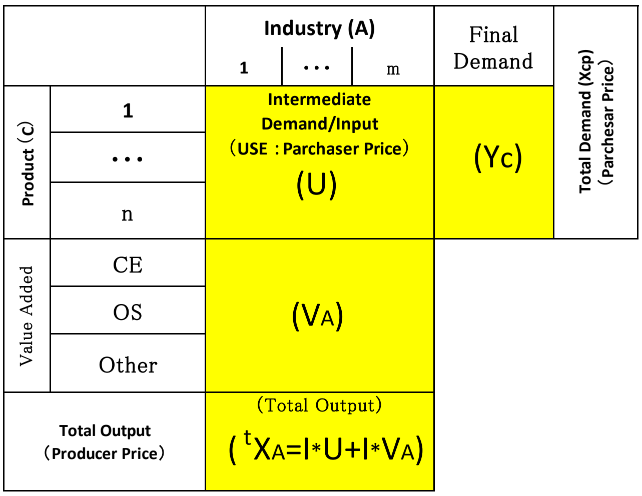


Fig 2.3 Layout of USE Table

Value added matrix: This matrix shows factors of value added by row and that of industry by column. The factors of value added include [1]Compensation of employees, [2] Tax on production plus subsidies (excludes tax on products), [3] Depreciation, [4] Operating

Surplus. Call this matrix is V: I'*V is value added vector by industry (I' is identified vector with 4 elements) as follows;

$$ {}^{t}\iota_{n}\ \mathbf{*U+}\ {}^{t}\iota_{V}\ \mathbf{*V=\ {}^{t}X_{A}} \qquad \textbf{(2.3)} $$

Where: ${}^{t}\iota_{n} = \begin{bmatrix} \overbrace{1 \ \cdots \ 1}^{n} \end{bmatrix}, {}^{t}\iota_{v} = \begin{bmatrix} \overbrace{1 \ \cdots \ 1}^{v} \end{bmatrix}$

Final demand matrix: This matrix shows component of final demand by column and commodity by row. The component of final demand includes [1] Household consumption expenditure, [2] Government consumption expenditure,[3] Fixed capital formation,[4] Changes in inventories, [5] Export. Call this matrix is Y and Y*I is vector of total final demand by commodity as follows;

$$ \mathbf{U*}\iota_{m}\ \mathbf{+\ Y_{c}*}\iota_{m}\ \mathbf{=\ X_{CP}} \qquad \textbf{(2.4)} $$

where: X_{CP} is vector of gross output by commodity at purchase price

ι_m is colum vector ($\iota_m = \begin{bmatrix} \left.\begin{matrix} 1 \\ \vdots \\ 1 \end{matrix}\right\} m \end{bmatrix}$), and

$$ X_C + T_D + T_T + T_P + M = X_{CP} \qquad \textbf{(2.5)} $$

where: T_D is trade margin vector (by commodity), T_T is transportation margin vector,

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

2.2.3 Purchaser prices vs Producer prices

Goods and services may be valued in various ways. The Price Index (PI) is a weighted index of prices measured at the transaction (wholesale, or producer level, or at the consumer level) . Following are the three ways in which they may be measured in the SNA:

The basic price is the amount receivable by the producer exclusive of taxes payable on products and inclusive of subsidies receivable on products. The equivalent for imported products is the c.i.f. (cost, insurance and freight) value, that is, the value at the border of the importing country.

The producer price is the amount receivable by the producer inclusive of taxes on products except deductible value added tax and exclusive of subsidies on products. The equivalent for imported products is the c.i.f value plus any import duties or other taxes on imports (minus any subsidies on imports). The relationship between different types of prices can be given as follows:

Producer prices = Basic prices + taxes on products (excluding VAT)

- subsidies on products (2.6)

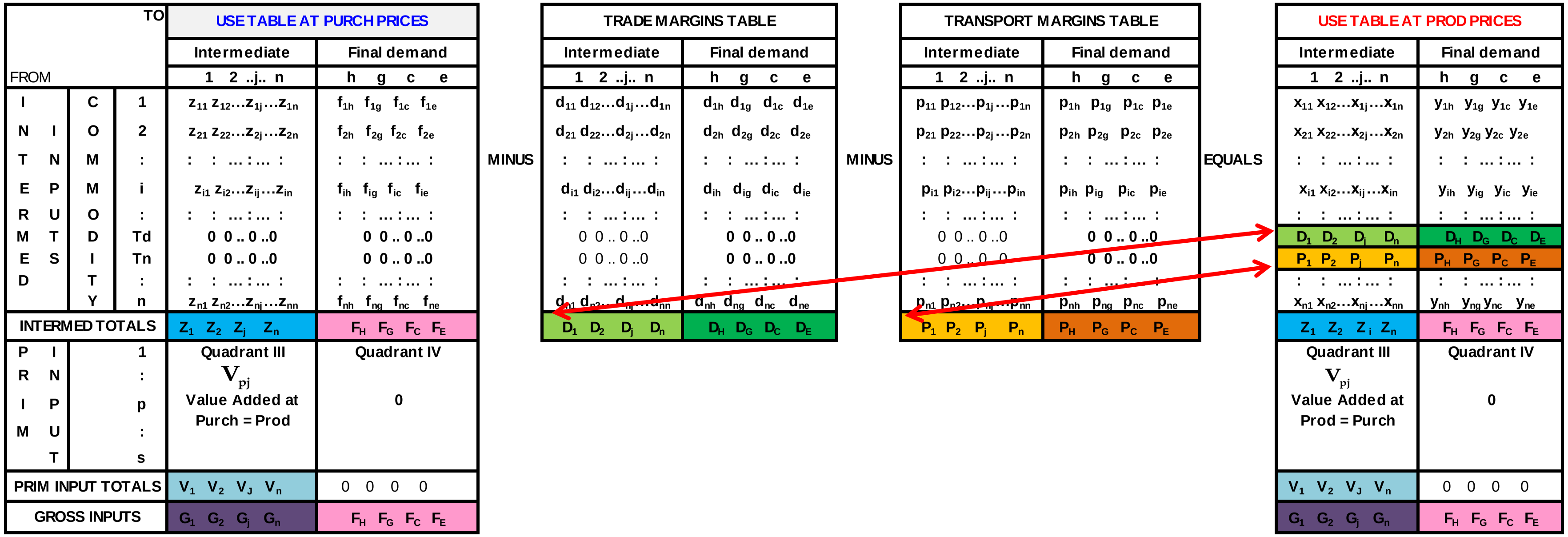
The purchaser price is the amount paid by the purchaser, excluding any deductible VAT [value added taxes] or similar deductible tax, in order to take delivery of a unit of a good or service at the time and place required by the purchaser. The purchasers' price of a good includes any transport charges paid separately by the purchaser to take delivery at the required time and place. It should be noted that in business accounts, "freight-in costs" are normally separated fi'om the purchased value of goods if these costs are paid separately. The relationship between different types of prices can be given as follows:

Purchaser prices = Producer prices + trade and transport margins

+ non-deductible VAT (2.7)

For countries that collect value added data at purchaser prices, GDP at purchaser prices = agriculture value added + industry value added + services, etc. value added at producer prices. For countries that collect value added data at basic prices, GDP at purchaser prices = agriculture value added + industry value added + services, etc. value added at basic prices + net taxes on products.

Fig.2.4 ilastrates Conversion process from purchase price to producer price



z_{ij} : intermediate use of commodity i consumed by commodity sector j at purchasers' prices

x_{ij} : intermediate use of commodity i consumed by commodity sector j at producers' prices

Fig.2.4 Conversion Process from Purchaser's Price to Producer's Price (USE TABLE)

2.2.4. Compilation of SIOT from SUT

2.2.4.1 Accounting framework

Shown in Fig 2.5 is the statistical accounting framework that is being currently adopted for the compilation of the national I-O accounts. This layout is patterned after the U.N. System of National Accounts (UN-SNA) framework for the Production Accounts that is subdivided into nine (9) blocks, each distinctly describing the sub-accounts.

TO / FROM		Product (C)	Industry (A)	FINAL DEMAND (by Category)	TOTALS
		1 2 ..... j ..... n	1 2 ..... j ..... m	1 2 ..... f	
Product (C)	1 2 : i : n	BLOCK I PRODUCT x PRODUCT USE MATRIX (Z_C) (SYMMETRIC IO MATRIX) [PRODUCT x PRODUCT]	BLOCK II PRODUCT x INDUSTRY USE MATRIX (U) (intermetdiate consumption) [PRODUCT x INDUSTRY]	BLOCK III PRODUCT x FINAL DEMAND MATRIX (Y_c)	Total Outputs by Product (X_c)
Industry (A)	1 2 : i : m	BLOCK IV INDUSTRY X PRODUCT MAKE MATRIX (S) SUPPLY MATRIX (OUTPUT) [INDUSTRY x PRODUCT]	BLOCK V INDUSTRY x INDUSTRY USE MATRIX (Z_A) (SYMMETRIC IO MATRIX) [INDUSTRY x INDUSTRY]	BLOCK VI INDUSTRY x FINAL DEMAND MATRIX (Y_A)	Total Outputs by Industry (X_A)
Gross Value Added (GVA)	1 : v	BLOCK VII PRODUCT VALUE ADDED (Vc)	BLOCK VIII INDUSTRY VALUE ADDED (V_A)	BLOCK IX (BLANK)	G D P
TOTALS		PRODUCT OUTPUTS (${}^tX_c$)	INDUSTRY OUTPUTS (${}^tX_A$)	GDE	

Fig 2.5 I-O Accounts Framework

Where;

$$Z_c = \begin{bmatrix} z^c_{11} & z^c_{12} & \cdots & z^c_{1n} \\ z^c_{21} & z^c_{22} & \cdots & z^c_{2n} \\ \vdots & \ddots & \ddots & \vdots \\ z^c_{n1} & z^c_{n2} & \cdots & z^c_{nn} \end{bmatrix}, \; Z_A = \begin{bmatrix} z^A_{11} & z^A_{12} & \cdots & z^A_{1m} \\ z^A_{21} & z^A_{22} & \cdots & z^A_{2m} \\ \vdots & \ddots & \ddots & \vdots \\ z^A_{m1} & z^A_{m2} & \cdots & z^A_{mm} \end{bmatrix}, U = \begin{bmatrix} u_{11} & u_{12} & \cdots & u_{1m} \\ u_{21} & u_{22} & \cdots & u_{2m} \\ \vdots & \ddots & \ddots & \vdots \\ u_{n1} & u_{n2} & \cdots & u_{nm} \end{bmatrix}, S = \begin{bmatrix} s_{11} & s_{12} & \cdots & s_{1n} \\ s_{21} & s_{22} & \cdots & s_{2n} \\ \vdots & \ddots & \ddots & \vdots \\ s_{m1} & s_{m2} & \cdots & s_{mn} \end{bmatrix},$$

$$Y_c = \begin{bmatrix} y^{c1}_1 & y^{c2}_2 & \cdots & y^{cr}_1 \\ y^{c1}_2 & y^{c2}_2 & \cdots & y^{cf}_2 \\ \vdots & \ddots & \ddots & \vdots \\ y^{c1}_n & y^{c2}_n & \cdots & y^{cf}_n \end{bmatrix}, \; Y_A = \begin{bmatrix} y^{A1}_1 & y^{A2}_2 & \cdots & y^{Ar}_1 \\ y^{A1}_2 & y^{A2}_2 & \cdots & y^{Af}_2 \\ \vdots & \ddots & \ddots & \vdots \\ y^{A1}_n & y^{A2}_n & \cdots & y^{Af}_n \end{bmatrix}, \; V_C = \begin{bmatrix} v^1_1 & v^1_{12} & \cdots & v^1_n \\ v^2_1 & v_2 & \cdots & v^1_n \\ \vdots & \ddots & \ddots & \vdots \\ v^v_1 & v^v_2 & \cdots & v^v_n \end{bmatrix}, \; V_A = \begin{bmatrix} v^1_1 & v^1_{12} & \cdots & v^1_m \\ v^2_1 & v_2 & \cdots & v^1_m \\ \vdots & \ddots & \ddots & \vdots \\ v^v_1 & v^v_2 & \cdots & v^v_m \end{bmatrix},$$

$$X_c = \begin{bmatrix} X_{c1} \\ \vdots \\ X_{cn} \end{bmatrix}, \; X_A = \begin{bmatrix} X_{A1} \\ \vdots \\ X_{Am} \end{bmatrix}, \; {}^tX_c = \begin{bmatrix} \overbrace{X_{c1} \quad \cdots \quad X_{cn}}^{n} \end{bmatrix}, \; {}^tX_A = \begin{bmatrix} \overbrace{X_{A1} \quad \cdots \quad X_{Am}}^{m} \end{bmatrix}$$

It can be observed that what the Statistical System can provide the framework are data for compiling the shaded blocks, that is, Blocks II, III, IV and VIII and the shaded row and column control totals as indicated. A product-by-industry USE table of the competitive-imports type could be formed from Fig 2.5 by combining Blocks II, III and VIII. In a competitive-imports type of USE table, no distinction is made between domestic and imported inputs, i.e. each cell entry in the table includes local and/or imported products. Given this type of I-O table, it is possible to conduct a comprehensive analysis of the production and distribution structure of the economy.

Ideally, however, economic impact analysis, which is the essence of I-O-based studies and researches, demands that the I-O table should be of the symmetric (square) product-by-product, non-competitive-imports type. The symmetric I-O matrix is generated by combining non-shaded Blocks I and VII with shaded Block III and is made square by sector reclassification such that n = m (n: number of product, m is number of industry).

2.2.4.2 Deriving of SIOT from SUT

By relaxing the assumption of one-to-one relationships between commodities and industries, this system allows industries to produce more than a single commodity. The implication of this model for compilers of statistical data is that survey data collected from establishments can be used directly for preparing use-make tables; the model is consistent with how industry output is collected and tabulated—that is, as the sum of secondary and primary product outputs of all establishments in the industry. Since industries and commodities are distinct in this system, the numbers of industries and commodities can differ.

With how industry output is collected and tabulated—that is, as the sum of secondary and primary product outputs of all establishments in the industry. Since industries and commodities are distinct in this system, the numbers of industries and commodities can differ.

The use matrix (U) carries the dimensions of the commodities-by-industries, while the make (V) matrix carries the dimensions of the industries-by-commodities, which implies that they are not necessarily square.

The make-use (U V)) system, which is shown with its different components in Fig 2.5, replaces the Leontief model with two matrices, including a make matrix (V) of outputs and a use matrix (U) of inputs. The make-use system was designed to better handle the growing diversity of industrial production in the economy. By relaxing the assumption of one-to-one relationships between commodities and industries, this system allows industries to produce more than a single commodity.

The implication of this model for compilers of statistical data is that survey data collected from establishments can be used directly for preparing use-make tables; the model is consistent with how industry output is collected and tabulated ; that is, as the sum of secondary and primary product outputs of all establishments in the industry. Since industries and commodities are distinct in this system, the numbers of industries and commodities can differ.

The use matrix (U) carries the dimensions of the product-by-industry, while the make (V) matrix carries the dimensions of the industries-by-product, which implies that they are not necessarily square. The unknown non-shaded blocks are derived by using either ad hoc survey data or thru mechanical means of “purifying” the product-by-industry table, given the Supply table (MAKE matrix (Block IV)) following some restrictive “conversion methods(or transforming methods)”

Next section reviews the alternative methods of conversion of SUT into SIOT. Here is introduced from three representative letteratures of deriving of SIOT from SUT. Shimizu (2008), George Soklis(2009), Thijs ten Raa and Jose Manuel Reuda-Cantuche (2010) review the available methods used to convert Supply and Use Tables of actual economic systems to Symmetric Input-Output Tables. Almost of methods are classified in statistical approach and mathematical approarch.

2.2.4.3 Statistic approach

The statistical approach is one of the practical method to separate “the production of the econdary products” by manmade processing operation based on detailed specific information. United Nations (1999) have recommended to governments to grasp as distinct different kinds of production activities as possible, at the time of implementing the statistical survey. If it is difficult to separate production actitivity into main product actitivity and secondary product activity due to the proparties of production technology at the conducting survey, The usual methods of conversion of SUT to SIOT are the following:

The Lump-Sum Method: The Lump-Sum (or Aggregation) Method (Office of Statistical Standards, 1974, p.116) treats „secondary products‟ as if they were produced as a „primary product‟ of the industry that they are actually produced.

The By-Product Method(BPM): The by-product method (Stone, 1961, pp. 39-41) assumes that all ' secondary products' are 'by-products' and that can be treated as negative inputs of the industries that they are actually produced. The Make matrix splits into and ,where is the diagonal matrix that describes the 'primary products' of each industry and is the off-diagonal matrix that describes the 'secondary products' of each industry.

The ESA Method: The ESA (European System of Integrated Economic Accounts) method (Eurostat,1979, pp. 116-7) recommends that 'secondary products' should be treated as if they were produced by the industries were these products are 'primary.

The Transfer Method: The Transfer method was proposed by Stone (1961, pp. 39-41) as an alternative method to treat 'by-products'. This method treats 'secondary products' as if they were bought by the industry where they are 'primary' and added to the output of that industry.

2.2.4.4 Mathematical approach

Mathematical techniques are one way of deriving the SIOT assuming from SUT by mathematical operation is a constant ratio in production technology or sold structures under economic system.

For making symmetric "the Product-by-Product IO table, Technology Assumption would be introduced as follows;

The Commodity Technology Assumption (CTA) which corresponds to Eurostat's model A: The CTA assumes that each industry produces only the total output of the commodity that is primary to that industry and that each commodity has its own input structure, irrespective of the industry that produces it.

The Industry Technology Assumption (ITA) which corresponds to “Eurostat’s model B” : The ITA assumes that each industry produces only the total output of the commodity that is primary to that industry and that has the same input requirements for any unit of output. In that case, the input structure of each commodity depends on what industry produces it.

The Mixed Technology Assumptions(MTA) which corresponds to “Eurostat’s mixed model A & B”: Mixed Technology Assumptions were suggested by Gigantes and Matuszweski (1968) and were incorporated in the 1968 System of National Accounts (United Nations, 1968, p. 50). This conversion method assumes that a part of the secondary products should be treated using the CTA and the remaining part should be treated using the ITA.

For making “Industry -by- Industry IO table”, Fixed sales structure assumption would be as follows;

The Fixed Industry Sales StructureAssumption (FISA) which corresponds to “Eurostat’s model C”: The FISA assumes that “each industry has its own specific sale structure, irrespective of its product mix (Eurostat 2008, pp297)”. Its generates negatives.

The Fixed Commodity Sales structures Assumption (FCSA) which corresponds to “Eurostat’s model D” : The FCSA assumes that “each product has its own specific sales structure, irrespective of the industry where it is produced (Eurostat 2008, p297)”. It is not affected by negatives as in the industry-assumption in Eurostat’s model B

2.2.5 Theoretical and Practical Considerations for SIOT compilation

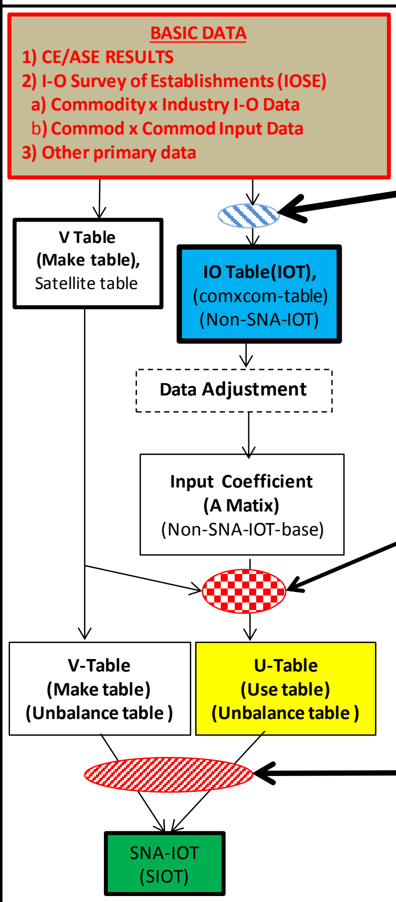
2.2.5.1 Type of IO compilation in major countries

There have been several historical background of IO compilation in the world. Benchmark IOT in Japan compiled by Government of Japan (GOJ), GOJ has been compiled “activitiy by commodity type IOT” not through SUT(not using Indirect approarch)” to reflect production technology (based on Direct approarch). They have higher priority to keep consistency with “activity by activity framework” than compatibility with difficulty of data collection (Table 2.2.1).

On the other hand, Benchmark IOT in Rest of the World compiled by the Government, they also compiled “commodity by commodity type IOT” based on Indirect approarch (Table 2.2.2, Table2.2.3). In USA or Europ counries, due to the serious difficulty to implement data collection and processing for IO compilation to keep quality(in 1968SNA), they developed practical approarch of IO compilation (Suppy and Use Table framework[SUT]). SUTs are being regualry published on a yearly basis easily, and they will be able to converted into Synmetric Input Output Table (SIOT) by using coefficient of structul assumpion. When SUT is converted in SIOT, data treatment with actual information is also need for final adjustment. According to the SNA, there are two type of table “commodity by commodity” and “industy by industy” tables, that each can derived using Technology Assumption (1.Commodity Tech[CTA], 2.Industry Tech[ITA]), or Market Share Assumption (3.Fixed Commodity Sales structures [FCSA], 4.Fixed Industry Sales structure[FISA]). Trasitionally and conceptually, CTA has not only been recognized most suitable hypothesis for keeping consistency with “activity by activity framework”, also recognized the problems (ex: negative value of coefficient generated by CTA in SIOT, etc). Rest of other assumptions(ITA, FCSA, FISA) also have properties (conceptual advantage and negative point).

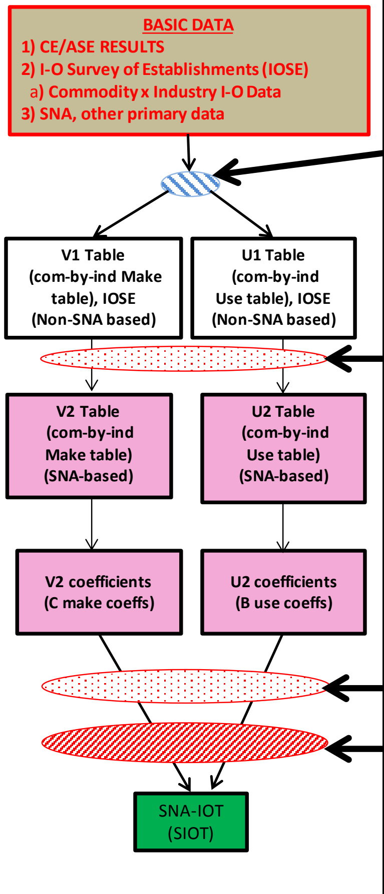
However there have been no-conprehensive empirical evaluation for assumption of SUT-SIOT. In current international society (espessilaly Asian-Pasific region), now is the important time to re-consider technical compatibility of statistic harmonization for policy analysis of international integration.

Table 2.2.1 Type of Approach for IO compilation （Case-I）

Stage No.	Compilation Stage of	Work Procedure	Technical Approach
	Case-I. Direct Aproach [Direct (Activity-by-Commodity) IOT System]		
		Work Procedure	**Direct Compilation of IO table (Commodity-by-Commodity) or (Industry-by-Industry)**
I	Input Output Table(IOT) (Non-SNA-IOT)		First Stage is "Simultaneous data processing" to summarize commodity x commodity output and input structures (1) Intermediate Transaction (2) Primary inputs (value added) (Progress Output) "Commodity-by-Commodity table" or "Industry-by-Industry table" (Symmetric, but Not-SNA based IOT)
II	Annual National Account(ANA), Make (V) table, Use(U) Table		Second stage is "the transforming and adjustment " from IOT (X table) to Use table ("[1]Mathematical approach" or "[2]Statistical approach") (Progress Output) "Industry-by-Commodity table" or "Commodity-by-Industry table" (Not Symmetric table)
III	SNA - IOT (Symmetric IOT[SIOT])		Third stage is "the Re-Transforming and adjustment" from V and U table to SIOT ("[1]Mathematical approach" or "[2]Statistical approach") (Final Output) "Activity-by-Commodity table"(Symmetric, SNA based IOT)
Note	1. Main Output	[1]V table and [2] Activity-by-Commodity IO table (Non-SNA base-IOT) , [3] SNA-IOT	
	2. Country	**Japan**	

(Note) Author edit

Table 2.2.2 Type of Approach for IO compilation （Case-II）

<table>
<tr><td rowspan="3">Stage No.</td><td colspan="3">Case - Ⅱ. Indirect Approach (1)
(V - U system)</td></tr>
<tr><td rowspan="2">Compilation Stage of</td><td rowspan="2">Work Procedure</td><td>Technical Approach</td></tr>
<tr><td>Indirect Compilation of commodity-by-commodity I-O table by combining V (make table) & U (use table) using tech assumptions</td></tr>
<tr><td>I</td><td>Input Output Table(IOT)
(Non-SNA-IOT)</td><td rowspan="3">
</td><td>First stage is "the first data processing" to summarise the "Commodity-by-Industry" Output or Input structures of Production

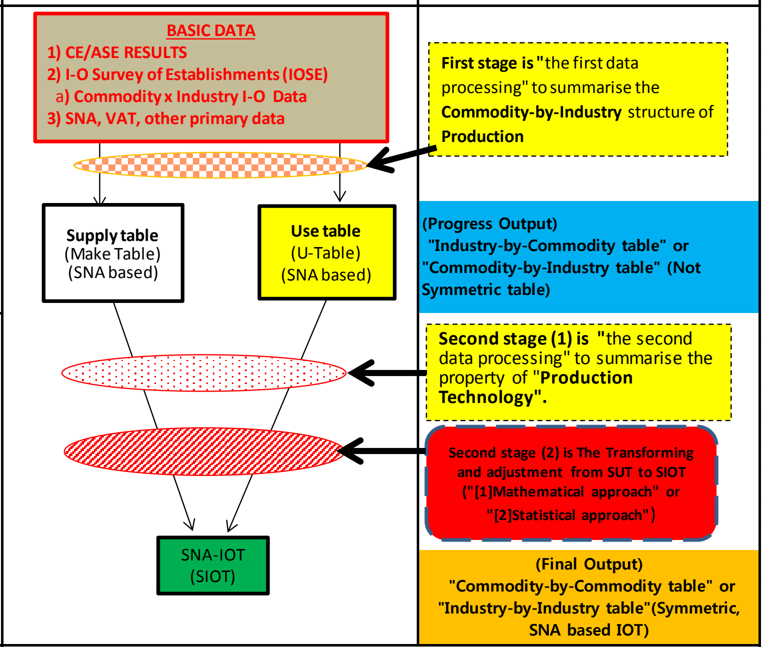
(Progress Output)
"Commodity-by-Industry" V and U tables and their coefficients based on IOSE data
(Not Symmetric table)</td></tr>
<tr><td>Ⅱ</td><td>Annual National Account(ANA), Make (V) table, Use(U) Table</td><td>Second stage is "the transforming and adjustment " from V1 to V2 & from U1 to U2 using SNA data as control totals and IOSE make & input coefficients

(Progress Output)
Preliminary Commodity-by-Industry V2 and U2 Tables based on SNA data</td></tr>
<tr><td>Ⅲ</td><td>SNA - IOT
(Symmetric IOT[SIOT])</td><td>Third stage is "the Transforming and adjustment" from V-U to SIOT ("[1]Mathematical approach" or "[2]Statistical approach")

(Final Output)
Derived SIOT by Mathematical approach</td></tr>
<tr><td rowspan="2">Note</td><td>1. Main Output</td><td colspan="2">[1] V-table & [2] Commodity-by-Commodity IO table (IOT) derived from Commodity-by-Industry IOSE data</td></tr>
<tr><td>2. Country</td><td colspan="2">Korea, China, Taiwan, Russia, India, Bangladesh, Srilanka, Thailand, Malaysia, Singapore, Philippines, Indonesia, etc</td></tr>
</table>

(Note) Author edit

Table 2.2.3 Type of Approach for IO compilation（Case-III）

<table>
<tr><td rowspan="2">Stage No.</td><td colspan="3">Case-Ⅲ. Indirect Aproach (2)
(SUT-SIOT system)</td></tr>
<tr><td>Compilation Stage of</td><td>Work Procedure</td><td>Technical Approach
Indirect Compilation of IO table (Industry-by-Commodity) or (Commodity-by-Industry)</td></tr>
<tr><td>Ⅰ</td><td>Suppy Table(Make-Table), Use Table(U-Table), National Acount (NA)</td><td colspan="2" rowspan="2">
</td></tr>
<tr><td>Ⅱ</td><td>Symmetric Input Output Table (SIOT) (SNA-IOT)</td></tr>
<tr><td rowspan="4">Note</td><td>1-1. Main Output</td><td colspan="2">"Commodity-by-Commodity SIOT" derived from SUT</td></tr>
<tr><td>1-2. Country</td><td colspan="2">USA, other 21's OECD countries, Vietnam</td></tr>
<tr><td>2-1. Main Output</td><td colspan="2">Industy-by-Industry SIOT derived from SUT.</td></tr>
<tr><td>2-2. Country</td><td colspan="2">Australlia, other 11 countries</td></tr>
</table>

(Note) Author edit

2.2.5.2 Treatment of Secondary Product in IOT

George Soklis (2009) has reviewed the available methods used to convert SUT-IOT (Bulletin of Political Economy, Vol. 3, No. 1, 2009: pp. 51-70), he has introduced that all conversion methods rest on the unrealistic assumption that single production, and not joint production, characterizes the economic structure of the real world. It is argued that all conversion methods rest on the unrealistic assumption that single production, and not joint production, characterizes the economic structure of the real world. In order to improve realistic, many case of IOT compilation has introduced technical treasmnt of relaxation. For example, Benchmark IOT in USA compiled by the BEA of Department of Commerce, the BEA has used mixed or hybrid technology assumption to create SIOT (Jiemin Guo, Ann M. Lawson, and Mark A. Planting (2002)) .

This method involves a two step process, in which some seconday products are first redefined or moded by hand to th industryis where the are primary, based on the principal of homogeneity of the input structures of the commodities. This step of treatment, which is called the redefinion method, plays a role of similar to that of CTA.

> **The Redefinition Method** : The Redefinition method is used to move outputs and inputs of ′ secondary products′ , that have distinctive production processes compared to those of the ʻprimary products′ of each industry, to the industries where these products are ʻprimary. This method is most suitable to be applied for „secondary products‟ that have production processes similar to the respective production processes of the industries where these products are ‘primary’ . Nevertheless, this method needs additional data on the production of the‘secondary products’that are not always available(Goerge Sokils(2009)).

After hand adjustements have been completed, all rememaining secondary products are considered to have input structures similar to those of the primary products of their producing industries. For practical reasons, the latter method is presently being used in generating the symmetric I-O table

It is also imperative to transform the symmetric table into a noncompetitive-imports type wherein distinction is made between domestic and imported inputs. This is made possible by compiling a satellite table on import transactions by using supplementary information obtained from either ad hoc surveys and/or secondary sources such as foreign trade statistics. It should be noted that it is also possible to generate a symmetric industry-by-industry USE matrix (Block V) by transforming Block II (product-by-industry USE matrix) using indicators derived from the Supply table (MAKE matrix (Block IV)). Industry-by-industry I-O tables are useful in the conduct of industry demand studies.

2.2.5.3 Performance of IO compilation

The next issue that comes up is which of the conversion methods is the most suitablefor the problem at hand. Since there were not any objective criteria to test the consistency of the various methods, Jansen and ten Raa (1990) developed four desirable properties or, alternative, axioms that the various methods should fulfill.

i. The 'Material Balance property': This property implies that the requirements needed to produce the output should be equal to the actual inputs of the economy.

ii. 'The Financial Balance property': This property implies that, assuming that market prices are equal to 1, the input cost of the output should be equal to the cost of the actual inputs.

iii. 'The Scale Invariance property': This property implies that, assuming that input coefficients will not be change when magnature of Input and output has changed at the same magnification. It stipulates that technical coefficients do not change when input requirements and output vary proportionally.

iv. 'The Price Invariance property': This property implies that whatever the base-year price is, the corresponding direct requirements matrix should be similar to the matrix A(U,V) .This property guarantees that the direct requirements matrix does not depend on the activity levels of the economy.

Table 2.3 illustrates summary of performance of each approach in the light of the consistencies. This table shows that

(1) If we make industry table, fixed industry sales structure model emerges as the best one under treatment of secondary product.

(2) If we make commodity table, Commodity technology assumption model emerges as the best on under treatment of seconday product.

Table 2.3 Performance of IO construction for Commodity and Industry tables

Model type		1. Theoritical Axioms Fulfillment				2. Practical Fulfillment			
		Balance		Invarience		Applicable type of Matrix (Rectangle or squre)		Problem of turning out negative values of IO coefficient	
								Under treatment of Secondary Product	
		Material Balance (M)	Financial Balance (F)	Scale Invariance (S)	Price Invarience (P)	Squre	Rectangle	Without treatment (before re-definition: SUT)	**With treatment (after re-definition: SUT)**
I. Statistic approach (Single processing)	1. Lum sum model	no	no	yes	no	—	—	—	—
	2. Stone Motel	no	no	yes	yes	—	—	—	—
	3. ESA	yes	no	no	yes	—	—	—	—
	4. Transfer Model	no	no	no	no	—	—	—	—
II. Mathematical approach (Single processing)	1. CTA (for Commodity by Commodity type table)	yes	yes	yes	yes	yes	—	Negative	—
	2. ITA (for Commodity by Commodity type table)	yes	no	no	no	yes	yes	Non-negative	—
	3. FCSSA (for Industry by Industry table)	no	yes	no	no	yes	yes	Non-negative	—
	4. FISSA (for Industry by Industry table)	yes	yes	yes	yes	yes	—	Negative	—
	5. Hybride type (CTA & ITA for Commodity by Commodity table)	no	no	yes	yes	yes	yes	Non-negative	—
III. Hybrid Approarch (Re-definition + Methematical approach) (Plural/Multi stage Processing)	**1. CTA (for Commodity by commodity type table)**	**yes**	**yes**	**yes**	**yes**	**yes**	—	—	Non-negative
	2. ITA (for Commodity by commodity type table)	**yes**	**no**	**no**	**no**	**yes**	**yes**	—	Non-negative
	3. FCSSA (for Industry by Industry table)	**no**	**yes**	**no**	**no**	**yes**	**yes**	—	Non-negative
	4. FISSA (for Industry by Industry table)	**yes**	**yes**	**yes**	**yes**	**yes**	—	—	Non-negative

(Source) Author edit from Kop Jansen and ten Raa(1990), Jose M.Rueda-Cantuche(2009), etc

(Note) yes: fullilled, no:not-fulrilled. Both:Square and Rectangle,

negative: negative sign of coefficient (which is inconsistent with IO theory) ,

non-negative: non-negative sign of coefficient (which is consistent with IO theory.).

2.3 Regional IO table

2.3.1 Framework

2.3.1.1 Intra regional IO table

Framework is based on the static and open type of I-O models. It is of the non-competitive-imports type wherein distinction is made between locally-produced and imported goods and services. Additionally, imports are further distinguished between foreign and domestic. Fig 2.6 shows the intra-regional I-O framework.

Fig 2.6 Intra-Regional I-O Framework

		TO	INTERMEDIATE DEMAND		FINAL DEMAND						GROSS OUTPUTS (GO)
FROM	REG	PROD	1 ..... j .... N	TID	1 ....k ... F	FXP	DXP	FMP	DMP	TFD	
INTERMEDIATE INPUT	REG1	1 : I : N	x_{ij}^{NN}	Σx_{ij}^{NN}	F_{ik}^{NN}	E_i^{NW}	E_i^{NR}				X_i^N
	RON	1 : i : N	M_{ij}^{RN}	ΣM_{ij}^{RN}	M_{ik}^{RN}				(M_i^R)		
	ROW	1 : i : N	M_{ij}^{WN}	ΣM_{ij}^{WN}	M_{ik}^{WN}			(M_i^W)			
	SUBTOTAL		TII_j^N	$\Sigma\ TII_j^N$	ΣF_k^N	$\Sigma\ E_i^{NW}$	$\Sigma\ E_i^{NR}$	$\Sigma(M_i^W)$	$\Sigma(M_i^R)$	GRDE	$\Sigma\ X_i^N$
GVA	1 : V		V_i^N	ΣV_i^N				MDT^N		MDT^N	
	SUBTOTAL		GVA_j	GRDP	0	0	0	MDT^N	0	MDT^N	GRDP*
GROSS INPUTS (GI)			$X_i^N = X_i^N$	$\Sigma\ X_i^N$	ΣFD^N	$\Sigma\ E_i^{NW}$	$\Sigma\ E_i^{NR}$	$\Sigma(M_i^W)*$	$\Sigma(M_i^R)$	GRDE*	

NOTE: Notations in parenthesis ( ) means negative

ABBREVIATIONS:

GRDP: Gross Regional Domestic Product

GRDP *: Adjusted GRDP

MDT: Import Duties and Taxes

GRDE: Gross Regional Domestic Expenditures

GRDE *: Adjusted GRDE

$\Sigma\ (M^W)*$: Total Foreign Imports Adjusted for MDT

This Intra-Regional I-O Table(Intra-RIOT) is a (square) symmetric product-by-product table of the non-competitive-imports type. A symmetric IOT is one in which there are the same classifications or units used in both rows and columns.

A product-by-product table shows which products are used in the production of which other products. Unlike in a product-by-industry table, the symmetric table satisfies the Leontief material balance that total output equals the product of IO coefficients and total output plus the final demand, i.e. X = AX + Y. The product-by-product table needs to be square in dimension so that its inverse matrix, which is the basis in IO analysis, can be calculated. The symmetric table therefore provides the analytical framework for economic modeling. Figure 2.6 shows the following structural identities:

a) $X_i^N = X_i^N$ (i =1,n)
b) $\Sigma GVA_j^{\ N} = \Sigma F_k^N + \Sigma E_i^{NW} + \Sigma E_i^{NR} + \Sigma(M_i^W) + \Sigma(M_i^R)$
i.e., GRDP = GRDE

The balance equation for the output of sector i to produce goods and services in NCR is given by, in matrix form:

$$\mathbf{X_i^N = x_{ij}^{NN} + F_{ik}^{NN} + E_i^{NW} + E_i^{NR} \qquad (i, j = 1, 2, \dots n) \qquad (2.8)}$$

where:

- $\mathbf{X_i^N}$ **:** column vector of Region-1(N) output of product i
- $\mathbf{X_{ij}^{NN}}$ **:** matrix of Intra-region's product i consumed by Region-1 product sector j
- $\mathbf{F_{ik}^{NN}}$ **:** matrix of Intra-region's product i consumed by Region-1 final demand k
- $\mathbf{E_i^{NW}}$ **:** column vector of Region-1's export of product i to Rest of World (ROW: foreign)
- $\mathbf{E_i^{NR}}$ **:** column vector of Region-1's outflow of product *i* to Other region in Rest of Nation (RON: domestic)

The same intra-regional accounting framework, as configured above, is replicated in compiling the intra-regional I-O table for the Rest of the Nation (RON; other region in same country). The compilation of the RON I-O table thus completes the data requirements of the IRIO framework as shown below. The balance equation for the output of sector i to produce goods and services in RON is given by:

$$\mathbf{X_i^R = x_{ij}^{RR} + F_{ik}^{RR} + E_i^{RW} + E_i^{RN} \qquad (i, j = 1, 2, \dots n) \qquad (2.9)}$$

where:

- $\mathbf{X_i^R}$ **:** column vector of RON output of product i
- $\mathbf{x_{ij}^{RR}}$ **:** matrix of RON's product i consumed by RON's product sector j
- $\mathbf{F_{ik}^{RR}}$ **:** matrix of RON's product i consumed by RON's final demand k
- $\mathbf{E_i^{RW}}$ **:** column vector of RON's export of product *i* to ROW (foreign)
- $\mathbf{E_i^{RN}}$ **:** column vector of RON's outflow of product *i* to REG-1 (domestic)

2.3.1.2 Bilateral Inter-Regional IO table

A single-region I-O model is a general equilibrium model at a specific point in time and space. The focus of the model is on local industrial structure and it sheds light on the impact of exogenous changes in final demand on economic activities of an individual region. However, its usefulness as an effective analytical tool is limited only to its capability to provide a comparative static assessment of the consequences of any policy, with the quantitative estimates serving primarily as indicators of directions of change and relative impact. Its main drawback is that it is not able to measure feedback and spillover effects that are primarily attributable to inter-regional trading.

The accounting framework for the 2-region IRIO is shown in Fig 2.7

Fig 2.7 2-REGION INTER-REGIONAL I-O FRAMEWORK

		TO	INTERMEDIATE DEMAND		FINAL DEMAND						GROSS OUTPUTS (GO)
		REG	REG-1 (N)	REG-2 (R)	REG-1 (N)			REG-2 (R)			
FROM	REG	PROD	1 .... j .... n	1 .... j .... n	1 ....k... F	FXP	FMP	1 ...k.....F	FXP	FMP	GO
INTERMEDIATE INPUT	REG-1(N)	1 : i : n	x_{ij}^{NN}	x_{ij}^{NR}	F_{ik}^{NN}	E_i^{NW}		F_{ik}^{NR}			X_i^N
	REG-2 (R)	1 : i : n	x_{ij}^{RN}	x_{ij}^{RR}	F_{ik}^{RN}			F_{ik}^{RR}	E_i^{RW}		X_i^R
	ROW	1 : i : n	M_{ij}^{WN}	M_{ij}^{WR}	M_{ik}^{WN}		(M_i^N)	M_{ik}^{WR}		(M_i^R)	
GVA	GVA	1 : p : V	V_{pj}^N	V_{pj}^R			MDT_p			MDT_p	GDP^P
GROSS INPUTS (GI)			$X_j^N = X_i^N$	$X_j^R = X_i^R$	Σ	Σ	Σ	Σ	Σ	Σ	

X_i^N : column vector of REG-1 output of product i
x_{ij}^{NN} : matrix of Intra-regional product i consumed by REG-1's product sector j
x_{ij}^{NR} : matrix of REG-1's product i consumed by REG-2(RON)'s product sector j
F_{ik}^{NN} : matrix of REG-1's product i consumed by REG-1 final demand k
E_i^{NW} : column vector of REG-1's export of product i to ROW
F_{ik}^{NR} : matrix of REG-1's product i consumed by REG-2 (RON)'s final demand sector k
X_i^R : column vector of RON's output of product i
x_{ij}^{RN} : matrix of REG-2 (RON)'s product i consumed by REG-1 product sector j;
x_{ij}^{RR} : matrix of REG-2 (RON)'s product i consumed by REG-2 (RON)'s product sector j
F_{ik}^{RN} : matrix of REG-2 (RON)'s product i consumed by REG-1's final sector k:
F_{ik}^{RR} : matrix of REG-2 (RON)'s product i consumed by REG-2 (RON)'s final demand sector k
E_i^{RW} : column vector of REG-2 (RON)'s export of product i to ROW

the following balance equations can be formed from Figure 2.5:

$$X_i^N = x_{ij}^{NN} + x_{ij}^{NR} + F_{ik}^{NN} + E_i^{NW} + F_{ik}^{NR} \quad (2.10)$$
$$X_i^R = x_{ij}^{RN} + x_{ij}^{RR} + F_{ik}^{RN} + F_{ik}^{RR} + E_i^{RW} \quad (2.11)$$

where: (i, j = 1,2,,…n)

Based on Leontief's assumption of linearity in production cost functions, i.e. $aij = xij / Xi$, we have the following regionally-defined "input coefficients":

$$a_{ij}^{NN} = x_{ij}^{NN} / X_j^N \qquad (i, j = 1,2,....n) \qquad (2.11)$$
$$a_{ij}^{NR} = x_{ij}^{NR} / X_i^R \qquad (i, j = 1,2,....n) \qquad (2.12)$$
$$a_{ij}^{RN} = x_{ij}^{RN} / X_j^N \qquad (i, j = 1,2,....n) \qquad (2.13)$$

$$a_{ij}^{RR} = x_{ij}^{RR} / X_i^{R} \qquad (i, j = 1,2,....n) \qquad (2.14)$$

Equations (2.11) and (2.14) represent the intra-regional direct input coefficients, while equations (2.12) and (2.13) account for the inter-regional trade coefficients. Substituting these structural equations into equations (2.10) and (2.11), we have:

$$X_i^{N} = a_{ij}^{NN} X_j^{N} + a_{ij}^{NR} X_i^{R} + F_{ik}^{NN} + E_i^{NW} + F_{ik}^{NR} \qquad (2.15)$$

$$X_i^{R} = a_{ij}^{RN} X_j^{N} + a_{ij}^{RR} X_i^{R} + F_{ik}^{RN} + F_{ik}^{RR} + E_i^{RW} \qquad (2.16)$$

Simplifying equations (2.15) and (2.16), we have, in matrix form:

$$\mathbf{X} = \mathbf{AX} + \mathbf{Y} \qquad (2.17)$$

$$\mathbf{X} = (\mathbf{I} - \mathbf{A})^{-1} \mathbf{Y} \qquad (2.18)$$

where: $\mathbf{X} = \begin{bmatrix} \mathbf{X_i^N} \\ \mathbf{X_i^R} \end{bmatrix}$, $\mathbf{A} = \begin{bmatrix} \mathbf{a_{ij}^{NN}} & \mathbf{a_{ij}^{NR}} \\ \mathbf{a_{ij}^{RN}} & \mathbf{a_{ij}^{RR}} \end{bmatrix}$, $\mathbf{Y} = \begin{bmatrix} \mathbf{Y_i^N} \\ \mathbf{Y_i^R} \end{bmatrix}$ **, and**

$$Y_i^{N} = F_{ik}^{NN} + E_i^{NW} + F_{ik}^{NR}; \qquad Y_i^{R} = F_{ik}^{RN} + F_{ik}^{RR} + E_i^{RW}$$

2.3.1.3 Multilateral Inter-Regional IO table

The accounting framework for the multi-region IRIO is shown in Fig 2.8

Fig 2.8 Multi Region's Inter Regional I-O Framework

		TO	INTERMEDIATE DEMAND			FINAL DEMAND			ROW	TOTAL GROSS OUTPUT (TGO)
		REG	R1	.....	Rm	R1	.....	Rm		
FROM	REG	PROD	1...j...n	.....	1...j...n	1...k...5	.....	1...k...5	(M)	
INTERMEDIATE INPUT	R1	1 ⋮ i ⋮ n	Intra-regional Flows of Intermediate Prods	.....	Inter-regional Flows of Intermediate Prods	Intra-regional Flows of Final Prods	.....	Inter-regional Flows of Final Prods		X_i^{R1}
	⋮	⋮	⋮	⋱	⋮	⋮	⋱	⋮	⋮	⋮
	Rm	1 ⋮ i ⋮ n	Inter-regional Flows of Intermediate Prods	.....	Intra-regional Flows of Intermediate Prods	Inter-regional Flows of Final Prods	.....	Intra-regional Flows of Final Prods	0	X_i^{Rm}
	ROW	1 ⋮ i ⋮ n	Imports of Intermediate Products	.....	Imports of Intermediate Products	Imports of Final Products	.....	Imports of Final Products	Total Imports	0
GROSS VALUE ADDED	GVA	1 ⋮ p ⋮ 4	Value Added	.....	Value Added	0	.....	0		GDP
TOTAL GROSS INPUTS (TGI)			X_j^{R1}	.....	X_j^{Rm}	Σ	.....	Σ		

Where:

X_i^{R1} : column vector of REG-1 output of product i
x_{ij}^{R1R1} : matrix of Intra-regional product i consumed by REG-1's product sector j
x_{ij}^{R1Rm} : matrix of REG-1's product i consumed by REG-m's product sector j
F_{ik}^{R1} : matrix of REG-1's product i consumed by REG-1 final demand k
E_i^{R1W} : column vector of REG-1's export of product i to ROW
F_{ik}^{R1Rm} : matrix of REG-1's product i consumed by REG-m's final demand sector k
X_i^{Rm} : column vector of REG-m's output of product i
x_{ij}^{RmR1} : matrix of REG-m's product i consumed by REG-1 product sector j;
x_{ij}^{RmRm} : matrix of REG-m's product i consumed by REG-m's product sector j
F_{ik}^{RmR1} : matrix of REG-m's product i consumed by REG-1's final sector k:
F_{ik}^{RmRm} : matrix of REG-m's product i consumed by REG-m's final demand sector k
E_i^{RW} : column vector of REG-m's export of product i to ROW

2.3.2. Methodology for estimation

2.3.2.1 Configuration of compilation procedure

Table 2.4 summarizes the distinction between the full servey, non-survey, hybrid method of producing regional IO tables. It can be observed that the only unique distinction between the hybrid and the non-survey methods is in the generation of the competitive type regional tables. Hybrid approach used more actual data, while the non-survey method adopts the national IO (or other IO) coefficients as the first approximation of the production structure of the region. It can concluded that, with actual regional data on hand, hybrid method is able to portray regional variations in sectoral input structure in the compilation of the basic table, unlike in the non-survey method wherein structure of regional technology is borrowed from the national IO table.

Table 2.4 Destinction between Full servey and Hybrid approach

Procedure	Output Tables	Methodology		
		Full Survey (FS)	Hybrid (HB)	Non-Survey(NS)
Phase-1 Compilation of Single Region IO table (1)	1. Competitive type IO table	Used actual regional data	Used actual regional data	Adopted National or other IO coefficients
Phase-2 Compilation of Single Region IO table (2)	2. Foreign Import Table	Used actual regional data	Used national import content coefficients	Adopted National import coefficients
	3. Non-Competitive IO table (Net of foreign imports)	Used actual regional data	Output 1 minus Output 2	Adopted National IO (used SLQ method) or other IO coefficients
Phase-3 Estimation of inter-regional commodity flow (or inter-regional input coefficient)	4. Domestic inflow table	Used actual regional data	Used SLQ method	Used SLQ method
Phase-4 Integration and compilation of Inter-regional IO table	5. Non-competitive IRIO table (net of foreign imports and domestic inflows)	Used actual regional data	Output 3minus Output 4 (in values & coefficients)	Output 3minus Output 4 (in coefficient only)

2.3.2.2 Procedure for estimation

The hybrid or mixed approach was adopted in constructing Regional IO table. The hybrid method starts with the compilation of readily available but limited survey-generated data at the regional level. Non-survey techniques of estimation are then employed to fill-in observed data gaps and deficiencies. In particular, indirect methods were applied in estimating external and domestic trade because, as in most countries, actual data on foreign and domestic outflows and inflows at the sub-national level are inadequate, if not nil, and inappropriate to meet the rigid data requirements of I-O accounting.

Phase 1: Compilation of Intra-Regional Tables (Competitive Type)

Stage 1 refers to the compilation of intra-regional tables of the competitive-imports type. A regional IO table of the competitive-imports type records the value of input-output transactions of products, whether they are regionally produced and/or imported whether from abroad or from other regions of the domestic economy. Similar to national IO compilation, regional MAKE and USE tables are initially compiled based on processed data obtained from the 2000 IO Survey of Enterprises (IOSE). GRDP and GRDE data by province and by sector were obtained from the GSO, PSO statistical year book which is published every year.

The MAKE or Supply table is an industry x product matrix showing the distribution of the value of IO-classified products produced by IO-classified industries during the reference year. The MAKE matrix at the regional level is constructed based on the 2000 IOSE, given estimated industry outputs. The IOSE is conducted during IO benchmark years to provide more detailed structural indicators on the composition of industry outputs and inputs. The MAKE table is valued in producers' prices while the basic USE table is valued in purchasers' prices. The derivation of regional industry outputs, as control totals in building the MAKE matrices, is carried out using the following equation:

$$\mathbf{X_j^R = GVA_j^R / GVAR_j^R} \qquad (2.19)$$

Where: X_j^R is estimated output of industry j in region R; GVA_j^R is estimated GVA of industry j based on GRDP Accounts, GSO/PSO; GVARjR is calculated GVA ratio based on 2000 CE regional data.

The MAKE matrix is then calculated by multiplying output allocation ratios at the 16-sector level (as derived from the IOSE results) by their respective control totals based on ratio of National IO, 2000, X_j^R.

The USE table is a product x industry table that traces the money flow of IO-classified products used by the intermediate and final demand sectors of the regional economy. The USE table is valued in purchasers' prices. It is constructed column-wise by multiplying computed input structures (based on IOSE data) by their respective industry outputs recorded in the MAKE matrix. That is, for each industry column sector j in Region R:

$$\mathbf{X_{ij}^{R} = IC_{ij}^{R} . X_{j}^{R}} \tag{2.20}$$

Where: X_{ij}^R is the estimated value of product *i* consumed by industry *j* in Region R; IC_{ij}^R is the derived input coefficient (from 2000 IOSE); and X_j^R is the estimated industry output (from the MAKE matrix). Similarly, for each final demand column sector k (except export sector) in Region R:

$$\mathbf{X_{ik}^{R} = YC_{ik}^{R} . YT_{k}^{R}} \tag{2.21}$$

Where: X_{ik}^R is estimated value of product *i* consumed by final demand sector *k*, YC_{ik}^R is final demand coefficient (derived from Household survey conducted by GSO, IOSE data, etc.) , YT_k^R is total of final demand sector k (based from report of PSO).

The (foreign) export vector in Region R is estimated based on export-revenue indicators derived from the 2000 IOSE (for the manufacturing sectors) and national export-output ratios derived from the national IO table for all the other sectors. The next process is to revalue the USE table from purchasers' to producers' prices to attain uniformity with the producers' price valuation of the MAKE table. This is carried out using regional trade and transport margin ratios derived primarily from the 2000 IOSE.

The final step in the construction of intra-regional tables of the competitive type is to generate a symmetric IO table, which could either be in industry x industry or product x product table format. A symmetric I-O table is one in which there are the same classifications or units used in both rows and columns. A product-by-product table shows which products are used in the production of which other products. Unlike in the product-by-industry USE table, the symmetric table satisfies the Leontief material balance that total output equals the product of I-O coefficients and total output plus the final demand, i.e. X = AX + Y. The symmetric table therefore provides the effective analytical framework for economic modeling. There are two ways for aggregating IO model with two assumptions. In this case study, the generation of a symmetric product x product table, that is deemed most useful in IO analysis, involved the merging of the industry x product MAKE and the balanced product x industry USE tables using the following equation, in matrix form:

$$App = BpiDip \tag{2.22}$$

where: App = product-by-product matrix of input coefficients; Bpi = product-by-industry matrix of input coefficients; and Dip = industry-by-product matrix of MAKE coefficients.

Phase 2 : Estimation of Inflows and Derivation of Non-Competitive Tables

It should be noted that, in the initial competitive type of IO table constructed in Phase I, exports and imports are lumped as a single residual vector of net exports, i.e. (XP-MP) where XP refer to exports that include domestic outflows and MP is imports to include domestic inflows. This accounting limitation emerges because of lack of direct data on regional exports and imports including domestic trade flows. While commodity flow statistics are currently available (from the GSO), their usefulness as direct source of information for compiling inter-regional outflows and inflows within the context of IO accounting remains to be desired. The raw data need further scrutiny to meet the rigid IO concept that goods should be shown as flowing directly from producers to consumers. Shipments via middlemen such as wholesalers and retailers are not considered to be originators or receivers. Moreover, such relevant issues as in-transit flows and cross hauling should be taken into account in the careful evaluation of existing commodity flow data within an inter-regional IO framework.

In view of the above data constraint, an indirect estimation technique was therefore applied in compiling the trade tables. Disaggregating the estimated residual vector on net exports (XP-MP) into its components, we have:

$$(XP - MP)_i = (FXP + DXP)_i - (FMP + DMP)i$$

$$= FXP_i + DXP_i - FMP_i - DMP_i \qquad (2.23)$$

$$DXP_i = (XP\text{-}MP)_i - FXP_i + FMP_i + DMP_i \qquad (2.24)$$

Where: DXP_i = total domestic export (outflow) of product i;

$(XP\text{-}MP)_i$ = next exports obtained from intra-regional I/O table;

FXP_i = estimated foreign export of product i (from 2000 CE data);

FMP_i = estimated foreign import of product i

DMP_i = estimated total domestic import (inflow) of product i.

In equation $X=(I-A)^{-1}(Y+E)$, domestic outflows are treated as residuals because it is not presently possible to estimate at this Stage this component, whether directly or indirectly.

Based on equation $X=(I-A)^{-1}(Y+E)$, two types of satellite tables have to be compiled initially, namely; a) (Foreign) Imports Table (FMP) and b) Domestic Inflow Table (DMP) .

Regional (foreign) imports, FMP, were estimated using national import content ratios as proxy indicators on the assumption that regional economies follow the national economy's consumption pattern of imported products, whether for further production or for final consumption. Given the intra-regional IO tables of the competitive type, the import content of product i consumed by intermediate sector j in region S is estimated, in matrix equation, as:

$$M_{ij}^S = MC_{ij}^N * X_{ij}^S \text{ (i ,j is label of sector)} \qquad (2.25)$$

Where: M_{ij}^S = matrix of estimated intermediate imported inputs in Region S; MC_{ij}^N = matrix of national intermediate import coefficients derived from the 2000 national IO table; and X_{ij}^S = matrix of intermediate input transactions in Region S.

Similarly, the import content of product i consumed by final domestic demand sector k (excluding export) in region S is calculated, in matrix equation, as:

$$M_{ik}^{S} = MC_{ik}^{N} * Y_{ik}^{S} \quad (2.26)$$

Where: M_{ik}^{S} = matrix of estimated final demand imports in region S; MC_{ik}^{N} = matrix of national final demand import coefficients; and Y_{ik}^{S} = matrix of final demand transactions (excluding exports) in Region S

Similarly, domestic inflows or the region's consumption of goods produced by other regions were estimated using the simple location quotient (SLQ) method. The SLQ approach assumes that the needs of region r for output i in each industry relative to the needs for output i in each of these industries nationally

Are the same as the ratio of the total regional to the total national output. In its equation form, the SLQ is calculated as:

$$\mathbf{SLQ_i^R = \frac{X_i^R / X^R}{X_i^N / X^N}} \quad (2.27)$$

Where; $\mathbf{X_i^R}$:Output in sector i in a given region R, $\mathbf{X^R}$: Total output in region R, $\mathbf{X_i^N}$:Output in sector i in the nation, $\mathbf{X^N}$:Total output in the nation.

From equation (2.27), if SLQi is less than unity, the region imports some of product i from elsewhere in the domestic economy. On the other hand, if SLQi is greater than 1.0, the region exports some of its industry's output. If SLQi is equal to 1.0, the region is viewed as self-sufficient with respect to output i.

In this study, SLQs are applied along the rows of the intra-regional table (net of foreign imports) for sectors with SLQs of less than unity. Sectors with SLQs that are equal or greater than unity are assumed to be self-sufficient and therefore are excluded in the estimation process. The product of each cell entry multiplied by its corresponding SLQ is the local content with the residual as the domestic inflow requirement that needs to be sourced from other regions. For the intermediate demand quadran and final demand, the domestic inflows are estimated as:

$$\mathbf{DMP_{ij}^R = X_{ij}^R - (SLQ_i^R X_{ij}^R)} \quad (2.28)$$

$$\mathbf{DMP_{ik}^R = X_{ik}^R - (SLQ_i^R Y_{ik}^R)} \quad (2.29)$$

where: DMP_{ij}^{R} is the domestic inflow of product i consumed by industry j, X_{ij}^{R} is the total value of product i consumed by industry j (as recorded in the intra-regional symmetric tables), DMP_{ik}^{R} is the domestic inflow of product i consumed by final demand sector k, Yi_{k}^{R} is the total value of product i consumed by final demand sector k (as recorded in the intra-regional symmetric tables), SLQ_{i}^{R} is the regional simple location quotient of product i,

$$\mathbf{SLQ_i^R = \begin{cases} SLQ_i^R & (if\_0 < SLQ_i^R < 1.0) \\ 1.0 & (is\_1.0 < SLQ_i^R) \end{cases}} \tag{2.30}$$

The second term in the right-hand side of both equations accounts for the share of local content or the regionally produced products. The non-competitive type of intra-regional table is derived by subtracting the resulting satellite tables on imports and domestic inflows from the competitive table as compiled in Stage 1. Thus, in a non-competitive table, inter-sectoral transactions within the region refer only to purely regionally Product inflows from foreign and other domestic sources are reflected as separate sub-matrices in the table to complete the IO accounts of the non-competitive type.

Phase 3: Estimation of Inter-Regional Product Flows

It should be noted that domestic inflow tables generated in Stage II represent the regional economy's requirements for products that need to be sourced from other regions within the domestic national economy. It shows the value of products that comes into the region but it does not show its region of origin. In inter-regional IO models, it is imperative that inter-sectoral transactions between regions in terms of outflows and inflows are compiled to complete the inter-regional IO accounting framework.

The desired number of inter-regional flow tables to be compiled is equal to 2m(m-1) where m is the number of regions. In the 2-region IRIO tble , four (4) inter-regional flow tables were compiled: 2 for intermediate demand and the other 2 for final demand. It can thus be observed that the problem of compiling inter-regional domestic trade flows becomes complicated as the number of regions increases. As stated earlier, the compilation of product outflows (exports) and inflows (imports) was done employing indirect methods due to data constraints. The first step in estimating product flows between regions is to distribute a region's estimated product outflow to the other recipient regions. In this study, we assume n as number of region. The total outflow of product i from region R to region S, OF_i^{RS}, is estimated as region R's total outflow of product i (as recorded in the noncompetitive table) multiplied by the share of domestic demand in recipient region S to total domestic demand of product i. In equation form,

$$\mathbf{OF_i^{RS} = DXP_i^R \frac{DD_i^S}{\sum_{S=1}^{n-1} DD_i^S}} \tag{2.31}$$

where: DXP_i^R = total domestic outflow of product i in region R, DD_i^S = total domestic demand of product i in region S.

The estimated vectors of product outflows from region R to region S, OF^{RS}, serve as the control totals in the succeeding process of allocation to the different using sectors in recipient regions, S. The allocation process is carried out by applying inter-regional trade coefficients, that are calculated as follows:

$$\mathbf{TC_i^{RS} = \frac{OF_i^{RS}}{DD_i^S}} \tag{2.32}$$

where: TCi^{RS} = trade coefficient of product i between region R and S; OF_i^{RS} = total outflow of product i from region R to region S; and

Total domestic demand of product i in region S is as follows;

$$DDiS = \Sigma\ XiS + \Sigma\ YiS - EiS \tag{2.33}$$

where X is intermediate demand, Y is final demand and E is (foreign) export.

It should be noted here that the estimation of TCs between regions was carried out for all products including the services sectors. These TCs were applied along their respective row sectors in each of the N's intra-regional tables of the non-competitive type.

Phase 4: Integration and Calculation of Coefficient Tables

The final stage is the consolidation of the outputs of Phase 2 (intra-regional USE tables, noncompetitive) and Phase 3 (inter-regional domestic flows). The integrated preliminary MRIRIO table is then subjected to a thorough evaluation, reconciliation and revalidation, after which the technical and inverse coefficient tables are calculated.

2.4 Empirical result from National Input - Output analysis

2.4.1 Supply and demand situation

In 2007, total supply goods and services was about 3,934 billion VND, of which 73,82% was domestic production and the rest of 26.18% was import. Domestic production reduced 5.43% while import increased 5.43% compared with respective figures in 2000.

On the demand side, the share of intermediate demand for goods and services in total demand slightly increased from 42.99% in 2000 to 45.32% in 2007. On other hand, the share of final demand to total demand decreased from 57.01% in 2000 to 54.68% in 2007 due to strongly decrease in consumption.

Table 2.5 Supply and Demand Situation, 2007 - 2000

(In VND Billion) [52])

	2007		2000	
	Value	Percent	Value	Percent
Total supply	**3,934**	**100.00**	**1,219**	**100**
Domestic production	2,904	73.82	966	79.25
Import	1,030	26.18	253	20.75
Total demand	**3,934**	**100.00**	**1,219**	**100.00**
Intermediate demand	***1,783***	45.32	524	42.99
Final demand:	2,151	54.68	695	57.01
Consumption	837	21.28	322	26.42
Invesment	482	12.25	131	10.75
Export	832	21.15	242	19.85

2.4.2 Output Structure

Table 2.6 shows output structure from 138 sectors can be aggregated into 22 sectors for 2000 and 2007 input-output tables. Total economy for Vietnam reached VND 2,904 billion in 2007. Table 2.6 shows a comparison of the distribution structure of output in 2000 and 2007.

Table 2.6 Output by sector, 2000 and 2007

(In Vietnam dong Billion)

Code	Sector	2007		2000	
		Value	%	Value	%
1	Crops, livestock & poultry & agricultural services	240	8.27	129	13.35
2	Round timber & other forest products	15	0.51	8	0.79
3	Fish & other marine products	84	2.88	26	2.70
4	Metallic ores & non-metallic minerals	137	4.71	59	6.16
5	Food manufactures	294	10.12	115	11.94
6	Beverage and tobacco manufactures	55	1.91	21	2.22
7	Textiles, garments & leather products	181	6.24	77	8.02
8	Wood & paper products	60	2.05	22	2.29
9	Chemicals & chemical products; petroleum, coal & coke products	91	3.13	25	2.58
10	Rubber & plastic products	67	2.31	13	1.34
11	Non-metallic mineral products	79	2.74	26	2.68
12	Basic metals & fabricated metal products	146	5.03	20	2.02
13	Machinery, equipment, appliances, parts & supplies	156	5.39	22	2.30
14	Transport equipment	133	4.57	25	2.60
15	Other manufactured products	71	2.45	10	1.00
16	Electricity and water	79	2.73	19	2.02
17	Construction	295	10.16	88	9.08
18	Wholesale & retail trade	193	6.63	83	8.54
19	Transportation & communication	130	4.47	29	2.96
20	Finance, insurance, real estate & business services	130	4.48	41	4.28
21	Public administration, defence & security	58	2.01	22	2.30
22	Personal, community, social & other services, n.e.c.	209	7.20	85	8.82
	All sectors	2,904	100.00	966	100.00

The share of crops, livestock & poultry & agriculture services decreased from 13.35% in 2000 to 8.27% in 2007; this structure like Malaysia in 1991 [14]. The share of metallic ores & non-metallic minerals, food manufactures, beverage and tobacco manufactures, textiles, garments & leather products sectors in 2007 decreased; the share of other manufacturing sectors in 2007 increased; the share of construction sector in 2007 increased about 1.08% compared with 2000; the share of trade sector in 2007 decreased 1.91% compared with 2000; the share of transportation & communication, finance, insurance, real estate & business services sectors increased 1.51% and 0.2% respectively, while the share of public administration, defense & security, personal, community, social & other services sectors in 2007 decreased 0.3% and 1.62%, respectively.

2.4.3 Input structure

The input structure includes intermediate input and primary input (or value added). Both components give the ratios of input used to produce output by each sector. In national income accounting, primary input would refer to gross value added (GVA).

Table 2.7 shows a comparison of the input structure of the 22 sectors in 2000 and 2007. In general, production cost in terms of usage of intermediate input hardly changed in year 2007 compared with 2000. In 2000, the amount that industries used for intermediate input was on the average of 0.55 thousand VND for 1 thousand VND of output, in 2007 it increased to an average of 0.62 thousand VND for 1 thousand VND of output. These ratios increased at almost sectors in economic activities; of course these ratios slightly decreased at some sectors as textiles, garment & leather products; rubber & plastic products; non-metallic mineral products; machinery equipment, appliances, parts & supplies; other manufactured products, construction; trade and public administration, defend & security sectors.

The ratios of intermediate input per output in 2007 were higher than that in 2000, it can be due to the technology of production changed or also due to less effective more than before period or due to both of them. In 2008, the intermediate input ratios of sectors can be higher than more in 2007 due to some sectors that was sole on production and selling their products decided increasing of their price. This problems means primary input will be decreased and leading to decrease of household consumption.

Table 2.7 Intermediate and primary inputs ratios of sectors, 2007 and 2000

Code	Sector	2007		2000	
		Intermediate	Primary	Intermediate	Primary
1	Crops, livestock & poultry & agricultural services	0.57	0.43	0.32	0.68
2	Round timber & other forest products	0.52	0.48	0.23	0.77
3	Fish & other marine products	0.74	0.26	0.43	0.57
4	Metallic ores & non-metallic minerals	0.35	0.65	0.28	0.72
5	Food manufactures	0.90	0.10	0.84	0.16
6	Beverage and tobacco manufactures	0.79	0.21	0.55	0.45
7	Textiles, garments & leather products	0.79	0.21	0.82	0.18
8	Wood & paper products	0.74	0.26	0.73	0.27
9	Chemicals & chemical products; petroleum, coal & coke products	0.83	0.17	0.66	0.34
10	Rubber & plastic products	0.55	0.45	0.68	0.32
11	Non-metallic mineral products	0.68	0.32	0.71	0.29
12	Basic metals & fabricated metal products	0.84	0.16	0.83	0.17
13	Machinery, equipment, appliances, parts & supplies	0.68	0.32	0.76	0.24
14	Transport equipment	0.79	0.21	0.73	0.27
15	Other manufactured products	0.52	0.48	0.74	0.26
16	Electricity and water	0.38	0.62	0.29	0.71
17	Construction	0.68	0.32	0.73	0.27
18	Wholesale & retail trade	0.32	0.68	0.46	0.54
19	Transportation & communication	0.56	0.44	0.40	0.60
20	Finance, insurance, real estate & business services	0.37	0.63	0.35	0.65
21	Public administration, defence & security	0.36	0.64	0.46	0.54
22	Personal, community, social & other services, n.e.c.	0.40	0.60	0.37	0.63
	All sectors	0.62	0.38	0.55	0.45

2.4.4 Demand Structure

Total demand is categorized into intermediate or industry demand and final demand.

Intermediate demand refers to demand for goods and services required by industries in the process of production. Final demand relates to personal consumption expenditures, government consumption expenditure, investment and exports.

Table 2.8 shows the demand patterns expressed as ratios to total demand. On the aggregate, ratio of intermediate demand for goods and services in 2007 accounts for 68%, slightly lower in 2000 of 69%. While, it's residual of 32% represents final demand share in

2007 as against 31% in 2000. As can be gleaned from Table 2.6, there exist differentials in demand patterns by sector between in 2007 and 2000 of national economic.

Table 2.8 Intermediate and final demand ratios, 2007 and 2000

Code	Sector	2007 (ratio)		2000 (ratio)	
		Intermediate	Final demand	Intermediate	Final demand
1	Crops, livestock & poultry & agricultural services	0.62	0.38	0.55	0.45
2	Round timber & other forest products	0.55	0.45	0.77	0.23
3	Fish & other marine products	0.46	0.54	0.42	0.58
4	Metallic ores & non-metallic minerals	0.25	0.75	0.13	0.87
5	Food manufactures	0.51	0.49	0.18	0.82
6	Beverage and tobacco manufactures	0.11	0.89	0.13	0.87
7	Textiles, garments & leather products	0.23	1.23	0.28	0.72
8	Wood & paper products	0.84	0.16	0.59	0.41
9	Chemicals & chemical products; petroleum, coal & coke products	0.59	0.41	0.71	0.29
10	Rubber & plastic products	0.22	0.78	0.88	0.12
11	Non-metallic mineral products	0.99	0.01	0.95	0.05
12	Basic metals & fabricated metal products	0.60	0.40	0.82	0.18
13	Machinery, equipment, appliances, parts & supplies	0.40	0.60	0.22	0.78
14	Transport equipment	0.05	0.95	0.54	0.46
15	Other manufactured products	0.25	0.75	0.36	0.64
16	Electricity and water	0.66	0.34	0.74	0.26
17	Construction	0.08	0.92	- 0.00	1.00
18	Wholesale & retail trade	0.60	0.40	0.47	0.53
19	Transportation & communication	0.53	0.47	0.38	0.62
20	Finance, insurance, real estate & business services	0.43	0.57	0.66	0.34
21	Public administration, defence & security	0.04	0.96	0.00	1.00
22	Personal, community, social & other services, n.e.c.	0.15	0.85	0.10	0.90
	All sectors	0.68	0.32	0.69	0.31

2.4.5 Composition of Domestic Final Demand

Table 2.9 shows the composition of domestic final demand by type of final demand. Households demand for domestic goods and services in 2007 accounted for 31.09% of total final demand - much lower than the national average of 42.59% in 2000. On the other hand, investment and exports recorded higher shares relative to period 2000. The high ratio for exports in 2007 is due to encouraged export policy in this period.

Table 2.9 Composition of Domestic Final Demand: 20007 and 2000

(In VND Billion)

Sector	2007		2000	
	Value	Percent	Value	Percent
Private consumption expenditure	564	31.09	296	42.59
Government consumption expenditure	66	3.64	26	3.74
Gross capital formation	352	19.40	131	18.85
Exports	832	45.87	242	34.82
Total	***1,814***	100.00	***695***	100.00

2.4.6 Backward and Forward Linkage

Economic fluctuations vary by the way different industries are related to each other. Some industries depend heavily on many other industries while some rely on a few others. Changes therefore in some industries will effect greater reactions than changes in others. With the availability of the inverse matrix of input coefficients, input-output analysis could be extended to measure the indirect effects, both backward and forward, of the production sectors. Backward and forward linkages of an industry are mean to measure the inter-sectoral linkages of a particular industry to other industries as user of inputs and as provider of inputs to other industries.

Backward Linkage(BL) is a measure of the relative importance of a sector as purchaser of raw material inputs from the entire production system. At the sectoral level, this is estimated as the ratio of the sum of the column elements of the inverse matrix to the average of the whole system. This ratio is called the index of the power of dispersion.

Forward Linkage (FL) indicates the relative importance of a sector as a supplier of raw materials to the entire production system. It is measured by the index of sensitivity, expressed as a ratio of the sum of the elements along any i^{th} row of the inverse matrix to the average of the entire system. Note that, usually these index calculated base on the input-output table at non-competitive – import type.

Table 2.10 present backward linkage and forward linkage of Vietnam economic in 2007 and 2000, these indices shows strongly input structure changed of Vietnam economic in 20007 compared with 2000, especially sectors with indices of the power and sensitive of dispersion more than unity are crop, livestock & poultry $ agricultures; food manufactures; wood and paper products; Non-metallic mineral products; Machinery, equipment, appliances, parts & supplies, while sectors with indices of the power and sensitive of dispersion in 2000 smaller than unity. Index of dispersion of food manufactures sector is biggest and their level is stronger than before time.

Table 2.10 Backward linkage and forward linkage of Vietnam economic: 2007 and 2000

Code	Sector	2007		2000	
		BL	FL	BL	FL
1	Crops, livestock & poultry & agricultural services	1.10	1.60	0.92	1.38
2	Round timber & other forest products	0.94	0.91	0.83	0.99
3	Fish & other marine products	1.36	0.87	0.93	0.83
4	Metallic ores & non-metallic minerals	0.78	0.98	0.86	0.88
5	Food manufactures	1.64	1.64	1.46	0.93
6	Beverage and tobacco manufactures	1.27	0.68	1.15	0.78
7	Textiles, garments & leather products	0.63	0.48	1.22	1.01
8	Wood & paper products	1.12	1.26	1.19	1.04
9	Chemicals & chemical products; petroleum, coal & coke products	0.97	1.05	0.76	0.96
10	Rubber & plastic products	0.79	0.74	1.08	1.11
11	Non-metallic mineral products	1.11	1.05	1.21	1.18
12	Basic metals & fabricated metal products	0.99	1.19	1.16	1.25
13	Machinery, equipment, appliances, parts & supplies	1.01	1.05	0.99	0.81
14	Transport equipment	0.97	0.66	1.11	1.10
15	Other manufactured products	0.94	0.78	1.05	0.83
16	Electricity and water	0.89	1.10	0.82	1.08
17	Construction	1.07	0.75	1.15	0.71
18	Wholesale & retail trade	0.82	1.50	0.97	1.57
19	Transportation & communication	0.90	1.17	0.75	0.90
20	Finance, insurance, real estate & business services	0.88	1.05	0.77	1.14
21	Public administration, defence & security	0.89	0.65	0.80	0.71
22	Personal, community, social & other services, n.e.c.	0.93	0.85	0.80	0.81

2.4.7 Impact analysis of final demand

An important feature of I-O analysis is that it provides the link between final demand and production. Given a bill of final demand, I-O analysis makes it possible to determine the output requirements needed to meet that final demand through the equation:

$$X = (I - A^d)^{-1} Y^d \qquad (2.34)$$

Where: X is the vector of output, A^d is coefficient matrix of domestic input, $(I - A^d)^{-1}$ is the inverse matrix and Y^d is the matrix of domestic final demand. Final demand for goods and services has repercussive or multiplier effects on the economy. In the first round, an increase in demand for a product of a particular sector will require additional output requirement for that sector. Subsequently, the first-order increases in output would require further inputs to generate them. The increased demand therefore translates to an increase in output, which in turn result to increases in income of the sectors involved and so on.

This section assesses the total (direct and indirect) effects of changes in final demand on the economy. In particular, it examines the impact of the final demand components on production and value added using the collapsed 22-sector National I-O table of the non-competitive type. Table 2.11 present the effects of each component of final demand to production in 2007 and 2000. If Vietnam economic in before period (2000), the production was induced biggest by investment (1.61), but this period the output was induced biggest by household consumption expenditure (1.80), the next of this induced to production is investment (1.69). In this period the final demand induct to production stronger than before period.

Table 2.11 The effects of final demand to production

	2007	**2000**
Household consumption expenditure	1.80	1.49
Government consumption expenditure	1.44	1.13
Investment	1.69	1.61
Export	1.53	1.46

2.4.8 Primary input induced by component of final demand

Table 2.11 presented the linkage between final demand and production, but the final result of any economic activity to be created income. Here presents the linkage between final demand and production income and this relation presented as follow:

$$V = v.(I-A^d)^{-1}.Y^d \qquad (2.35)$$

Where: V is matrix of value added, v is coefficient matrix of value added.

Table 2.12 shows Government consumption expenditure propagated to gross value added (GVA) being biggest, Of course, percent of Government consumption expenditure induced to GVA is only 2,06%; So in this period (The period presented by the input-output table 2007) Government expenditure will be best induced to gross value added .

Table 2.12 Gross value added induced by final demand

	2007		2000	
	GVA induced by:	Percent allocated to GVA induced by:	**GVA induced by:**	Percent allocated to GVA induced by:
Household consumption expenditure	0.71	40.08	0.67	41.5
Government consumption expenditure	0.83	2.06	0.73	4.9
Investment	0.50	16.25	0.48	13.8
Export	0.55	41.61	0.62	39.8
Total		100.00		100.00

2.5 Conclusions

This chapter overviews technical arspects for feasiblie IO compilations. Regarding to IO compilation, Table 2.13 ilustrates summary of overviewing feasible compilation of Hybrid IOT.

Table 2.13 Feasible compilation of Hybrid IOT

Point I / Point II / Point III			I. Level of Consistency with Symetric Input Output Table (SIOT) Compilation		
		(1) Level of consistentcy with input output structure	Direct estimation of SIOT based on survey data	Transforamtion from Asymmetry Table into SIOT	
		(2) Level of treatment of secondary product adjustment for estimation	Treatment of secondary product adjustment for estimation		No-treatment of secondary product adjustment for estimation
		(3) Level of consistency with SNA	Not-using Supply (Make) and Use Table (Not consist with SNA)	Using Supply (Make) and Use Table (consist with SNA)	
		(4) Level of hamonized sector classification (CPC, ISIC)	Treatment of secondary product adjustment for estimation		No-treatment of secondary product adjustment for estimation
		III. Type of IOT	Dirct SIOT compilation (Activity-by-Activity, Commodity-by-Commodity Table)	Indirct SIOT compilation from asymmetry data (Commodity-by-Industry, or Industry-by-Commodity based data)	
				Hybrid SIOT compilation	Indirect SIOT compilation from sedondary rectangrar form based data.
II. Level of Using Original Information	(1) Using survey based data for all of component	Survey Based IOT: Full survey based SIOT	Full survey and Direct compiled IOT (No-SNA based IOT)	Full survey and Hybrid compiled IOT (SNA-base IOT)	Full survey and Indrect compiled IOT (Not consistency with IO structure)
	(2) Using survey based data for main component				
	(3) Bollowing processing data from other sources for main component	Survey Based IOT: Hybrid SIOT	Hybrid survey and Direct compiled IOT (No-SNA based IOT)	Hybrid survey and Hybrid compiled IOT (SNA-base IOT)	Hybrid and Indrect compiled IOT (Not consistency with IO structure)
	(4) Bollowing processing data and coefficient from other sources for all of component	Non-survey based SIOT	Non survey and Direct compiled IOT (No-SNA based IOT)	Non survey and Hybrid compiled SIOT (SNA based IOT)	Up-dated and Indrect compiled IOT (Not consistency with IO structure)

Chapter 3

Compilation and Utilization of National SAM in Vietnam

3.1 Introduction

The first Social Account matrix was developed by Richard Stone and Brow in 1962, after that Graham Pyatt and Eric Thorbecke became first persons continue developers of SAMs. The Social Accounting Matrix (SAM) is one of the most useful tools of economic research. The matrix can be used for policy analysis and economic planning, and offers an efficient means of summarizing complex economic relationships and identifying gaps in statistical information. Being an extension of the existing national economic accounts, a SAM is a consistent and complete representation of the socio-economic system that captures the interdependencies between institutional groups. It is both a conceptual framework and a data system that can support analyses of socio-economic policy issues, used to evaluate the socio-economic impact of exogenous changes, or serve as a database for general equilibrium modeling.

This chapter describes a methodology of the construction of a Macroeconomic of Social Accounting Matrix of Vietnam in 2005. This Chapter also describes the construction of SAM 2005 which is constructed using the newly compiled non-competitive I-O table for 2005. In previous versions of SAM constructed for Vietnam, savings is often assumed to be equal to investment. In our new SAM 2005, this unrealistic assumption has been relaxed.

In the first part of this chapter, we describe how the I-O table was updated from I-O table 2003. We, in the second part, discuss the competitive and non-competitive I-O type tables. In part three of the paper, we discuss how to reconcile the differences between the import-export data provided by the Ministry of Finance and the export and import vector of the updated IO 2005. In section 4, we discuss in the details the construction of SAM 2005.

3.2 Past Overviews of SAM in Vietnam

Social account matrix (SAM) can be considered as a natural outgrowth of input-output table which is a widely used framework to provide detailed information on the flow of goods and services as well as on the structure of production costs. By extending market-based transactions of the I-O table to include nonmarket transactions, SAM of a nation or a region will track the monetary flows between industries and institutions. In fact, the input-output table is a subset of the entire SAM. The SAM accounts track all monetary flows, both market and non-market. The market flows are those between producers and consumers of goods and services. Examples of the nonmarket flows are those between households and government, government and households. These flows are often called inter-institutional transfers. As such, SAM is an useful framework for analytical presentation of economic data jointly with other relevant data-such as data on social conditions or the environment - as an integrated whole. Such presentations go beyond what is available today from published national accounting statistics. SAMs allow users of the accounts to more easily analyze socio-economic questions, to supply the information needed for policy development or to build general equilibrium models.

A SAM depicts the entire circular flow of income for an economy in a (square) matrix format. It shows production leading to the generation of incomes which, in turn, are allocated to institutional sectors. In addition, it shows the redistribution of income leading to disposable income of institutional sectors. These incomes are either spent on products or saved. Expenditures by institutional sectors lead to production by domestic industries as well as supply from imports. This format; shows in detail who pays, how much is paid, and to whom the payment is made.[1]

In the last decade, there have been several attempts to build a SAM for Vietnam resulted in SAM 1996, SAM 1997, SAM 1999 and SAM 2000. The latest I-O table on which a SAM was built for Vietnam is the I-O table in 2000. The resulting SAM was called the 2000 Macro SAM. This SAM was constructed by SNAD (GSO) and CIEM in collaboration with the Institute of Economics at the University of Copenhagen under the umbrella of the CIEM/NIAS project. This paper documents how the SAM 2005 for Vietnam was constructed. There are great differences between the old versions of SAM and SAM 2005.

Earlier versions of SAMs were based on SUT tables while SAM 2005 is based on the updated I-O 2005 table. Notably, the I-O 2005 table is a non-competitive type I-O table in

[1] The terminology used within a SAM framework is somewhat different than that of an input-output model. In the I-O table, the typical term for payments to workers and profits is termed value-added while in a SAM framework, we refer to value added as payments to factors of production. The consumption of goods and services by households, government, and firms are usually refered to as final demands in an IO framework. In a SAM framework, the consuming final demand sectors are called institutions.

which the imports are separated from the domestically produced goods. (The advantage of this source of data is discussed later on in the paper).

Earlier versions of SAM built for Vietnam was based on an unrealistic assumption that is investment equal savings. In this version of SAM 2005, we relax this assumption. By relaxing the restrictive assumption of previous SAM, allowing $I \neq S$, our version of SAM 2005 certainly describes much more realistically and precisely the Vietnam's economy. In our SAM 2005, *S* is only a part of *I* which includes not only S but also net capital transfers and net lending.

3.3 Updating Vietnam I-O 2005 by Hybrid Approach

By construction, an IOT describes the flows among the various sectors of the economy. It represents the value of economic transactions in a given period of time. Transactions of goods and services are broken down by intermediate and final use. The IOT also shows the cost structure of production activities: intermediate inputs, compensation to labor and capital, taxes on production.

One of the major differences between SAM 2005 and the earlier versions of SAMs is the source of data and information. While earlier versions of SAM were based mostly on the SUT (Supply and Use Tables) framework; our SAM 2005 is based on the updated I-O 2005. Thus having an updated I-O 2005 is of utmost importance.

In order to update I-O table for the year 2005, certain sources of data were used.

1) Data on Intermediate Inputs and Gross Inputs. These are taken from the "Survey on activities of enterprises", undertaken by the General Statistics Office

2) S.U.T 2003 which is available from the GSO

3) Export and Import data were provided by the Ministry of Finance

4) Balance of Payment from Central Bank

5) State budget data from Ministry of Finance

The approach of updating the I-O table for the year 2005 was derived from the following basic relations of the IO table:

$$A.X+Y=X \tag{3.1}$$

$$X= (I-A)^{-1}.Y \tag{3.2}$$

$$Y = C + G + I + E - M \quad (3.3)$$

$$M_i/TDD_i<1 \quad (3.4)$$

$$TDD_i=IC+C+G+CF \quad (3.5)$$

and

$$\Delta X = (I - A)^{-1}.\Delta Y \quad (3.6)$$

Where; A is the direct input coefficient matrix, X is vector of supply or sectoral output

Y is vector of final demand, $(I - A)^{-1}$ is the Leontief Inverse, or matrix of multipliers

C is final consumption of household, G is final consumption of government

I is gross fixed capital or capital formation, E is export, M is import

M_i is import of commodity I, TDD_i is total domestic demand of commodity i

From these basic relations of the I-O table, the following formulas were derived with taking into account the three changes in X, namely price changes, technical changes and changes in Y (final demand) through the years (equation 3.7). Given the structure of the Vietnam's economy and the relatively short time break from the last updating of I-O table taken place in 2003, formula (3.8) was used to calculate the technical coefficient matrix A for the updated 2005 I-O table, which assumes that there was no or only small changes in prices and technical change.

$$x_{ij}^{2005} = \left(\frac{x_{ij}^{2003}}{GI_j^{2003}} \right) \cdot GI_j^{2005} \quad (3.7)$$

$$va_{kj}^{2005} = \left(\frac{va_{kj}^{2003}}{VA_j^{2003}} \right) \cdot VA_J^{2005} \quad (3.8)$$

$$x_{ij}^{2005} = \left(\frac{x_{ij}^{2003}}{II_j^{2003}} \right) \cdot II_j^{2005} \quad (3.9)$$

Where; x_{ij}^{2005} is the amount of the product of sector i absorbed – as its input – by sector j in 2005, x_{ij}^{2003} is the amount of the product of sector i absorbed – as its input – by sector j in 2005, II_j^{2003} is an element of the vector II in 2003 or the total intermediate input in 2003, II_j^{2005} is an element of the vector II in 2005 or the total intermediate input in 2003, va_{kj}^{2005} is an element of the value added matrix in 2005,

Where; k is factor of value added at factor cost, va_{kj}^{2003} is an element of the value added matrix in 2003,

Where k is factor of value added at factor cost, VA_j^{2003} is an element of the vector value added in 2003, VA_J^{2005} is an element of the vector value added in 2005

These formulas were used to compute the technical coefficient matrix A and therefore the intermediate demand matrix of the IO table and the value added matrix, which is broken-down into payments to labor and capital, depreciation, and indirect taxes.

As stated above, equation (3.8) was used with an assumption that technological change and the change in prices have not occurred during the last two years, which we believe is a reasonable assumption. One issue with the vector GI is of course the property of this vector since it is an industry-by-industry vector. Therefore this must be recalculated to get a commodity-by-commodity vector. This could be done with the data from the S.U.T 2003 as follows:

From S.U.T 2003, the supply matrix S is taken out. This is an industry-by-commodity matrix. With a simple formula presented below, the commodity-by-commodity GI vector can be calculated

$$GI_{2005}^{c} = s'.GI_{2005}^{a} \qquad (3.10)$$

Where

GI_{2005}^{c} is vector of gross input by commodity of the year 2005

GI_{2005}^{a} is column vector of gross input by industry of the year 2005

S is coefficient matrix of S with dimension (industry x product)

S’ is transpose of s with dimension (product x industry)

The use matrix of the S.U.T can be used to get the use matrix of the 2005:

$$U_{2005} = U_{2003}.GI^{a}_{2005} \tag{3.11}$$

With

U_{2003} is coefficient matrix of use table in 2003

U_{2005} is coefficient matrix of use table in 2005

From the above formulas, now the A matrix of I-O 2005 can be computed using the following formula:

$$A = U_{2005}.s^{-1} \tag{3.12}$$

With s^{-1} is an inverse of matrix s (commodity technology assumption).[2]

The value added matrix and the final demand matrix is left to be computed. The value added matrix can be calculated from the formula:

$$B = A.GI^{c}_{2005} \tag{3.13}$$

Where B is the matrix containing both the A matrix and the value added matrix.

The final demand or the Y was computed using equation (3.3).

As for the computation of the final demand matrix, we derive the following formula using equations (3.3) and (3.5)

$$CF_j = GO_j - IO_j - C - G - E + \left(M_j + T_j\right) \tag{3.14}$$

With IO_j is the intermediate output of industry j and T_j is the import tax.

3.4 Competitive and Non-competitive I-O Tables

Competitive I-O table: in the competitive I-O table the intermediate inputs include both commodities produced domestically and imported. For the purpose of analyzing the economy based on I-O tables, the competitive table is not of much use for the reasons stated above; the competitive table does not separate the intermediate inputs which are

[2] In deriving the matrix A some elements of the matrix is negative and thus should be corrected by changing it to 0. Further, to balance the I-O table, we use RAS method.

produced by domestic industries from the imported intermediate inputs. Thus the precision and the usefulness of the analysis based on the competitive table is a matter for arguing.

Non-competitive I-O table: in this kind of I-O tables, the intermediate inputs are broken-down into commodities produced domestically and commodities imported from the rest of the world. In contrast to the competitive I-O table, a non-competitive table with import clearly separated from intermediate inputs produced domestically and thus with two intermediate input coefficient matrix A^d (domestic A) and A^m (import A) will give the users a much better picture of the economy.

Following is the indirect method to derive the non-competitive I-O table from the competitive I-O table. From the basic relations of the I-O table with equations from (3.1) to (3.6), we take the equations (3.4) and (3.5) to compute the ratio of imported goods in Total domestic demand. From this structure of imported goods in domestic demand, the intermediate input matrix can easily be achieved. The value added matrix of non-competitive table remains the same as in the competitive table. In the final demand matrix, all the elements are different except for the export vector.

Export and import data: The data on exports and imports provided by the Ministry of Finance were used for our SAM 2005. These data are classified according to the HS code and had to be changed to the CPC codes. At this stage, one issue arose: the export and import data of the Ministry of Finance do not coincide with the export and import vector of the updated IO 2005. Some corrections therefore had to be taken; the following section will discuss this issue in detail.

In Table 3.1, export data provided by the MOF is compared against the export from the I-O 2005. It is obviously from that the Table that some of the export data provided by the MOF for commodities listed below if compared with the value of Gross Input does not make sense. Take the example of the Raw rubber: the value of export alone, which is VND 11,327,976 millions exceeds the value VND 3,720,931 million of Gross Input which is defined as the sum of the value of II, C, G and E less import. Another group of commodities facing the same problem is Coffee beans.. Similarly, there are significant differences in eight other groups of commodities including: Coal, Metallic ore, Processed wood and wood products, Basic organic chemicals, Precise and optics equipment, meter (all kinds), Other special-purpose machinery, Electrical machinery, Gasoline, lubricants (already refined) that export value is higher than the total output.

Table 3.1 Comparison of Export data

(1)	(2)		(3)	(4)	(5)	(6)
No.	Commodities classified in I-O table		Export by MOF	Export in I-O 2005	(3) – (4)	GO
1	2	Raw rubber	11,327,976	3,475,935	7852041	3,720,931
2	3	Coffee beans	11,547,266	8,736,511	2810755	9,102,519
5	16	Coal	10,623,024	5,423,024	5200000	11,865,474
10	21	Crude oil, natural gas (except exploration)	109,322,476	119,157,819	-9835343	121,089,757
13	34	Processed seafood and by-products	39,048,312	36,248,312	2800000	44,527,418
17	44	Processed wood and wood products	27,746,900	17,746,900	10000000	20,225,890
21	52	Processed rubber and by-products	3,110,380	6,110,380	-3000000	12,868,285
26	67	Other special-purpose machinery	16,834,411	4,834,411	12000000	6,247,718
30	71	Other electrical machinery and equipment	16,978,945	21,478,945	-4500000	26,993,088
31	73	Non-ferrous metals and products	8,558,416	14,058,416	-5500000	24,458,805
32	74	Ferrous metals and products (except machinery equipment)	1,088,396	5,088,396	-4000000	5,614,637
33	81	Leather goods	53,996,914	48,496,914	5500000	71,960,871
35	86	Gasoline, lubricants (already refined)	4,961,588	961,588	4000000	1,596,434
41	112	Other services	4,054,057	8,054,057	-4000000	27,766,366

On the other hand, there are commodities whose export values are underreported. An example is Sugarcane. The export value reported by the MOF is rather small, being VND 621 million. Gross output of VND 3,937,145 million many times exceeds this number. Since sugarcane is mainly used as intermediate input in sugar production, final consumption is of much less quantity so the rest must be eventually exported. Other underreported exports are also products used mostly or completely as intermediate goods in production of other final goods, including: Stone, Milk, butter and other dairy products, Sugar, refined, Other food manufactures, Chemical fertilizer, Pesticides, Processed rubber and by-products, Plastic (including semi-plastic products), General-purpose machinery, Automobiles, Other transport means, Other electrical machinery and equipment, Ferrous metals and products (except machinery equipment), Animal feeds, Electricity, gas, Communication services, Banking, credit, treasury, Education and training, Other services. Notably the export of Electricity and gas is recorded by the MOF as zero. The fact that exporting of Gas and Electricity to Laos do not go through customs partly explains this reality. In total, there are 41 groups of commodities where the export data provided by the MOF do not coincide with the export data in the updated I-O table 2005.

3.5 SAM Building

In this section, the construction of the SAM 2005 will be discussed in detail. This is because constructing a SAM table is a rather complicated task and requires a deep knowledge of the SNA, the IO table, and SUT framework as well as different updating and balancing methods namely the RAS method, not least the knowledge on the performance of the Vietnam's economy.

The Social Accounts track the monetary flows between industries and institutions. The relation between a SAM and an I-O table is the fact that the input-output accounts are a subset of the entire social accounts recorded in a country. The social accounts track all monetary flows, both market and non-market. The market flows are those between producers of goods and services and consumers, both industrial, and non-industrial (i.e. households, government, investment, and trade). The non-market flows are those between households and government, government and households, capital and households and so on. These flows are often called inter-institutional transfers. A classical and very simple aggregate version of SAM is presented in Table 3.2.

Table 3.2 SAM Framework expansion from S.U.T (Supply & Use tables)

	(1) Industry	(2) Commodity	(3) Factors	(4) Institutions	(5) Saving (Capital formation)	(6) ROW	(7) Total
1-Industry		1x2					1x7
2-Commodity	2x1			2x4	2x5	2x6	2x7
3-Factors	3x1						3x7
4-Institutions	4x1		4x3	4x4	4x5	4x6	4x7
5-Saving				5x4		5x6	5x7
6-ROW		6x2		6x4	6x5		6x7
(7) Total	7x1	7x2	7x3	7x4	7x5	7x6	

Where, Cell 1x2: Make matrix at producer's price, Cell 2x1:Use matrix at producer's price, Cell 3x1:Labor and capital share, Cell 4x1:Tax on production, Cell 7x1:Gross input by industry at producer's price, Cell 6x2: Imports, Cell 7x2:Gross output by commodity at producer's price, Cell 4x3: Redistribute income (property income), Cell 7x3:Total redistribute income by factor income, Cell 2x4:Household and Government consumption expenditure, Cell 4x4:Income receipt from transfer by each other institutional, Cell 5x4 :Saving by institutional, Cell 6x4: Transfer expenditure of institution to foreign, Cell 7x4:Total expenditure of institution, Cell 2x5:Gross capital formation by products, Cell 6x5: Capital transfer, Cell 7x5:Balancing of accumulation account, Cell 2x6:Exports of goods and services, Cell 4x6:Transfer income with foreign, Cell 5x6:Capital transfer, Cell 7x6: Total receipt from foreign, Cell 1x7: Gross output by industry at producer's price, Cell 2x7: Gross output by commodity at producer's price, Cell 3x7:Total income from production by factor, Cell 4x7:Total income by institution, Cell 5x7:Balancing of accumulation account, Cell 6x7:Balancing of foreign account,

In Table 3.2, each cell represents a sub-matrix. Rows represent an institutional or industry receipt of income. Columns represent an institutional or industry payment or expenditure. In a SAM table, rows and columns balance exactly so all flows are counted. Following is the explanation of the data contained in each cell of the above example of an aggregated SAM.

1. Industry is the industry sectors from the I-O table
2. Commodity is the commodities also from the I-O table
3. Factors include the value-added elements:
    - Types of Labor incomes (L), Type of capital incomes (K)
4. Institutions include
    - Households , Government
    - Enterprises (basically consists of corporate profits)
    - Capital
5. ROW (rest of the world)
    - Imports, Exports

Again, the building of SAM 2005 requires a certain source of data, namely:

1) Data of Intermediate Inputs and Gross Inputs are taken from the "Survey on activities of enterprises", undertaken by the General Statistics Office

2) SUT 2003

3) Export and Import data were provided by the Ministry of Finance

4) Balance of Payment

5) State budget

6) Updated non-competitive I-O 2005

In this SAM 2005, while the main attribute of a classical SAM remains the same. There in addition some changes. The detailed elements of the SAM 2005 are in the following table.

Table 3.3 SAM 2005 expansion from I-O table

	(1) Commodity	(2) Factors	(3) Institutions	(4) I-S	(5) ROW
1 Commodity	1x1	1x2			1x5
2--Factors	2x1			2x4	
3- Institutions	3x1				
4-Saving		4x2	4x3	4x4	4x5
5-ROW	5x1		5x3	5x4	5x5

From table 2 we can convert to table 3.3 by the following formula

$A = U.S^{-1}$

Where: A presents (1x1) matrix of table 3.3

U – (2x1) matrix of table 2 and S is (1x2) matrix of table 2 that is why dimension of A matrix is (commodity x commodity)

3.6 Conclusions

In an attempt to provide a precise and reliable source of data for economic-policy making, the SAM 2005 of Vietnam was created, overcoming the weaknesses of the earlier versions of Vietnam' SAMs.

This chapter very briefly dealt with the construction of both an updated I-O table, namely non-competitive I-O and the SAM. The authors of SAM 2005 hopes that this version of SAM will be an useful source of reference for users of CGE modeling framework and SAM multipliers or demographic - economic analysis as well as other analyzers of Vietnam's economy in a way that is a reliable supply of the information needed for policy development.

Chapter 4

Structural Change Comparison of Interactions Analysis between Manufacturing & Non Manufacturing Industries: "Application to Vietnam Economy after Renovation (Doimoi 1986-2004) based on I-O Tables 1989, 1996,2000"

4.1 Introduction

As the Vietnam(VN) economy has grown, its structure has changed. Using very broad measures, the VN economy has moved from an economy dominated by agricutlre to one where services play a major role. For example, over the 1972 to 1996 period nominal GDP grew at an average annual rate of 8 percent, but contributions by manufacturing to GDP grew at an average of 6.5 percent annually. During the same period, the share of intermediate transactions to total industry gross output from manufacturing fell while those from services grew from 21 percent to 27 percent. Both of these measures are indicators of changes occurring in the structure of the economy, but they do not tell us fully where or why those changes are occurring.

Input-output analysis allows us to study these structural changes in the economy. It provides the tools necessary to evaluate industries, including their relationships to the rest of the economy and the effects of international trade on those relationships. It has been said that input-output analysis is one of the major contributions to economics in the 20th century that accomplished "the mutual support that theory, data and application have come to provide to one another."

The methodology of this chapter is based on Sonis and Hewings (1993), inter-regional economic systems analysis of Miyazawa (1966,1971); Moreover, instead of doing research on interaction between regions, this chapter lays emphasis on linkages of manufacturing and non-manufacturing. The linkages in the economy of Vietnam are based on three national I-O tables (1989, 1996 and 2000). The independencies and interdependencies between groups of manufacturing sectors and non-manufacturing sectors are considered in input output system.

This Chapter is also based on the working academy of Jiemin Guo, Sonis and Hewings. In order to analyze internal and external linkages of manufacturing and non-manufacturing of Chinese Metropolitan economies. This paper also draws from the paper by P.Q.Ngoc, B.Trinh and Thanh that analyzes structural changes and the economic performance of Vietnam from 1986-2000 (presented at Sedan conference, 2006).

This chapter lays focus on the current phases of the economic transition of Vietnam (1986-2004) by exploring the three national input-output tables (1989, 1996 and 2000). The interrelationships between the structural change groups of manufacturing industries and non-manufacturing industries is examined using internal and external multipliers.

The primary focus in this study is on measures of inter-industries linkages within and between two different economic production groups, manufacturing and non-manufacturing, and total output requirement decomposed by direct, indirect and, induce impacts of final demand and other sector group. Further, price impacts also are estimated based on input output tables at a constant price (1994 price).

This chapter is organized as follows: Part I data describes the data; part II presents on the methodology; part III discusses the result of the analysis; and part IV presents some concluding remarks.

4.2 Data Sources

The input output tables used in this study are 1989, 1996 and 2000 tables for Vietnam's national economy at a current price and a constant price; these input output tables are consistently developed with the same industrial classification and are competitive-import type at a current price and a constant price. These tables are compiled based on a *system of national account* (SNA) approach, which replace the *material products balance system* (MPS) approach used by Vietnam Statistics before 1989. The 1989 input output table is the first one created in Vietnam; hence, the Vietnam national input output tables comprise not only material products but also non-material products in the intermediate input, which cover goods and services. This system of tables allows an opportunity for the comparison of Vietnamese input output system with that of other countries in the world.

The original input output table in 1989 has 54 sectors; and other tables are the 97 - sector table and 112 - sector table in 1996 and 2000 respectively; these sectors in the original tables have been aggregated into 31 sectors for three tables, those are in table 4.1 below. These sectors were identified to base on policy of Vietnam Government and backward and forward linkages in Vietnam economic activities from 1986 to 2004, During the period from 1986-1992, these sectors were presented by Vietnam IO table 1989; the period from 1993-1998 these were presented by Vietnam IO table;1996 and the period from 1999-2004 was presented by Vietnam IO table, 2000.

Table 4.1 Classification of Vietnam input output tables (1989, 1996 and 2000)

Code of manufacturing	Description	Code of non-manufacturing	Description
1.	Food	22.	Agriculture
2.	Ceramics, glass, porcelain	23.	Forestry
3.	Bricks, tile (all kinds)	24.	Fishing
4.	Cement	25.	Mining
5.	Other construction materials	26.	Construction
6.	Paper pulp and paper products and by-products	27	Trade
7.	Processed wood and wood products	28	Hotel and restaurants and personal repairs
8.	Chemical products	29	Transportation and
9.	Fertilizer, pesticides and veterinary medicine	30	Banking, credit, treasury, lotto, insurance and retirement subsidy
10.	Health medicine	31	Other services
11.	Processed rubber and		
12.	Soap, detergents, perfumes and other toilet preparations		
13.	Plastic, plastic products		
14.	Other chemical products		
15.	Other metallic products		
16.	Equipment, machinery		
17.	Electrical and electronic products		
18.	Ferrous and non- ferrous metal and products		
19.	Manufacture of textiles, carpet, rugs, leather, footwear, bleaching, dyeing of fabrics		
20.	Petroleum, natural gas, Electricity and gasoline and water		
21.	Other industry		

4.3 Methodology

4.3.1 Inter-industrial analysis

Consider a two-industrial group in input output system represented by the following block intermediate input coefficients matrix, A:

$$A = \left\langle \begin{array}{c|c} A_{cc} & A_{ck} \\ \hline A_{kc} & A_{kk} \end{array} \right\rangle \tag{4.1}$$

Where A_{cc}, A_{ck}, A_{kc}, A_{kk} are sub-matrices of matrix A; A_{cc} and A_{kk} are square matrices with dimension are *(manufacturing by manufacturing)* and *(non-manufacturing by non-manufacturing)*; A_{ck}, A_{kc} are sub-matrices with dimension *(manufacturing by non-manufacturing)* and *(non-manufacturing by manufacturing)*. With X_c, X_k are gross output of industrial groups of manufacturing and non-manufacturing and Y_c, Y_k are final demand of industrial groups of manufacturing and non-manufacturing So, a basic equation of Leontief system can be written as follows:

$$\left\langle \begin{array}{c} Xc \\ Xk \end{array} \right\rangle = B. \left\langle \begin{array}{c} Yc \\ Yk \end{array} \right\rangle \tag{4.2}$$

With:

$$B = (I - A)^{-1} = \left\langle \begin{array}{c|c} B_{cc} & B_{ck} \\ \hline B_{kc} & B_{kk} \end{array} \right\rangle \tag{4.3}$$

Based on Sonis and Hewing [25] on Miyazawa multipliers, we can re-write as follow:

$$B_{ii} = \Delta i. \ (I-A_{ii})^{-1} \tag{4.4}$$

Where i = c,k; $(I-A_{ii})^{-1}$ is referred to as the intra-industrial in each industrial group of manufacturing and non-manufacturing for a unit increase on final demand of each industrial group; Δ_i is interpreted as the inter-industrial feedback effects that induced by the production of other industrial group; So, B_{ii} is interpreted as enlarged Leontief inverse, the elementary of B_{ii} includes direct impact, indirect impact and induce effects from the production of other industrial group; They contain elements which are large than those of the $(I-A_{ii})^{-1}$ matrix, because they include extra output required to meet the production of the other industrial group induced output effects. B_{ij} (i,j=c,k) is referred to as the inter-industrial feedback effects that induced by final demand on products of the other industrial group; B_{ck} is interpreted as the *non-manufacturing* multipliers matrix, it means the effects on the output of each manufacturing sector of an additional unit of non-manufacturing; B_{kc} is interpreted as the manufacturing multipliers matrix, it means the effects on the output of each non-manufacturing sector of an additional unit of manufacturing. So, inter-industrial feedback effects of manufacturing presented by external and non-manufacturing multipliers and inter-industrial feedback effects of non-manufacturing presented by external and manufacturing multipliers.

However, from Leontief standard system and denotes (4.1) and (4.2) we can be write as:

$$A_{cc}.X_c + A_{ck}.X_k + Y_c = X_c \text{ or } (I - A_{cc}).X_c - A_{ck}.X_k = Y_c \quad (4.5)$$

$$A_{kc}.X_c + A_{kk}.X_k + Y_k = X_k \text{ or } (I - A_{kk}).X_k - A_{kc}.X_c = Y_k \quad (4.6)$$

Or:

$$X_c = (I - A_{cc})^{-1}.(A_{ck}.X_k + Y_c) \quad (4.7)$$

$$X_k = (I - A_{kk})^{-1}.(A_{kc}.X_c + Y_k) \quad (4.8)$$

Assume, Yc = 0. The assessment impacts on both industrial groups of a change in final demands in group k only. Base on those conditions, the equation (4.7) is solved in terms of Xc yields:

$$X_c = (I - A_{cc})^{-1}.A_{ck}.X_k \quad (4.9)$$

Similar we have:

$$X_k = (I - A_{kk})^{-1}.A_{kc}.X_c \quad (4.10)$$

$(I - A_{cc})^{-1}.A_{ck}$ is presented output requirement of group c when production of group k changed. These multipliers was calculated by input output tables at constant price in order to observe essence on production.

4.3.2 IO table at constant price

The Vietnam National input output tables was compiled at producer's price, the assumption that P^t is vector of producer price index (PPI) of year t compare with benchmark year, in this case t =1989, 1996, 2000; The elementary p^t_i of vector P^t is producer price index of product i, P^m is vector of import price index, gross output at constant price denotes X^s, the elementary of intermediate demand matrix at constant price denotes X^s_{ij}, the elementary of final demand matrix at constant price denotes Y^s_{ik} (where: i presents product and k present component of final demand) and the value added vector at constant price is VA^s; We have:

$$X_j^s = X_j/p^t_j \tag{4.11}$$

$$X^s_{ij} = X_{ij}/p^t_i \tag{4.12}$$

$$Y^s_{ik} = Y_{ik}/p^t_i \tag{4.13}$$

$$m_i^s = m_i/p^m_i \tag{4.14}$$

Where: m_i is elementary i^{th} of vector import M; m_i^s – imports of product i at constant price. we have:

$$VA_j^s = X_j^s - \sum X^s_{ij} - m_i^s \tag{4.15}$$

From these equations, we have the equation in order to balance as follow:

$$\sum_j X^s_{nj} + \sum_k Y_{nk} = \sum_i X^s_{in} + m_n^s + VA_n^s = X^s_n \tag{4.16}$$

4.3.3 The output change influenced by price

The assumption that the changing on gross output dose not only depends final demand but also depend the changing of price and technical coefficients, so, we can re-write from Leontief system standard as follow:

$$\partial X - (I-A)^{-1}. \partial Y = \partial[(I-A)^{-1}].Y \tag{4.17}$$

where: ∂ denotes the changing as differential in the case with assumption the change of output depend only final demand, the equation (4.18) go back standard equation:

$$\partial X = (I-A)^{-1}. \partial Y \tag{4.18}$$

$\partial[(I-A)^{-1}]$ includes the changing on price impact and impact of technical coefficients, from the input output table at current price and input output table at constant price can calculate price impact to output. In that case, If $\partial[(I-A)^{-1}] >0$ this means the price impact to production of that product is positive or the price impact will excite to production of product, it can lead to ratio of value added per gross input decrease; If $\partial[(I-A)^{-1}] <0$ this means the price impact to production of that product is negative or the price impact will deduct output requirement of that product but the ratio of value added per gross input can increase; However, in the case the price growth on intermediate input vis-à-vis products of other industrial group faster than the change on price in intra – linkages will be leading to the ratio of value added per gross input decrease although $\partial[(I-A)^{-1}] < 0$.

4.4 Empirical Study

4.4.1 Structural comparison analysis

Table from 4.2 to 4.5 show the decomposed industrial multipliers and economic linkages for three stages that presented by three input output tables (1989,1996 and 2000). The input output tables at constant price will be used in order to calculate these industrial multipliers because 1) the price impact excepted in each input output table, so, the internal and external multiplier effects within each of two groups can be obviously revealed 2) the interaction between the two groups of manufacturing and non-manufacturing will be a reality 3) In Vietnam the growth of GDP is always said to be an indicator, and calculated as a division of GDP at constant price.

Table 4.2 Internal multipliers in non-manufacturing sectors at constant price

$(I-A_{kk})^{-1}$

Code	*Sectors*	1989		1996		2000	
		Backward linkages	*Forward linkages*	*Backward linkages*	*Forward linkages*	*Backward linkages*	*Forward linkages*
1	Agriculture	1.3182	1.4037	1.1738	1.1730	1.2172	1.1879
2	Forestry	1.2265	1.1096	1.1893	1.1207	1.2342	1.0860
3	Fishing	1.5021	1.0311	1.3083	1.1300	1.4335	1.0789
4	Mining	1.3736	1.2388	1.4375	1.1591	1.3302	1.1058
5	Construction	1.1319	1.1257	1.2634	1.0910	1.2267	1.1050
6	Trade	1.1733	1.5195	1.2347	1.2266	1.3815	1.4987
7	Hotel and restaurants and personal repairs	1.1378	1.0954	1.3237	1.0987	1.4074	1.1092
8	Transportation and communication	1.5581	1.1226	1.3999	1.4543	1.3734	1.3494
9	Banking, credit, treasury, lotto, insurance and retirement subsidy	1.1869	1.0978	1.2948	1.2508	1.3488	1.3198
10	Other services	1.2540	1.1856	1.2252	1.5177	1.3158	1.4997

Table 4.3 Internal multipliers in manufacturing sectors at constant price

$\Delta c = B_{cc}.(I-A_{cc})$

Code	Sectors	1989		1996		2000	
		Backward linkages	***Forward linkages***	***Backward linkages***	***Forward linkages***	***Backward linkages***	***Forward linkages***
1	Food	1.1423	1.2371	1.2727	1.0588	1.2829	1.0523
2	Ceramics, glass, porcelain	1.1852	1.0128	1.2093	1.0114	1.1280	1.0174
3	Bricks, title (all kinds)	1.1777	1.0262	1.2126	1.0108	1.1327	1.0241
4	Cement	1.2626	1.0266	1.2601	1.0247	1.1495	1.0432
5	Other construction materials	1.2263	1.0297	1.1469	1.0259	1.0979	1.0295
6	Paper pulp and paper products and by-products	1.1534	1.0484	1.1692	1.0645	1.1544	1.0848
7	Processed wood and wood products	1.0787	1.0714	1.1340	1.0791	1.2038	1.0301
8	Chemical products	1.3098	1.1243	1.2099	1.1784	1.0947	1.0659
9	Fertilizer, pesticides and veterinary medicine	1.3416	1.0865	1.1493	1.1495	1.1129	1.1066
10	Health medicine	1.0632	1.0122	1.0530	1.0126	1.0817	1.0105
11	Processed rubber and by-products	1.1337	1.0536	1.1040	1.0457	1.1435	1.0306
12	Soap, detergents, perfumes and other toilet preparations	1.0496	1.0058	1.0512	1.0047	1.0738	1.0053
13	Plastic, plastic products	1.0579	1.0615	1.0788	1.1408	1.0770	1.1780
14	Other chemical products	1.1167	1.0975	1.1401	1.0812	1.0827	1.0467
15	Other metallic products	1.0524	1.2066	1.0368	1.1624	1.0844	1.6950
16	Equipment, machinery	1.0612	1.7531	1.0804	1.2928	1.1069	1.1784
17	Electrical and electronic products	1.0283	1.0758	1.0475	1.4758	1.1098	1.2651
18	Ferrous and non- ferrous metal and products	1.1193	1.5751	1.1059	1.6250	1.1263	1.4253
19	Manufacture of textiles, carpet, rugs, leather, footwear, bleaching, dyeing of fabrics	1.0638	1.1224	1.1087	1.0705	1.1228	1.0690
20	Petroleum, natural gas, Electricity and gasoline and water	1.1118	1.4915	1.1481	1.2883	1.0678	1.2923
21	Other industry	1.0463	1.0431	1.0926	1.1482	1.1419	1.1500

Table 4.2 and table 4.3 show in three stages the manufacturing sectors tend to have much higher internal linkages than those of the non-manufacturing sectors group; The average internal multipliers for manufacturing group of three stages is 1.91, however, backward linkages and forward linkages tend to increase, For example, in 1989 the average back ward linkage is 1.85, in 1996 it is 1.90, and in 2000 it is 1.92. The average forward linkage in 1989 is 1.89, in 1996 it is 1.93 and it is 1.97 in 2000; These figures correspond with GDP growth in the period (1986-1992 presented by the 1989 input output table, the average GDP growth is 5,6 1993-1998 period presented by 1996 input output table the average GDP

growth is 8,3. GDP growth of 7.2 is in stage of 1999-2004, which is presented by 2000 input output table).

Furthermore, table 4.4 and 4.5 show the external linkage of manufacturing sectors group is also higher than that of the non-manufacturing sectors, except backward linkage of in 1989 of non-manufacturing group have relatively external linkage higher than this of manufacturing sectors group, that means the developing of non-manufacturing will excite more development of manufacturing group; this result is obviously derived from the triangulated structure of the input output tables in which manufacturing sectors group would with time reveal stronger backward linkages and more significant intra - manufacturing forward linkages; Whereas non-manufacturing sectors group would tend to have a structure characterized by diverse forward linkages and modest backward linkages.

Noting that backward linkages of ceramics, glass, porcelain; bricks, tiles (of all kinds); Cement; Other construction materials are increasing with time, but the influences of those sectors on other sectors is less than on manufacturing sector. The average external linkages of above sectors in stage 1999-2004 (presented in 2000 IO table) is less than that in the earlier stage. But sector number 8 (chemical product) has internal and external linkages is decreasing with time. External linkage of construction is highest in all sectors at both manufacturing sectors and non-manufacturing sectors group; this means the influence of construction on other sectors is the highest.

Note that forward linkages of internal multiplier of ferrous and non-ferrous metal and products of all stages is very high but impression is backward linkage at internal multipliers of this sector is increasing with time, if in 1989 it is 1.97, in 1996 it is 1.98 it become highest in all sectors on backward linkage, 2.64; furthermore, this external linkage is also very high; these mean this sector has strong backward linkage and significant forward linkage in both internal and external multipliers.

These tables also show that the differences of intra-effects of each of two group for three stages are not perfect, this means that the technological structure within manufacturing and non-manufacturing are not eminent as it is shown in developed countries and the significant differences in internal and external multipliers effects within each group for individual sectors of three stages are exposed.

Table 4.4 External multipliers in non-manufacturing sectors at constant price

$\Delta k = B_{kk}.(I-A_{kk})$

Code	Sectors	1989		1996		2000	
		Backward linkages	*Forward linkages*	*Backward linkages*	*Forward linkages*	*Backward linkages*	*Forward linkages*
1	Agriculture	1.1178	1.2200	1.1028	1.1652	1.0847	1.1358
2	Forestry	1.0633	1.0680	1.0484	1.0661	1.0508	1.0467
3	Fishing	1.1032	1.0899	1.0487	1.0595	1.0895	1.0187
4	Mining	1.0899	1.3016	1.1202	1.1645	1.0323	1.0740
5	Construction	1.2087	1.0320	1.2883	1.0157	1.3208	1.0195
6	Trade	1.0788	1.1534	1.0538	1.1946	1.1516	1.4306
7	Hotel and restaurants and personal repairs	1.2741	1.0066	1.1829	1.0151	1.2008	1.0170
8	Transportation and communication	1.1565	1.0596	1.1068	1.1154	1.0731	1.0708
9	Banking, credit, treasury, lotto, insurance and retirement subsidy	1.2201	1.0455	1.0341	1.0384	1.0481	1.0337
10	Other services	1.1064	1.0626	1.0848	1.0961	1.1001	1.0804

Table 4.5 External multipliers in manufacturing sectors at constant price

$\Delta c = B_{cc}.(I-A_{cc})$

Code	Sectors	1989		1996		2000	
		Backward linkages	***Forward linkages***	***Backward linkages***	***Forward linkages***	***Backward linkages***	***Forward linkages***
1	Food	1.1423	1.2371	1.2727	1.0588	1.2829	1.0523
2	Ceramics, glass, porcelain	1.1852	1.0128	1.2093	1.0114	1.1280	1.0174
3	Bricks, title (all kinds)	1.1777	1.0262	1.2126	1.0108	1.1327	1.0241
4	Cement	1.2626	1.0266	1.2601	1.0247	1.1495	1.0432
5	Other construction materials	1.2263	1.0297	1.1469	1.0259	1.0979	1.0295
6	Paper pulp and paper products and by-products	1.1534	1.0484	1.1692	1.0645	1.1544	1.0848
7	Processed wood and wood products	1.0787	1.0714	1.1340	1.0791	1.2038	1.0301
8	Chemical products	1.3098	1.1243	1.2099	1.1784	1.0947	1.0659
9	Fertilizer, pesticides and veterinary medicine	1.3416	1.0865	1.1493	1.1495	1.1129	1.1066
10	Health medicine	1.0632	1.0122	1.0530	1.0126	1.0817	1.0105
11	Processed rubber and by-products	1.1337	1.0536	1.1040	1.0457	1.1435	1.0306
12	Soap, detergents, perfumes and other toilet preparations	1.0496	1.0058	1.0512	1.0047	1.0738	1.0053
13	Plastic, plastic products	1.0579	1.0615	1.0788	1.1408	1.0770	1.1780
14	Other chemical products	1.1167	1.0975	1.1401	1.0812	1.0827	1.0467
15	Other metallic products	1.0524	1.2066	1.0368	1.1624	1.0844	1.6950
16	Equipment, machinery	1.0612	1.7531	1.0804	1.2928	1.1069	1.1784
17	Electrical and electronic products	1.0283	1.0758	1.0475	1.4758	1.1098	1.2651
18	Ferrous and non- ferrous metal and products	1.1193	1.5751	1.1059	1.6250	1.1263	1.4253
19	Manufacture of textiles, carpet, rugs, leather, footwear, bleaching, dyeing of fabrics	1.0638	1.1224	1.1087	1.0705	1.1228	1.0690
20	Petroleum, natural gas, Electricity and gasoline and water	1.1118	1.4915	1.1481	1.2883	1.0678	1.2923
21	Other industry	1.0463	1.0431	1.0926	1.1482	1.1419	1.1500

Table 4.6, and 4.7 is defined in equation (4.9), (4.10); these tables illustrate economic interactions among the manufacturing and non-manufacturing industry group. The visual realization of these differences is clearly shown in the extended economic landscapes. The extended landscapes, instead of showing an economic photograph of the economic as a whole, reveal the inter-relationships of two economic groups through the synergetic interaction measurements. The table 4.6 shows the inter industrial feedback effects of manufacturing to non-manufacturing decreases in 1999-2004 compare with the previous time 3.5% in whole sectors of non-manufacturing sectors group except trade sector; these effects of manufacturing sectors group to trade sector increases from 0.92 in 1993-1998 to 1.77 in 1999-2004. Whereas,table 4.7 shows average inter-industrial feedback effects of non-manufacturing to manufacturing during 1999-2004 larger than the previous time 7.2%; from 0.225 in 1993-1998 to 0.241 in 1999-2004; it means when the non-manufacturing sectors increases a unit of output will be exciting 0.225 in 1993-1998 and 0.241 in 1999-2004.

If considering inter-relationships on total output requirements of whole a sectors group induced by each sector of other sectors group as backward linkages of $(I-A_{ii})^{-1}.A_{ij}$ (i,j=c,k).

Table 4.6 Inter-industrial feedback effects of manufacturing to non-manufacturing for each sector

$X_k=(I-A_{kk})^{-1}.A_{kc}.X_c$

code	*Sectors*	**1996**	**2000**
1	Agriculture	0.899	0.691
2	Forestry	0.543	0.477
3	Fishing	0.229	0.084
4	Mining	0.869	0.604
5	Construction	0.077	0.085
6	Trade	0.923	1.766
7	Hotel and restaurants and personal repairs	0.074	0.08
8	Transportation and communication	0.589	0.378
9	Banking, credit, treasury, lotto, insurance and retirement subsidy	0.179	0.139
10	Other services	0.445	0.357
Average		**0.483**	**0.466**

Table 4.7 Inter-industrial feedback effects of non-manufacturing to manufacturing for each sector

$X_c=(I-A_{cc})^{-1}.A_{ck}.X_k$

code	*Sectors*	**1996**	**2000**
1	Food	0.1970	0.1970
2	Ceramics, glass, porcelain	0.0350	0.0370
3	Bricks, tile (all kinds)	0.0580	0.1070
4	Cement	0.1460	0.1700
5	Other construction materials	0.1300	0.0620
6	Paper pulp and paper products and by-products	0.1170	0.1310
7	Processed wood and wood products	0.1730	0.0830
8	Chemical products	0.2430	0.1190
9	Fertilizer, pesticides and veterinary medicine	0.1730	0.1580
10	Health medicine	0.0240	0.0200
11	Processed rubber and by-products	0.0610	0.0420
12	Soap, detergents, perfumes and other toilet preparations	0.0120	0.0210
13	Plastic, plastic products	0.1900	0.3860
14	Other chemical products	0.1090	0.1000
15	Other metallic products	0.2400	0.4920
16	Equipment, machinery	0.4170	0.3490
17	Electrical and electronic products	0.3570	0.4340
18	Ferrous and non- ferrous metal and products	0.9620	0.7030
19	Manufacture of textiles, carpet, rugs, leather, footwear, bleaching, dyeing of fabrics	0.0830	0.1080
20	Petroleum, natural gas, Electricity and gasoline and water	0.2120	0.2790
21	Other industry	0.7880	1.0670
Average		**0.2250**	**0.2410**

Note that in this relation the inter sectors feedback effects of the construction sector to whole manufacturing group is largest with time, if in 1993-1998 a unit added of output of construction will excite 1.02 units of output of whole manufacturing group, but during 1999-2004 this index is 1.23, it is higher than the previous time 21%. Some sectors have a high internal linkage such as other metallic products; electrical and electronic products; ferrous and non-ferrous metal and manufacture of textiles, carpet, rugs, leather, footwear, bleaching, dyeing of fabrics. However, input structure on non-manufacturing sectors is under the influences of non-manufacturing internal propagation, these sectors ranked number 20 among 21 sectors. It means that these sectors play more important roles in manufacturing sectors, but they influence on non-manufacturing sectors less than they do on manufacturing. Food, Processed wood and wood products and Chemical products sectors have a low internal linkage but these sectors show strong external linkages and inter-relationship linkage.

4.4.2 The output and value added change influenced by price

Based on the equation (4.18) can be estimated backward linkages of internal and external for each industrial group by input output tables at two type prices; its difference present the price impact to output requirements and value added, The results presented in table 4.8.

Some sectors have internal and external backward linkages larger than zero, that means, although, internal and external linkages at current price is high but it is due to the impact of price, so, these impacts decrease the value added; whereas if these linkages smaller than zero, that means, the price impacts decrease the output requirement but increase the value added. However, in some cases, although, internal and external backward linkages smaller than zero the value added also decreases due to input structure on other industrial groups increase higher than price impacts in internal linkages.

Table 4.8 shows the average of ratio between value added and gross output decrease 1.3% during 1993-1998 and decrease 2% during 1999-2004 due to the impact of price growth; it is note that during 1999-2004 the price impact decrease ratio between value added and gross output 154% higher than the previous time; especially, other construction materials (9%); other chemical products (8%); Bricks, tile (7%); ceramics, glass, porcelain (6%) and processed wood and wood products (6%). But there are some sectors that the price impact decrease value added tends to be lessening as chemical products decrease from 14% in earlier stage to 4% in 1999-2004, bricks, tile decrease from 9% in earlier stage to 7% in stage 1999-2004. So, these sectors have strong intra - linkages will be influenced by price impacts vis-à-vis stronger than other sectors.

Regarding the non-manufacturing group, table 4.8 show the sectors that used many products of manufacturing industrial group in production as input structure will be leading to value added decreased by price impact; these sectors are agriculture, construction and transportation and communication, whereas, the remaining sectors of non-manufacturing industrial group has ratio between value added at current price higher than these ratios at constant price, it means price of products of manufacturing industrial group grows more than the price of products of non-manufacturing industrial group.

Table 4.8. Internal multipliers in manufacturing sectors at constant price

Code		Manufacturing sectors						Non-Manufacturing sectors					
		1996			2000			1996			2000		
		*Price impact to internal BL**	*Price impact to external BL***	*Price impact to VA*	*Price impact to internal BL**	*Price impact to external BL***	*Price impact to VA*	*Price impact to internal BL**	*Price impact to external BL***	*Price impact to VA*	*Price impact to internal BL**	*Price impact to external BL***	*Price impact to VA*
1	Food	0.0020	-0.0040	-0.0110	-0.0160	-0.0180	0.0140	0.0040	0.0090	-0.0050	0.0090	0.0080	-0.0095
2	Ceramics, glass, porcelain	-0.0190	-0.0010	-0.0310	0.0420	0.0060	-0.0630	0.0000	-0.0010	0.0090	-0.0120	-0.0060	0.0330
3	Bricks, tile (all kinds)	0.0150	0.0100	-0.0890	0.0280	0.0070	-0.0670	0.0050	0.0020	-0.0050	0.0000	-0.0010	0.0289
4	Cement	0.0180	0.0070	-0.0750	-0.0413	-0.0082	-0.0004	-0.0430	-0.0190	0.0910	-0.0130	-0.0010	0.0199
5	Other construction materials	0.0360	0.0040	-0.0480	0.0940	0.0090	-0.0870	0.0200	0.0130	0.0160	0.0380	0.0580	-0.0578
6	Paper pulp and paper products and by-products	-0.0100	-0.0020	-0.0150	0.0140	0.0010	-0.0510	0.0000	-0.0010	0.0100	-0.0140	-0.0080	0.0641
7	Processed wood and wood products	-0.0220	-0.0030	-0.0120	-0.0240	-0.0180	-0.0640	-0.0030	-0.0010	0.0200	-0.0170	-0.0190	0.0564
8	Chemical products	0.1010	0.0390	-0.1450	0.0490	0.0020	-0.0440	-0.0030	-0.0020	0.0200	0.0180	0.0070	-0.0188
9	Fertilizer, pesticides and veterinary medicine	-0.0990	-0.0070	0.0410	0.0000	-0.0050	-0.0140	-0.0030	-0.0010	0.0080	0.0040	0.0010	-0.0029
10	Health medicine	0.0250	0.0030	-0.0160	0.0260	0.0040	-0.0270	0.0000	0.0000	0.0120	-0.0100	-0.0080	0.0424
11	Processed rubber and by-products	-0.0340	-0.0010	0.0160	-0.0440	-0.0090	0.0110						
12	Soap, detergents, perfumes and other toilet preparations	-0.0480	0.0020	0.0480	0.0440	0.0070	-0.0330						
13	Plastic, plastic products	-0.0350	0.0000	0.0030	0.0650	0.0140	-0.0530						
14	Other chemical products	-0.0770	-0.0030	0.0410	0.1250	0.0060	-0.0750						
15	Other metallic products	0.0310	0.0010	-0.0130	0.0800	0.0030	-0.0410						
16	Equipment, machinery	-0.0660	-0.0020	0.0190	-0.0190	-0.0050	-0.0100						
17	Electrical and electronic products	-0.0430	-0.0020	0.0070	-0.0150	-0.0030	-0.0160						
18	Ferrous and non- ferrous metal and products	0.0120	-0.0030	-0.0160	-0.0480	-0.0100	-0.0030						
19	Manufacture of textiles, carpet, rugs, leather, footwear, bleaching, dyeing of fabrics	-0.0360	-0.0010	0.0070	-0.0050	0.0050	-0.0340						
20	Petroleum, natural gas, Electricity and gasoline and water	-0.0300	-0.0010	0.0120	-0.0430	-0.0100	0.0010						
21	Other industry	-0.0280	-0.0030	0.0030	-0.1080	-0.0110	0.0520						
Average(AV)		**-0.0150**	**0.0020**	**-0.0130**	**0.0100**	**-0.0020**	**-0.0290**	**-0.0010**	**0.0000**	**0.0080**	**0.0000**	**0.0010**	**0.0070**

Ratio between the value added and gross input at current price of manufacturing sectors group is 0.260, this ratio at constant price is 0.273 in 1993-1998 but during 1999-2004 the difference of that ratios at current price and constant price is -0.029 instead of -0.013 during 1993-1998; it means in 1999-2004 the ratio between value added and gross input at current price of manufacturing sectors group is 0.209, white this ratio at constant price is 0.238. Note that the ratio of value added and gross input depend the change of price impact (-0.029) and the change of technology coefficients of input structure (-0.035); these impacts can be written: 0.209 = 0.273 + (-0.029) + (-0.035).

Whereas, the ratio of value added per gross input of non-manufacturing between the current price and constant price is +0.010 in 1993-1998 and+0.015 in 1999-2004. This ratio at constant price in 1993-1998 is 0.605, this ratio at current price in 1999-2004 is 0.571; the change on technology coefficients is -0.049, so the impact of value added can be written as: 0.571 = 0.605 + (+0.015) + (-0.049).

4.5 Conclusions

This chapter is an attempt in order to be obviously revealed through the linkages and multipliers analysis of two industry groups, manufacturing and non-manufacturing with time. The intra-effects of each industry group, inter-industrial feedback effects between a industry group and other industry group and price impacts to intra-linkages and value added of each industry group were exposed under the main results as follows:

(a) The technological structure within manufacturing and non-manufacturing are not eminent for each period

(b) This is important for policy makers to focus on the different roles of each sector that can play in economy. Furthermore, it is especially important to make account of their limitation (large internal linkage but small external linkage or whereas) when doing to emphasize the importance of those leading industries in an economy

(c) The role of manufacturing sectors vis-à-vis non-manufacturing sectors smaller than the role of non-manufacturing sectors vis-à-vis manufacturing; that means non-manufacturing sectors, therefore, the relative influences of the manufacturing internal propagation may be expected to diminish by non-manufacturing group increase.

(e) The impacts of price increase gross input but decrease value added vis-à-vis manufacturing sectors, but because inter industrial feedback effects of manufacturing sectors group to services sectors group were small, so ratio of value added and gross input of services sectors group at current price increase; it may be realized that the compensation of employees or operating surplus in manufacturing sectors group to be low at current price comparison with level of price growth, while the compensation of employees or operating surplus in services sectors group to be high comparison with turn-over of services activities.

Chapter 5

Analyzing the Relationship between Income Groups & Final Demand Based on Extended Input-Output Framework

5.1 Introduction

There are different ways to develop input-output framework initiated by W. Leontief. Those may be the Social Accounting Matrix (SAM) extended by Richard Stone, the Inter-regional input output framework developed by Miyazawa, Demographic-economic modeling with income multiplier matrix proposed by Miyazawa, Sonis and Hewing; and the Hybrid Input - Output table linking Environment and Economic activities started by Miller and Blair. Kalecki (1954) divided value added into labor income and capital income as compensation of employees and capitalists. In his demographic-economic modeling, Miyazawa (1976) divided the value added by income groups and classified their consumption accordingly. Further, Miyazawa traces the development of the income multiplier from the relatively simple Keynesian structure to the full interrelational income multiplier for income groups. However, in his study, Miyazawa did not pay much attention to capital income and investment activity as well as their induced effects on the economy.

In this chapter we try to reorganize value added flows, in which it consists of *net income from capital* and *net income from labor*. In addition, the later is further divided into two sub-income groups, i.e. rural and urban. It is assumed that net income from capital is used to reinvest only while net income from each group of labor (including compensation of employees plus redistribution of operating surplus) is used completely for consumption and savings. Under these assumptions, demographic-economic modeling of Miyazawa could be extended for calculating interrelational income multiplier matrix. In addition, investment multiplier as well as income and consumption multipliers for each groups are also computed and analyzed. Based on Miyazawa interrelational income multiplier concept, we try to understand how the income of one group can be generated by another group's income in the context of Vietnam presently.

This chapter is organized as follows: Following this introduction, 5.2 provides an outline of theoretical framework. 5.3 shows the analysis of the empirical results, followed with some remarks in 5.4.

5.2 Theoretical Framework

Formally, the Leontief system regards the household sector as an industry whose output is total labor income and whose inputs are consumption goods. In this paper, it is assumed that the value added of production could be decomposed for workers (w) as below:

$$W = W_1 + W_2 \tag{5.1}$$

where W_1 is income created by production, and W_2 is income created by redistribution of operating surplus. And capital *(P)* includes amount of depreciation and a part of operating surplus (excluding amount redistributed).

Hence, we may decompose value added (V) into:

$$V = W_1 + W_2 + P = W + P \tag{5.2}$$

If W can be decomposed as a matrix of "labor income" for r-fold income groups, then we may define w as ratio matrix of matrix W:

$$w_i = W_i / X_i \tag{5.3}$$

If P is a vector of "capital income", then p, ratio vector of P, could be defined as:

$$p_i = P_i / X_i \tag{5.4}$$

where W_i, P_i are elements of matrices W, P; X_i is gross input of sector *i.*

We use C to denote a matrix of consumption and c a corresponding matrix of consumption coefficients of C; I a vector of investment and q a vector of coefficients of I. We have:

$$c_{ij} = C_{ij} / Y_j^1 \tag{5.5}$$

$$\text{and } q_i = I_i / Y^2 \tag{5.6}$$

where Y_j^1 is total income of income group j, it includes income created by production and exogenous income (G_j^1).

$$Y^2 \text{ is total capital resource, } Y^2 = \Sigma P_i + G^2 = \Sigma I_i \tag{5.7}$$

where G^2 is other capital resources, it can include capital resources received by foreign direct investment and capital transfer or borrowing.

Hence, we may rewrite extension formulation based on Leontief standard system as follows:

$$X = A.X + c.Y^{1} + q.Y^{2} + f \tag{5.8}$$

$$Y^{1} = w.X + G^{1} \tag{5.9}$$

$$Y^{2} = p.X + G^{2} \tag{5.10}$$

where X is a vector of gross output; A is a matrix of direct input coefficients; f is a vector of final demand except consumption and capital formation.

Equations (5.8), (5.9) and (5.10) may be rewritten in matrix form as follows:

$$(I-B)^{-1} = \left\langle \frac{B*}{U.B*} \middle| \frac{B*.H}{K} \right\rangle \tag{5.11}$$

It is noted that $B*H = (I-A)^{-1}.H.K$ (5.12)

and $UB* = K.U.\ (I-A)^{-1}$ (5.13)

where:

$(I-A)^{-1}.H$ is a matrix of the production induced by endogenous consumption and capital investment. $U.\ (I-A)^{-1}$ is a matrix of endogenous income earned from production.

And $K = I + U.B*.H$ is a matrix of the inter-relational income multipliers.

The matrices A, $(I-A)^{-1}$, $B*$, $B*H$, $UB*$ and K are used to derive input – output multipliers. Of course, these matrices can be extended from IO table, competitive type or non-competitive type.

5.3 Empirical Study

5.3.1 Data Sources

The empirical study of decomposition of income multipliers by groups of income is based on Vietnam SAM 2000, published by NIAS/CIEM in 2004. The generic MacroSAM accounts for Vietnam are presented in Table 5.1.

Table 5.1 includes nine rows and nine columns sharing the same labels. Activity and commodity accounts track flows of goods and services; Factor, Enterprise and Household accounts track the flow of factor income through the economy and private expenditures by the households; a State account tracks savings and investment while the Rest of The World (ROW) account tracks the balance of payments. Intermediate goods are included explicitly, and production and final demand is decomposed in the activities and commodity accounts.

Table 5.1 A Macro SAM for Vietnam - Generic Macro Accounts

Receipts	Expenditures								
	1. Activities	2. Commodi-ties	3. Factors	4. Private Households	5.Enterprises	6. Recurrent State	7. Investment/ Saving	8. Rest of the World	9. Total
1. Activities									
2. Commodities									
3. Factors									
4. Private Households									
5. Enterprises									
6. Recurrent State									
7. Investment /Savings									
8. Rest of the World									
9. Total	Total Domestic Payments	Total Commodity Supply	Total Factors Payments	Allocation of Private Household Income	Total Enterprise Payment	Allocation of State Revenue	Total Investment	Total Foreign Exchange	

Source: CIEM/NIAS (2004) a New Vietnam Social Accounting Matrix for the year 2000.

The construction of Vietnam SAM 2000 is based on several sources of data as follows;

- A new and comprehensive input-output table (I-O) for the year 2000, compiled by GSO in 2003, which is based on a 112 sector commodity disaggregation;

- Detailed and up-to-date data on marketing margins by commodity;

- 2001 enterprise census (GSO, 2002);

- Updated and revised National Income and Product data; and

- Detailed trade statistics reconciled with official domestic sources.

Based on the above-mentioned sources of data, we rearranged Vietnam SAM 2000 into the framework of equation (5.10) and explored the equation (5.11) for analysis.

5.3.2 Empirical results

Multipliers was calculated based on both competitive type and non-competitive I-O tables so that they could provide a better understanding of the operating mechanism underlying the Vietnam's economy before and after taking account of imports. To that end, we now examine each of the four parts as represented in equation (5.11*). The first part, enlarged Leontief inverse B*, produces output and input multipliers which are accompanied by backward and forward linkages for easier consideration. Table 5.2 indicates remarkable differences in backward and forward linkages of several sectors between the competitive type and the non-competitive type. In terms of backward linkages, Fertilizer and pesticides, Automobile and other transport vehicles, Ferrous metals, Garments and leather products, Chemicals, Other manufacturing, and Construction appear to have above-average powers for dispersion which turn out to be less than 1 after imports are taken into account. The reverse holds true for Food Processing and for Sugar with the highest backward linkages, 1.22 and 1.16 respectively, in the non-competitive type. This is because a larger part of these six sectors' requirements for inputs are satisfied by imports, hence making their "pull" effect more likely to come to an earlier end and to be weaker. For example, in Garments and leather products, most Vietnam's enterprises operates under CMT (cutting, making, and trimming) subcontracting with inputs provided by foreign partners who buy back all their finished products. Hence, according to Kenta's investigation (2003), the added value attributed to domestic textile and garment enterprises accounts for only 15.3% of the final product's unit price.

In contrast, with comparative advantage in farming, the total value of production in the whole economy would exhibit the greatest increase if final demand for Food processing's and Sugar's outputs rises. The important role of Food processing sector is further confirmed as it has the most significant forward linkages in both competitive and non-competitive types. Meanwhile, the sensitivity of dispersion for Other manufacturing, Chemicals, and Garments and leather products decreases rapidly after allowing for imports.

In this modeling, we broke down value added into a capital group and two labor groups, namely, rural households (HH-RUR) and urban households (HH-URB). The matrix B*.H introduced in equation (5.11*) or the three last columns of the "closed matrix inverse" which are the consumption multipliers by household groups and the investment multipliers is shown in Table 5.3.

Table 5.2 Output, Input Multipliers and Backward, Forward Linkages by Types of Enlarged Leontief Inverse Matrix

(Calculation was based on B from equation (11))*

Sectors		Competitive Type		Non-competitive Type		Competitive Type		Non-competitive Type	
		Output Multiplier	**Backward Linkage**	**Output Multiplier**	**Backward Linkage**	**Input Multiplier**	**ForwardLinkage**	**Input Multiplier**	**Forward Linkage**
1	Rice	7.95	0.74	2.31	0.86	14.45	1.35	4.98	1.34
2	Coffee bean	8.90	0.83	2.22	0.82	1.05	0.10	1.01	0.27
3	Sugar cans	7.94	0.74	2.34	0.87	2.57	0.24	1.82	0.49
4	Other crops	7.54	0.70	2.25	0.83	10.46	0.98	3.48	0.94
5	Livestock	8.71	0.81	2.90	1.07	9.08	0.85	3.34	0.90
6	Forestry	8.96	0.84	2.57	0.95	6.88	0.64	1.87	0.50
7	Fisheries	10.98	1.03	2.78	1.03	7.87	0.74	3.01	0.81
8	Irrigation	10.85	1.01	2.88	1.07	1.50	0.14	1.25	0.34
9	Other agricultural service	11.01	1.03	2.88	1.07	2.55	0.24	1.62	0.44
10	Crude oil	10.85	1.01	3.00	1.11	1.90	0.18	1.20	0.32
11	Other mining	11.21	1.05	2.80	1.04	5.58	0.52	1.79	0.48
12	Food processing	9.88	**0.92**	3.29	**1.22**	27.06	**2.53**	7.96	**2.14**
13	Tobacco, beers and alcohol	9.11	0.85	2.62	0.97	7.05	0.66	2.64	0.71
14	Sugar	10.16	**0.95**	3.14	**1.16**	3.36	0.31	1.71	0.46
15	Cement	11.88	1.11	2.98	1.10	5.92	0.55	2.53	0.68
16	Paper	11.74	1.10	2.70	1.00	8.45	0.79	2.27	0.61
17	Fertilizer and pesticides	11.80	***1.10***	2.54	***0.94***	6.89	0.64	1.85	0.50
18	Automobile and other transport vehicles	12.20	***1.14***	2.53	***0.93***	15.74	1.47	3.07	0.83
19	Ferrous metals	12.21	***1.14***	2.42	***0.90***	5.29	0.49	1.37	0.37
20	Garments and leather products	12.60	***1.18***	2.47	***0.91***	23.76	***2.22***	3.42	***0.92***
21	Chemicals	11.91	***1.11***	2.52	***0.93***	36.27	***3.39***	4.10	***1.10***
22	Other manufacturing	11.84	***1.11***	2.50	***0.92***	57.13	***5.34***	6.03	***1.62***
23	Electricity, gas, petroleum and water	11.05	1.03	2.77	1.02	21.53	2.01	3.34	0.90
24	Construction	12.01	***1.12***	2.59	***0.96***	16.70	1.56	5.00	1.35
25	Retail and wholesale trade	11.12	1.04	2.83	1.05	1.00	0.09	1.00	0.27
26	Transportation	11.25	1.05	2.77	1.02	2.77	0.26	1.18	0.32
27	Education and training	11.37	1.06	2.86	1.06	4.42	0.41	1.63	0.44
28	Health and social protection	11.45	1.07	2.74	1.01	2.31	0.22	1.35	0.36
29	Administration	11.58	1.08	2.85	1.05	1.00	0.09	1.00	0.27
30	Finance, banking, sciences and telecommunication	10.85	1.01	2.84	1.05	8.81	0.82	3.17	0.85
31	Other services	11.00	1.03	2.90	1.07	12.56	1.17	3.78	1.02

We can see that while investment has the highest total effect (10.73) on output in competitive type modeling, consumption by rural households does (2.19) in non-competitive type modeling. At first sight, it is tempting to conclude that capital formation exerts the biggest "pull" on the economy as a whole (and Vietnam is currently pursuing this policy), but after imports set in, the picture has changed dramatically. It is because of differences between the composition of commodities and services consumed by urban households and in capital formation on one side and the composition of commodities and services consumed by rural households on the other. These differences can be understood in two ways. First and quite obviously, imports are likely to form a smaller part in the consumption basket by rural households due to their lower income than in that by urban households and investment which lays too much emphasis on building capital-intensive industries. Second and a little more indirectly, rural households are more likely to spend their income on those sectors that in their turn are more likely to consume other domestic commodities and services. Hence, the spillover effect resulting from rural households' consumption is felt much longer and larger throughout the economy.

As a result, when imports are excluded, the investment multipliers and the consumption multipliers of urban households have declined much more than those of rural households. This tendency holds for almost all of the thirty one sectors in the economy, except for those sectors technically relevant to capital formation such as Construction, Cement and Ferrous metals. Table 5.3 implies that in Food processing, the biggest sector in terms of gross output, as well as in Rice and Other crops, the sectors producing the highest values added, the relatively large effects of consumption by rural households are strengthened as we move from the competitive type to the non-competitive type.

Having examined the impacts of capital formation and consumption by rural and urban households on production of 31 sectors in the economy, we now switch to the reverse impacts, i.e. impacts of production of 31 sectors on income earned by capital, rural and urban households. Fortunately, the third part in equation (5.11*), U.B* matrix, gives a clear answer in Table 5.3.

Since Vietnam's garment enterprises contribute just about 15% to the finished product's value as above mentioned, it is not surprising that the total income multiplier of Garments and leather products plummets fastest, from 3.71 in the competitive type to 0.56 in the non-competitive type. Those sectors with slightly less drastic decrease in their total income

Table 5.3 Consumption and investment multipliers

(Calculation was based on equation (5.11), B*.H matrix)*

Sector		Competitive Type			Non-competitive Type		
		Rural	**Urban**	**Inv.**	**Rural**	**Urban**	**Inv.**
1	Rice	0.52	0.44	0.42	0.22	0.15	0.09
2	Coffee bean	0.00	0.00	0.00	0.00	0.00	0.00
3	Sugar cans	0.04	0.03	0.03	0.01	0.01	0.01
4	Other crops	0.37	0.33	0.28	0.14	0.11	0.03
5	Livestock	0.32	0.30	0.25	0.14	0.12	0.04
6	Forestry	0.17	0.16	0.21	0.02	0.02	0.03
7	Fisheries	0.27	0.24	0.21	0.12	0.09	0.03
8	Irrigation	0.01	0.01	0.01	0.01	0.00	0.00
9	Other agricultural service	0.05	0.04	0.04	0.02	0.01	0.01
10	Crude oil	0.03	0.03	0.03	0.01	0.01	0.01
11	Other mining	0.12	0.11	0.17	0.01	0.01	0.04
12	Food processing	1.06	0.90	0.81	0.45	0.31	0.13
13	Tobacco, beers and alcohol	0.23	0.22	0.19	0.09	0.08	0.03
14	Sugar	0.08	0.07	0.08	0.03	0.02	0.02
15	Cement	0.12	0.12	0.23	0.03	0.03	0.12
16	Paper	0.20	0.21	0.23	0.02	0.03	0.02
17	Fertilizer and pesticides	0.17	0.15	0.14	0.02	0.02	0.01
18	Automobile and other transport vehicles	0.42	0.45	0.55	0.06	0.07	0.09
19	Ferrous metals	0.12	0.12	0.16	0.01	0.01	0.01
20	Garments and leather products	0.84	0.74	0.69	0.12	0.09	0.04
21	Chemicals	1.06	1.02	1.22	0.09	0.09	0.11
22	Other manufacturing	1.58	1.60	2.29	0.13	0.14	0.30
23	Electricity, gas, petroleum and water	0.58	0.59	0.64	0.06	0.06	0.05
24	Construction	0.44	0.44	1.08	0.16	0.15	0.76
25	Retail and wholesale trade	0.00	0.00	0.00	0.00	0.00	0.00
26	Transportation	0.06	0.06	0.05	0.01	0.01	0.00
27	Education and training	0.13	0.13	0.10	0.03	0.03	0.01
28	Health and social protection	0.05	0.05	0.04	0.02	0.02	0.00
29	Administration	0.00	0.00	0.00	0.00	0.00	0.00
30	Finance, banking, sciences and telecommunication	0.23	0.25	0.22	0.05	0.07	0.03
31	Other services	0.42	0.46	0.35	0.13	0.16	0.04
Total		**9.70**	**9.26**	**10.73**	**2.23**	**1.92**	**2.05**

multipliers are Ferrous metals, Automobile and other transport vehicles, Other manufacturing, Construction, Paper, Chemicals, Cement, and Fertilizer and pesticides. This is because these sectors tend to use less intensively labor, the abundant factor in Vietnam, and output of sectors that are more likely to consume domestic inputs.

However, the sector that exhibits the second highest total income multiplier in the non-competitive type is Education and training in Table 5.4. This fact is very remarkable if other immeasurable virtuous effects of education are brought into play. Of other sectors with quite high non-competitive income multipliers emerge Crude oil, Electricity, gas, petroleum and water, and Finance, banking, sciences and telecommunications as creating more income for rural labor than for urban labor. Hence the more available and better their supply, the faster Vietnam does in poverty reduction and narrowing the rural-urban inequality.

So far we have gone a complete circular flow which demonstrates the effects of a dollar's worth of income being spent by rural, urban households and capital formation on the total value of production in all sectors of the economy which in their turn influences the income earned by these three groups.

And those influences on income will be translated into the production of 31 sectors. This process goes on and on with its aggregate effects being shown by matrix K (Tab.5.5), the fourth part. After imports are taken into consideration, Table 5.5 shows that consumption by rural households has the largest total income multiplier (1.74) compared to urban households (1.67) and investment (1.61). Specifically, a dollar of income being spent by rural households generates 1.26 dollars for themselves, 0.34 and 0.14 dollar for urban labor and capital respectively.

As a result, if more income goes to rural households in some way, the total output of the economy will increase faster and a larger part (72%) of this output growth will be allocated to rural labor, hence bridging the income gap between urban and rural areas which is apparently widening.

Table 5.4 Income multipliers by groups

(*Calculation was based on equation (5.11*),U.B* matrix*)

Sector		Competitive Type				Non-competitive Type			
		Rural	Urban	Capital	Total	Rural	Urban	Capital	Total
1	Rice	0.97	1.22	0.54	**2.73**	0.19	0.58	0.10	**0.87**
2	Coffee bean	1.23	1.22	0.62	**3.07**	0.29	0.47	0.10	**0.86**
3	Sugar cans	0.99	1.27	0.55	**2.81**	0.22	0.64	0.11	**0.97**
4	Other crops	1.08	1.07	0.51	**2.66**	0.35	0.47	0.10	**0.92**
5	Livestock	1.10	1.24	0.57	**2.90**	0.30	0.57	0.12	**0.99**
6	Forestry	1.30	1.34	0.63	**3.27**	0.42	0.62	0.13	**1.16**
7	Fisheries	1.56	1.56	0.80	**3.93**	0.42	0.63	0.15	**1.21**
8	Irrigation	1.49	1.64	0.79	**3.91**	0.39	0.74	0.16	**1.29**
9	Other agricultural service	1.48	1.61	0.79	**3.88**	0.35	0.68	0.15	**1.18**
10	Crude oil	1.79	1.31	0.91	**4.01**	0.71	0.43	0.30	**1.43**
11	Other mining	1.62	1.35	0.93	**3.90**	0.46	0.40	0.28	**1.13**
12	Food processing	1.22	1.26	0.66	**3.14**	0.31	0.51	0.15	**0.97**
13	Tobacco, beers and alcohol	1.19	1.05	0.69	**2.92**	0.29	0.32	0.19	**0.80**
14	Sugar	1.39	1.25	0.70	**3.34**	0.42	0.46	0.15	**1.04**
15	Cement	1.66	1.27	0.88	**3.80**	0.42	0.26	0.18	**0.85**
16	Paper	1.62	1.28	0.85	**3.75**	0.37	0.26	0.15	**0.78**
17	Fertilizer and pesticides	1.70	1.35	0.91	**3.95**	0.41	0.30	0.18	**0.89**
18	Automobile and other transport vehicles	1.60	1.35	0.91	**3.86**	0.30	0.27	0.17	**0.74**
19	Ferrous metals	1.60	1.34	0.90	**3.85**	0.28	0.25	0.16	**0.69**
20	Garments and leather products	1.57	1.25	0.89	**3.71**	0.24	0.17	0.14	**0.56**
21	Chemicals	1.61	1.37	0.91	**3.89**	0.33	0.30	0.19	**0.82**
22	Other manufacturing	1.59	1.30	0.87	**3.77**	0.31	0.26	0.16	**0.73**
23	Electricity, gas, petroleum and water	1.72	1.29	1.00	**4.00**	0.57	0.35	0.34	**1.26**
24	Construction	1.62	1.33	0.88	**3.83**	0.33	0.27	0.16	**0.76**
25	Retail and wholesale trade	1.60	1.28	0.96	**3.84**	0.47	0.35	0.31	**1.13**
26	Transportation	1.67	1.27	1.00	**3.94**	0.48	0.31	0.33	**1.12**
27	Education and training	1.55	1.50	1.08	**4.12**	0.38	0.54	0.42	**1.33**
28	Health and social protection	1.55	1.46	1.03	**4.05**	0.36	0.48	0.36	**1.20**
29	Administration	1.52	1.47	1.07	**4.07**	0.32	0.48	0.39	**1.19**
30	Finance, banking, sciences and telecommunication	1.63	1.23	1.00	**3.86**	0.53	0.33	0.38	**1.24**
31	Other services	1.56	1.28	1.02	**3.86**	0.45	0.37	0.39	**1.20**

Table 5.5 Interrelational income multipliers (K matrix)

Source of Source of income origin income receipt	Rural	Urban	Capital
Rural	1.26	0.24	0.25
Urban	0.34	1.28	0.23
Capital	0.14	0.15	1.12
Total	**1.74**	**1.67**	**1.61**

** Calculation was based on non-competitive IO Table.*

In addition, the second row shows that urban labor would earn more from rural households' consumption (0.34) than from capital formation (0.23). However, if urban households themselves have one more dollar of income to spend, rural labor's income would then rise by only 0.24 dollar (in the first row). It implies that urban households benefit more from rural households' consumption than the other way round.

5.4 Conclusions

The demographic-economic modeling proposes that the more income is diverted to rural households in Vietnam, the more output this economy would produce and the faster Vietnam does in poverty reduction and narrowing the rural-urban inequality [30]. It is because rural households tend to consume less imports and to spend more of their income on those sectors that in their turn are more likely to use other domestic commodities and services as their intermediate inputs. Moreover, the results indicate that special attention should be paid to Food processing and Sugar sectors so that Vietnam's comparative advantages would be more exploited. And the more widespread and better supply of Electricity, gas, petroleum and water, and Finance, banking, sciences and telecommunications could give rural households a new lease on life.

Chapter 6

Economic-Environmental Impact Analysis Based on a Bi-regional Interregional I-O Model for Vietnam, between Ho ChI Minh City and the Rest of Vietnam, 2000

6.1 Introduction

The structure of interregional linkages have been common topics of discussion in regional analysis; attention has been directed to problems of interregional feedback effects and the degree to which change originating in one region has capacity to influence activity levels in another region, in turn, will effect activity back in the region of origin.

While Miller (1966, 1969) proposed a formulation of the feedback process to handle this problem, Miyazawa suggested an innovative way of partitioning the system of regions that resulted in the identification of what are now referred to as ***internal, external*** multipliers ***interregional feedback effects***. From time to time, Input – Output model systems have been applied in estimating economic – environment linkages. Further, the economic interregional input output model system can be applied in analysis impacts on residuals generated by interregional economic activities.

This chapter will focuce on stracture of inter-regional llinkage, which will processed with case study of HoChiMinh City (HCMC) and the Rest of Vietnam (ROV) based on interregional input output approach. The Vietnam interregional input output table constructed by the hybrid approach from National competitive input output table and HoChiMinh competitive input output table in 2000. The national IO tables was compiled by Vietnam General Statistical Office (GSO) and published in 2003, The HoChiMinh input output table was compiled as a joint undertaking between HCMC Province statistical Office GSO with financial assistance provided by the HCMC's people and Provincial committees. This particular study was made possible with the availability of the just-completed research project on the compilation of the 2000 Bi-region Inter-Regional IO (IRIO) Table for the Vietnamese economy, with HoChiMinh City as the area of interest. As such, this two-region table specifically divided the country into: Region 1 - HoChiMinh City, and Region 2 – the Rest of Viet Nam. The resulting IRIO table shows, in its compact form, the intra- as well as the inter-regional economic transactions at the two-region level of spatial delineation.

The first part of this chapter presents the conceptual and accounting framework of the IRIO model in inter-regional economic impact analysis. In this paper, special attention is paid of the Miyazawa system in the decomposition of the economic multiplier effects [22]. For the purpose of this study, the IO model is being extended to be able to measure economic-environmental linkages.

The second part is a case study for HoChiMinh City based on the 2000 IRIO table. The objective of this study is to measure the inter-regional, inter-industrial interdependencies as well as the consequent environmental effects of pollution emissions due to economic activities. An analysis of the empirical results on the economic-environmental multipliers is shown in the last part of this case study.

6.2 Configuration of Ho Chi Minh City

The following are some of the major socio-economic indicators at the national and sub-national level of geographic classification, see Tab.6.1 below.

HoChiMinh city is one of the biggest cities in Viet Nam with a large area and crowded population, lies between the Mekong River Delta and Eastern Nam Bo. HoChiMinh city is the most important commercial center and the second most important political center of the country next to the capital of Hanoi. This city has good conditions on transportation, especially for airway and seaway, for example, Tan Son Nhat airport. So it is very convenient to undertake trading or exchange relations with the rest of Viet Nam (ROV) and the rest of the World (ROW) too. There are a lot of economic activities taking place here every day.

Like other places, HoChiMinh city not only use its own products but also products from other provinces and from the rest of the World for its intermediate and final consumption demands. It means that this city import products from other places and export products to the rest of the economy as well as to the rest of the World.

It imports products not only for its own use but also for other provinces. In short, HoChiMinh City is the main transit point for imports required by other provinces. Similarly, HoChiMinh city is the principal transit point for exports coming from other provinces to foreign countries and to other provinces as well. The reason for choosing HoChiMinh city as the principal intermediate transit point in Viet Nam is because HoChiMinh City has the best transportation facilities, whether by sea or air, to carry out export-import economic activities.

Table 6.1 Major Socio-Economic Indicators: Viet Nam

	YEAR			
Major Indicators	**1990**	**1995**	**1996**	**2000**
1) AREA (Sq. Km.)				
VIET NAM				330,991
HO CHI MINH				2,095
REST OF VIET NAM				328,896
2) POPULATION (000 Persons)				
VIET NAM	66,016	71,995	**73,157**	77,635
HO CHI MINH	4,118	4,640	**4,749**	5,175
REST OF VIET NAM	61,898	67,355	**68,408**	72,460
3) POPULATION DENSITY (Persons/Sq Km)				
VIET NAM	199.4	217.5	**221.0**	234.6
HO CHI MINH	1,965.6	2,214.8	**2,266.8**	2,470.2
REST OF VIET NAM	188.2	204.8	**208.0**	220.3
4) EMPLOYMENT (000 Persons)				
VIET NAM	29,412	33,030	**33,761**	36,702
HO CHI MINH	1,529	1,821	**1,895**	2,237
REST OF VIET NAM	27,883	31,209	**31,866**	34,465
5) GDP (Billion Dong at Current Prices)				
VIET NAM	41,955	228,892	**272,036**	441,646
HO CHI MINH	6,770	36,975	**45,545**	75,444
REST OF VIET NAM	35,185	191,917	**226,491**	366,202
6) GDP (Bill. Dong At Constant 1994 Prices)				
VIET NAM	131,968	195,567	**213,833**	273,666
HO CHI MINH	17,993	32,596	**37,380**	52,228
REST OF VIET NAM	113,975	162,971	**176,453**	221,438
7) PER CAPITA GDP (000 Dong, current prices)				
VIET NAM	635.5	3,179.3	**3,718.5**	5,688.7
HO CHI MINH	1,644.0	7,968.8	**9,590.4**	14,578.6
REST OF VIET NAM	568.4	2,849.3	**3,310.9**	5,053.9

Source of Basic Data: GENERAL STATISTICS OFFICE

HoChiMinh city is an important center for culture, economy and trade and international exchange. It also faces a big water pollution problem due to domestic and industrial wastewater. HoChiMinh city is located in the transitional zone of the east southern region and the Cuu Long River Delta. The river and canal system in HoChiMinh city is influenced by the semidiurnal solar tide. The level of tides is highest in October-November and lowest in June-July. Intrusion of saline water by tide influences the whole river and canal system.

The population of HoChiMinh City is more than 5.1 million inhabitants, accounting for about 6% of the country's total population. On the other hand, the industrial production of the city accounts for third of the whole country's industrial production.

HoChiMinh city has more than 680 factories/plants of which 500 are in the inner city. It has approximately 22 industrial zones: the main industries include textile, paper, food, chemical, sugar, soap, detergent, beverages, plastic, rubber, machines. In addition

HoChiMinh city has almost 24.000 small-scale industrial companies, of which 89% are located in the residential areas of the inner city.

There is no wastewater treatment plant in almost all existing factories. All the wastewater is discharged directly into the sewerage system of the city or into the receiving bodies. The flow rate of industrial wastewater is smaller than that of domestic wastewater but the pollutant concentration of the former is much higher and more dangerous. The factories and small scale industries in the city contribute significantly to the economy, but they also significantly pollute the environment. The water pollution can be classified into seven types: (1) Organic pollution, (2) Bacterial pollution, (3) Suspended solid pollution, (4) Nutrient pollution, (5) Pesticide pollution, (6) Heavy pollution, and (7) Oil pollution.

6.3 Methodology

6.3.1 Enlarged Leontief Inverse and Internal and External Multipliers

As in national IO models, the basic relationship in intra-regional IO models is:

$$AX + Y = X \quad \text{or} \quad (I - A).X = Y \tag{6.1}$$

Assume a two – fold division of a national economy into a region, 1 and Rest of national economy, 2. Miyazawa's internal and external multipliers were directed to partition the standard Leontief inverse into the internal propagation and external propagation activities. In the case of a two region input output system, the direct coefficients can be represented by the following block sub-matrix:

$$A = \begin{pmatrix} A_{11} & A_{12} \\ A_{21} & A_{22} \end{pmatrix} \tag{6.2}$$

where: A11 and A22 are the quadrate matrices of direct inputs within region 1 and region 2 (i.e. intra-regional), respectively A12 and A21 are the interregional matrices representing direct inputs connections from region 1 to region 2 and from region 2 to region 1 (i.e. inter-regional), respectively. Final demand (Y) and gross output (X) vectors are partitioned in a similar fashion:

$$X = \begin{pmatrix} X_1 \\ X_2 \end{pmatrix} \quad \text{and} \quad Y = \begin{pmatrix} Y_1 \\ Y_2 \end{pmatrix} \tag{6.3}$$

The Standard Leontief inverse matrix will have following form:

$$B = (I - A)^{-1} = \left\langle \frac{B_{11}}{B_{21}} \middle| \frac{B_{12}}{B_{22}} \right\rangle \tag{6.4}$$

This can be further elaborated with the help of the Schur formula (Schur, 1917; Sonis and Hewings, 1993 [25]):

$$B = (I - A)^{-1} = \left\langle \frac{B_{11}}{B_{22}A_{21}B_1} \middle| \frac{B_{11}A_{12}B_2}{B_{22}} \right\rangle \tag{6.5}$$

where: $B_1 = (I\text{-}A_{11})^{-1}$ and $B_2 = (I\text{-}A_{22})^{-1}$ represent internal multipliers matrices of region 1 and region 2.

The following Sonis and Hewings "Miyazawa's contributions to understanding economic structure, 1999":

$$B_{11} = (I\text{-}A_{11}\text{-}A_{12}.B_2.A_{21})^{-1} \tag{6.6}$$

And: $B_{22} = (I\text{-}A_{22}\text{-}A_{21}.B_1.A_{12})^{-1}$ (6.7)

B_{11} and B_{22} defined as Enlarged Leontief Inverse matrices. From (6.3) and (6.5) yields:

$$X_1 = B_{11}.(Y_1 + A_{12}.B_2.Y_2) \tag{6.8}$$

$$X_2 = B_{22}.(Y_2 + A_{21}.B_1.Y_1) \tag{6.9}$$

From (6.8) and (6.9) showed that The Enlarged Leontief Inverse matrix contain elements which are larger than elements of internal matrix multiplier, because they include extra output required to meet intermediate inputs of another region induced output effects; These extra output requirements as external matrix multipliers, So, the enlarged Leontief inverse of region 1 and 2 can be obtained:

$$B_{11} = \Delta_{11}.B_1 \tag{6.10}$$

$$B_{22} = \Delta_{22}.B_2 \tag{6.11}$$

where: Δ_{11} and Δ_{22} are external multipliers of region 1 and 2; B_1 and B_2 are internal multipliers of region 1 and 2.

6.3.2 Interregional feedback effects in two-region model

Subsequently, we shall explain how to define and measure interregional feedback effects in multiregional setting. For simplicity, consider a two-region economy.

Therefore, (6.1), (6.2), (6.3) may be exhibited as:

$$.\begin{pmatrix} X_1 \\ X_2 \end{pmatrix} = \begin{pmatrix} Y_1 \\ Y_2 \end{pmatrix} \quad \begin{pmatrix} I - A_{11} & -A_{12} \\ -A_{21} & I - A_{22} \end{pmatrix} \tag{6.12}$$

Now, we can rewrite (6.2) in the form of an equation system as follows:

$$(I - A_{11})X_1 - A_{12}X_2 = Y_1 \tag{6.12a}$$

$$(I - A_{22})X_2 - A_{21}X_1 = Y_2 \tag{6.12b}$$

Given a vector of changes in final demands in two regions, we can find the consequent changes in gross outputs in both regions. Assume, for simplicity, that $Y_2 = 0$ (i.e. we are to assess the impacts on both regions of a change in final demand in region 1 only). Under these conditions, solving equations (6.12a) and (6.12b) for X_1 and X_2 may yield:

$$X_2 = (I - A_{22})^{-1}.A_{21}.X_1 \tag{6.13}$$

$$X_1 = (I - A_{11})^{-1}.A_{12}.X_2 \tag{6.14}$$

It can be observed that $(I - A_{11})^{-1} A_{12}$ in eq. (6.4) is a measure of the total output multiplier or propagation effect of X_2 on X_1, implying that in case of no change in region 1's final demand, one unit increase in total output of region 2 may cause an increase in total output of region 1 by the amount of amount of $(I - A_{11})^{-1} A_{12}$.

Similarly, is $(I - A_{22})^{-1} A_{21}$ considered as the propagation effect of X_1 on X_2, and has the analogous interpretation.

6.3.3 The Calculating Emission impacts based on interregional input output model

The general economic input-output model system can be extended to encompass emissions from each sector. These consequences can only be estimated if the framework includes information on the environmental consequences of production within the various economic sectors, this is done by estimating a number of emission coefficients for each sectors indicating the amount of various substances emitting per output value.

The sectoral emission coefficients only relate to emission resulting directly from the production process. However, the production process also places an input demand on other sectors, thereby raising their production and emissions. The sum of these direct and indirect emissions can be calculated by Leontief – inverse matrix indicating for each sector the emission coefficients for the total direct and indirect environmental consequences.

Direct emission coefficients matrix (V*) can be represented by the following block matrix:

$$B = \left\langle \frac{V_1^*}{0} \middle| \frac{0}{B_2^*} \right\rangle \tag{6.15}$$

Where: V^*_1 and V^*_2 are direct emissions coefficients matrix of first region and second region and total emissions impact (V) generated by production will be divided as following:

$$V = \begin{pmatrix} V_1 \\ Y_2 \end{pmatrix} \tag{6.16}$$

From equation (8) and (9) yields:

$$V1 = V^*_1.X_1 = V^*_1.B_{11}.Y_1 + V^*_1.B_{11}.A_{12}.B_2.Y_2 \tag{6.17}$$

$$V_2 = V^*2.X_2 = V^*_2.B_{22}.Y_2 + V^*_2.B_{22}.A_{21}.B_1.Y_1 \tag{6.18}$$

Using an explicit hierarchical order among the regions with this matrix decomposition technique, Sonis and Hewings (1993) identified the following multiplicative structure of Leontief inverse and Miyazawa partitioned multipliers:

$$B = (I-A)^{-1} = \begin{pmatrix} \Delta_{11}B_1 & \Delta_{11}P_1B_2 \\ \Delta_{22}P_2B_1 & \Delta_{22}B_2 \end{pmatrix} = \begin{pmatrix} \Delta_{11} & 0 \\ 0 & \Delta_{22} \end{pmatrix} \cdot \begin{pmatrix} I & P_1 \\ P_2 & I \end{pmatrix} \cdot \begin{pmatrix} B_1 & 0 \\ 0 & B_2 \end{pmatrix} \tag{6.19}$$

Where: $P_1 = B_1.A_{12}$ and $P2 = B_2.A_{21}$

From (6.16), (6.17), (6.18), and (6.19) yield:

$$V = V^*.B.Y \tag{6.20}$$

Further, the matrix A is known as the direct requirements coefficients matrix and B is the open Leontief inverse which frequently referred to as the total; requirement coefficients matrix. In an “open” input – output model where only the productive sectors of the economy are assumed to be endogenous (determined by factors inside the productive system), all final demand are assumed to be determined by factors outside the productive system. The model, however, can be closed with respect to households by including in the matrix 'A' one more column and row, for household consumption and value added, respectively. This will form a new matrix denoted by C and $(I\text{-}C)^{-1}$ is termed the closed inverse matrix. This inverse matrix has one more column and row than the open matrix B, the last column of the closed inverse matrix is interpreted as the consumption multiplier (the effect on the output of each sector of an additional unit of consumption) and last row as the income multiplier (income created by each unit of sales of each sector).

The remaining rows and columns of the closed inverse (denoted by C*), the C8 contain elements which are larger than those of the open inverse, because they include extra output required to meet consumption induced output effects, as a result of closed the model with respect to household. The matrix C* is also enlarged Leontief inverse type. Hence, the residual impacts generated by production and consumption can be estimated yield:

$$U = V^{*}.C^{*}.Y \tag{6.21}$$

Where: U is total residual impact generated by production and consumption.

6.4 Empirical Study

6.4.1 On the Economy

6.4.1.1 Overview of two - region system

Prior to an analysis of unscheduled event, a brief digression will be made to explore the general structure of the interregional system of Vietnam. In the empirical analysis using the equations (6.10),(6.11) for calculating internal and external multipliers of HoChiMinh City (HCMC) and Rest of Vietnam (ROV) and equation (6.13), (6.14) for calculating interregional feedback effects of HCMC and ROV and a applied to a two – region between HCMC and rest of Vietnam (ROV) with 2000 interregional input output table of Vietnam aggregated 12 sectors and some comparisons with result of 1996 interregional input output table (this table compiled by private researcher group with financial assistance provided by NISSAN Study Foundation).

Table 6.3 shows the column sum and row sum of elements of the internal and external matrix multipliers for HoChiMinh city and rest of Vietnam. The column sum of multipliers indicates the pattern of power of dispersion of industries in each region, while the row sum shows the sensitivity of dispersion for industries in each region. The result in table 6.3 shows about the relationship between HCMC and the ROV. On average, the internal multiplier effect of HCMC (1.421) is significantly higher than that for the ROV (1.38), while the round – about external multiplier of HCMC is relatively little lower than the ROV. In each sector, however, these figures are different, reflecting the characteristics of each region's industrial structure.

Table 6.2 Internal and External Multipliers of Two-Model of the Vietnam Economy (2000)

		HCMC				ROV			
		Internal		**External**		**Internal**		**External**	
Column		Column	Row	Column	Row	Column	Row	Column	Row
1	Agriculture, fishery & forestry	1,336	1,132	1,003	1,000	1,261	1,998	1,004	1,006
2	Mining and quarrying	1,296	1,016	1,004	1,000	1,250	1,123	1,001	1,003
3	Food, beverage & tobacco manufactures	1,512	1,339	1,009	1,000	1,960	1,191	1,002	1,001
4	Other consumer & industrial goods	1,626	3,030	1,006	1,025	1,580	2,154	1,006	1,023
5	Capital goods	1,617	1,494	1,005	1,001	1,395	1,409	1,005	1,003
6	Electricity, gas & water	1,310	1,207	1,002	1,001	1,125	1,233	1,001	1,006
7	Construction	1,670	1,000	1,004	1,000	1,542	1,000	1,010	1,000
8	Trade	1,373	1,795	1,002	1,007	1,381	1,551	1,002	1,002
9	Transportation & communication	1,414	1,299	1,002	1,001	1,196	1,182	1,002	1,000
10	Finance, real estate & business services	1,256	1,552	1,001	1,004	1,274	1,573	1,004	1,001
11	Government services	1,324	1,065	1,002	1,000	1,248	1,056	1,006	1,000
12	Personal, community & household services	1,315	1,121	1,003	1,001	1,337	1,078	1,002	1,000
Average		1,4207	1,4207	1,0035	1,0035	1,3790	1,3790	1,0037	1,0037

Especially internal multiplier of HCMC of some sectors as other consumer & industrial goods (1.63-sector number 4); capital goods (1.62-sector number5) and construction (1.67-sector number 7) are very high, while external multiplier effect of HCMC of sector food, beverage & tobacco manufactures (9%-sector number 3). The internal multiplier of the ROV of sector number 3 is highest (1.96), while external multiplier effect of the ROV of some sectors as Agriculture, fishery & forestry (0.4%); Other consumer & industrial goods (0.6%); capital goods (0.5%); construction (1%); government services (0.6%) are high. Anyway, the internal propagation in HoChiMinh City has a multiplier effect of 1.42 and the round – about external repercussion through the rest of Vietnam creates a 3.5% increase; therefore, the total effect is about 1.47. On the other hand, the rest of Vietnam has a value of 1.38 and a 3.7% increase for the internal propagation multiplier and for external repercussion, respectively; thus, the total effect of rest of Vietnam is about 1.43. This result shows that the total multiplier effect of HoChiMinh City is relatively larger than that for the rest of Vietnam.

This due to internal propagation of HoChiMinh City is relatively larger than that for the rest of Vietnam, while external repercussion of HCMC is relatively smaller than that for the rest of Vietnam. In terms of external multipliers for HCMC, Food, beverage & tobacco manufactures, Personal, Food, beverage & tobacco manufactures Capital goods, Construction, community & household services sectors have relatively large "power of dispersion" (column sum),while Other consumer & industrial goods; Trade; Finance, real estate & business services have relatively large "sensitivity of dispersion" (row sum).

Table 6.3 Interregional feedback effects of HCMC and ROV

		HCMC		ROV	
		Interregional feedback effects		Interregional feedback effects	
		Column	Row	Column	Row
1	Agriculture, fishery & forestry	0.024	0.002	0.125	0.363
2	Mining and quarrying	0.008	0.000	0.274	0.246
3	Food, beverage & tobacco manufactures	0.012	0.006	0.374	0.121
4	Other consumer & industrial goods	0.042	0.175	0.184	0.459
5	Capital goods	0.037	0.009	0.131	0.136
6	Electricity, gas & water	0.008	0.009	0.107	0.195
7	Construction	0.062	0.000	0.143	0.000
8	Trade	0.02	0.046	0.056	0.063
9	Transportation & communication	0.021	0.01	0.062	0.02
10	Finance, real estate & business services	0.04	0.054	0.039	0.054
11	Government services	0.049	0.013	0.071	0.001
12	Personal, community & household services	0.016	0.015	0.114	0.021
	Average	0.028	0.028	0.014	0.014

The table 6.3 shows output required of a region for a unit output of another region. On average interregional feedback effect on output of the ROV (0.14) higher than HCMC (0.03), Table 6.2 and table 6.3 show that economic development in Vietnam seem not to be appropriate.

6.4.1.2 Changes in internal and external Multipliers

Table 6.4 shows powerful change on structure of using product for intermediate input by source. On average, direct input product of HCMC increased by 43%, while using product of the rest of Vietnam and the rest of the world for direct input decreased by 41% and 18%.

Table 6.4 Change direct input of HCMC between 2000 and 1996

(Percentage)

Direct Intermediate Input			
Sector	**HCMC**	**ROV**	**ROW**
Agriculture, fishery & forestry	0.799	-0.499	-0.381
Mining and quarrying	0.142	-0.381	-0.685
Food, beverage & tobacco manufactures	0.828	-0.352	-0.580
Other consumer & industrial goods	0.560	-0.376	-0.164
Capital goods	0.278	-0.727	1.257
Electricity, gas & water	0.151	-0.821	0.257
Construction	0.197	-0.006	-0.393
Trade	0.559	-0.587	-0.620
Transportation & communication	0.533	-0.272	-0.516
Finance, real estate & business services	0.528	0.008	0.338
Government services	0.329	-0.510	-0.464
Personal, community & household services	0.239	-0.381	-0.187
Average	**0.429**	**-0.409**	**-0.178**

Due to powerful change on structure of direct input by source it leads to the change in internal and external multipliers from 1996 to 2000 and they are displayed in table 6.6 as bellow:

In HoChiMinh City, the internal multipliers increased by 13%, while, external multipliers decreased only by 0.07% on average, respectively. In the rest of Vietnam, the internal multipliers increased only by 0.8% and external multipliers decreased by 1.6% on average. In terms of the internal multipliers of HCMC, all sectors are in the increase in column sums; especially, Food, beverage & tobacco manufactures; Other consumer & industrial goods, Capital goods and trade have largest increase in the row and column sums, which may be influenced by the change of input structure by source, both directly and indirectly. It is obvious that the economic development of HoChiMinh City instead of developing in breadth it has developed in depth as well.

Table 6.5 Changes in Internal and External multiplier between 2000 and 1996

Code	Sectors	HCM				ROV			
		Internal		External		Internal		External	
		Row	Column	Row	Column	Row	Column	Row	Column
1	Agriculture, fishery & forestry	0.155	0.046	-0.003	-0.001	0.030	-0.034	-0.004	-0.016
2	Mining and quarrying	0.063	-0.070	-0.009	0.000	-0.049	-0.096	-0.015	-0.010
3	Food, beverage & tobacco manufactures	0.229	0.144	-0.004	-0.003	0.003	-0.020	-0.005	-0.002
4	Other consumer & industrial goods	0.220	0.530	-0.008	-0.047	0.004	0.097	-0.015	-0.041
5	Capital goods	0.145	0.300	-0.021	-0.011	0.106	0.102	-0.020	-0.011
6	Electricity, gas & water	0.071	-0.044	-0.022	-0.005	-0.106	-0.072	-0.037	-0.017
7	Construction	0.133	-0.001	-0.003	0.000	-0.037	-0.009	0.003	-0.069
8	Trade	0.139	0.284	-0.003	0.002	0.185	0.072	-0.007	-0.005
9	Transportation & communication	0.152	0.030	-0.001	-0.006	-0.057	-0.135	-0.019	-0.008
10	Finance, real estate & business services	0.102	0.036	0.000	-0.003	0.069	0.162	-0.018	-0.004
11	Government services	0.098	-0.021	-0.004	0.000	-0.035	-0.045	-0.029	-0.001
12	Personal, community & household services	0.086	0.064	-0.003	-0.003	0.014	0.030	-0.021	-0.001
Average		**0.134**	**0.134**	**-0.007**	**-0.007**	**0.008**	**0.008**	**-0.016**	**-0.016**

6.4.2 Environmental impacts

Analogous to the concept of the output multiplier is that of residual multiplier. The residual multiplier matrix V is given as: $V= V^*.(I-A)^{-1}$ (Using equation (20)) and based on direct coefficients to wastewater as TSS, BOD, COD, NH4 and total N (annex A, B) by sectors (kg/million Vietnam dong), these consequences estimated based on "Survey in enterprise to get information for wastewater charge calculation – National environment agency, 1996" and study result of Institute of tropical Technology and Environmental Protection. As an example, in order to service a one unit (In the table 6.7 presented, one unit is one million Vietnam dongs (2000), equivalent to about $70U.S.) increase in final demand, approximately 1.7 kg of TSS, 2 kg of TSS will be discharged into HoChiMinh City and the rest of Vietnam wastewater [38].

Table 6.6 Residual impacts generated by production

(Kg/million VND)

	HoChiMinh City			Rest of Vietnam		
	Internal propagation	interregional feedback	Total impact	Internal propagation	interregional feedback	Total impact
TSS	0.856	0.027	**0.883**	0.99	0.186	**1.176**
BOD	0.501	0.022	**0.523**	0.555	0.14	**0.695**
COD	1.765	0.043	**1.808**	1.601	0.28	**1.881**
NH4-N	0.082	0.002	**0.084**	0.134	0.032	**0.166**
Total N	0.301	0.007	**0.308**	0.376	0.087	**0.463**

From final demand by sector in 2000, we can estimate total residuals by type of HCMC Vietnam and the rest of Vietnam as bellow:

Table 6.7 Value of residual

(Unit: kg)

	HoChiMinh City	Rest of Vietnam	Vietnam
TSS	8,646,940	62,744,096	71,391,036
BOD	5,956,252	38,198,810	44,155,063
COD	15,489,343	73,147,671	88,637,013
NH4-N	654,945	9,895,414	10,550,360
Total N	2,508,596	27,916,010	30,424,606

The table 6.7 and table 6.8 are residual impact generated by production; the equation (21) shows the residual impact generated by production and household consumption represented as bellow:

Table 6.8 Residual impacts generated by production and household consumption

(Unit: kg/VND)

	HoChiMinh City			**Rest of Vietnam**		
	Internal propagation	interregional feedback	Total impact	Internal propagation	interregio nal feedback	Total impact
TSS	1.059	0.202	**1.261**	2.149	1.536	**3.685**
BOD	0.655	0.154	**0.809**	1.379	1.099	**2.478**
COD	2.123	0.35	**2.473**	3	1.91	**4.91**
NH4-N	0.099	0.017	**0.116**	0.365	0.301	**0.666**
Total N	0.367	0.063	**0.43**	1.052	0.874	**1.926**

Table 6.9 Value of residual

(Unit: VND)

	HoChiMinh City	**Rest of Vietnam**	**Vietnam**
TSS	17,495,697	121,519,799	139,015,496
BOD	12,658,533	79,961,690	92,620,223
COD	31,069,597	144,141,595	175,211,192
NH4-N	1,411,596	21,618,320	23,029,916
Total N	5,369,340	62,172,659	67,541,998

6.5 Conclusions

6.5.1 Summary

Miyazawa's framework provides a valuable analytical method for impact assessment of an unscheduled event. After all, the central concern of an impact analysis and any economic analysis is the estimation of internal, external multipliers changes. These changes may become significant both in a regional context and in an interregional context. But there are some limitations on economics and environmental data in Vietnam such as:

+ To summarize, the hybrid approach, as the trade – off between survey-based and non-survey methods of intra – and inter-regional Io compilation, was adopted in this research mainly because of inadequacy of hard data on commodity trade flows.

+ The environmental data of Vietnam is very difficult for collecting and processing.

6.5.2 Future direction

To conclude, the following general areas of concerns are presented for consideration, give the observed limitations of this study:

a) Improvement of data adequacy and quality at the sub-national level;

b) Development and maintenance of framework for generation of commodity flow statistics useful in inter-regional Io compilation.

c) Enhancing scope and coverage of HCM IO compilation by taking into consideration such typical phenomena in urban economic as the contribution of the informal sector, environmental effects, the economic role of head office activities, etc.

d) Continuing efforts on IO based applied researches; CGE analysis, Miyazawa model, policy evaluation, etc.., give fiscal and technical resources and

e) Strengthening the country's professional/technical capability in IO compilation and analysis

Chapter 7

Economic Impact Analysis Based on Multi Inter-regional Input-Output Model

7.1 Introduction

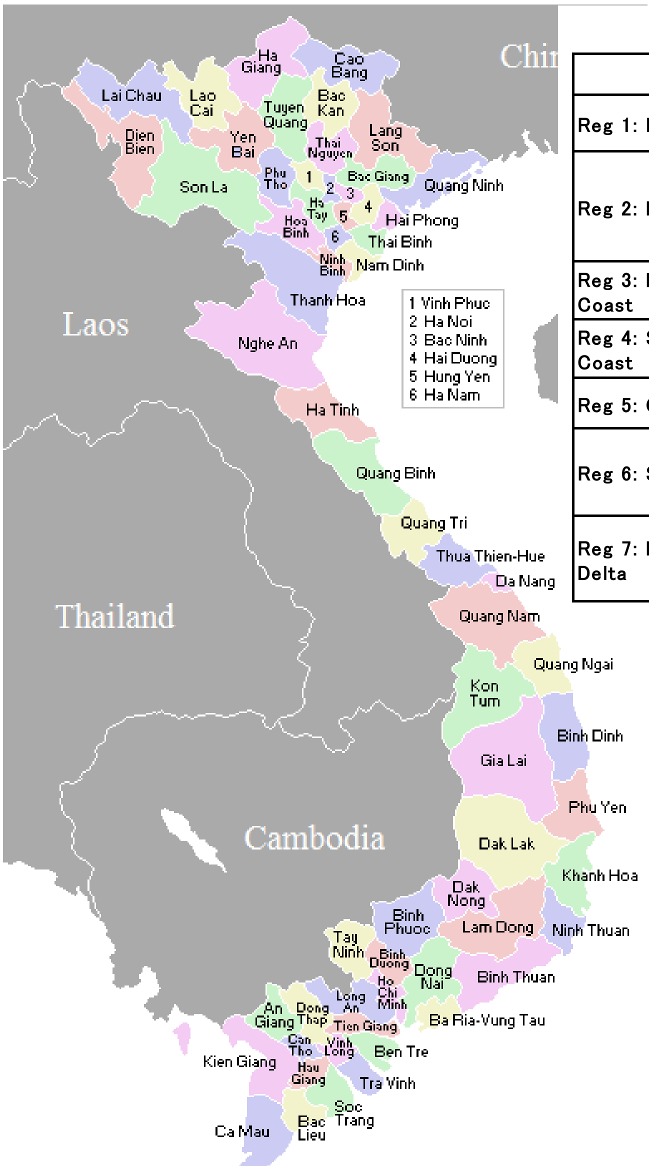
Many regional economist in Vietnam have just done the descriptive analysis on regional development problem when they approach this topic. One reason is the IO analysis is still not popular method for understanding regional ecomoic feature and other is that it is difficult for regional economic analysist. In the development of more general or economy-wide models, the initial addition to standard input-output systems has been viewed as the social accounting matrix most closely associated with Richard Stone (Pyatt and Round, 1985; Sonis, Hewing and Madden 1995). A parallel development was proposed and empirically implemented by Miyazawa (1960, 1966, 1968, and 1971); however, these contributions were not widely appreciated outside Japan until Miyazawa brought them to the attention of modelers on regional science in 1976. Miyazawa's major contributions are the notions of internal and external multipliers, which can be used to explain the role of interregional trade and interrelation between income and consumption.

This chapter will show ***internal multipliers*** in each region and ***external multipliers*** induced by other regions in Vietnam based on Interretional IO model. This means when final demand in region *i* has changed, it will lead to the change in output of that region. The change in output of that region will also necessitate additional flows of goods and services from other regions, resulting in changed output in those regions. These effects are referred to as the induced impacts. In order to meet region *i's* new demand of goods and services, industries in other regions will have to expand their production, which again may lead to another change in output of region *i.* These additional effects are known as the ***interregional feedback effects***. It also shows the impacts of final consumption of goods and services of each region on output of that and other regions; moreover, it has spillover effect to components of the value added. This chapter also presents the multi-interregional input output model of Vietnam using data from the 2001 Input-Output survey conducted by the System of National Accounts Department of Vietnam General Statistical Office.

At the regional level, compilation of IO tables has not yet been developed officially in Vietnam, although a few IO-based research studies have been recently conducted by private organizations/institutions. Among these is the two-region (HoChiMinh City & Rest of

Vietnam) interregional IO table, covering 3 regions: HoChiMinh-Danang-Rest of Vietnam), first compiled by Bui Trinh, Francisco T. Secretario and Kwang Moon Kim (1996) and later elaborated by Bui Trinh et al. (2000). These studies followed the conventional inter-regional I-O framework, notably of Isard (1951, 1960), Richardson (1972), Miller and Blair (1985) and Francisco T. Secretario (1999). The multi-interregional input output framework covers 7 regions and 10 aggregated sectors, as Figure 7.1.

This chapter is an attempt of a private research group to extend the use of the official Vietnam national I-O tables.



Regional Classification

Regions	Province
Reg 1: Red River Delta	Ha Tay, Ha Noi, Hai Duong, Hai Phong, Thai Binh, Hung Yen, Ha Nam, Nam Dinh, Ninh Binh
Reg 2: North Upland	Lao Cai, Ha Giang, Cao Bang, Lang Son, Quang Ninh, Bac Giang, Thai Nguyen, Bac Can, Tuyen Quang, Yen Bai, Phu Tho, Vinh Phuc, Bac Ninh, Lai Chau, Son La, Hoa Binh
Reg 3: North Central Coast	Thanh Hoa, Nghe An, Ha Tinh, Quang Binh, Quang Tri, Hue
Reg 4: South Central Coast	Da Nang, Quang Nam, Quang Ngai, Binh Dinh, Phu Yen, Khanh Hoa
Reg 5: Central Highlands	KonTum, Gia Lai, Dac Lac
Reg 6: Southeast	Lam Dong, Ninh Thuan, Binh Thuan, Dong Nai, Binh Phuoc, Tay Ninh, Binh Duong, Ho Chi Minh City, Vung Tau
Reg 7: Mekong River Delta	Long An, Tien Giang, Dong Thap, An Giang, Vinh Long, Ben Tre, Tra Vinh, Soc Trang, Can Tho, Kien giang, Bac Lieu, Ca Mau

Sector Classification

SECTORS	
No.	Name
1	Crops
2	Other Agricultural activities
3	Mining
4	Food processing
5	Light manufactures
6	Heavy manufactures
7	Machinery
8	Utility
9	Construction
10	Services

Figure 7.1 Sector and Regional Classification

7.2 Methodology

7.2.1. Framework

The basic framework of inter - regional shown at Fig 7.2. It shows the example of division of the VRIO table into blocks or quadrants, each block explicitly describing a distinct type of IO transaction. In its blown-up format, the number of intermediate or input-output blocks is equal to m2 = 49, where m is the number of regions. There are 7 blocks to account for intra-regional IO transactions and the remaining 42 blocks for inter-regional transactions on outflows/inflows. Each intermediate demand The model contains 10 industries, 5 final demand categories and 4 primary inputs or value-added components in each of 7regions.

Fig 7.2. Accounting Layout for the 7-Region IRIO Table (Vietnam)

FROM	TO	INTERMEDIATE DEMAND			FINAL DEMAND			ROW	TGO
		R1	.....	R7	R1	.....	R7		
		1…j…10	.....	1…j…10	1…k…5	.....	1…k…5	(M)	
R1	1 : i : 10	X^{11} Intra-regional Flows of Intermediate Prods	.....	X^{17} Inter-regional Flows of Intermediate Prods	Y^{11} Intra-regional Flows of Final Prods	.....	Y^{17} Inter-regional Flows of Final Prods	0	$X^{1.}$
: : :	: : :	: : :	....	: : :	: : :	.....	: : :	: : :	: : :
R7	1 : i : 10	X^{71}	.....	X^{77}	Y^{71}	.....	Y^{77}	0	Y^{7}
ROW	1 : i : 10	${}^{I}M^{W1}$ Imports of Intermediate Products	.....	${}^{I}M^{W7}$	${}^{F}M^{W1}$ Imports of Final Products	.....	${}^{F}M^{W7}$ Imports of Final Products	$-M^{T}$ Total Imports	0
GVA	1 : p : 4	V^{1} Value Added	.....	V^{7} Value Added	0	.....	0	D^{T}	GDP
TGI		$X^{.1}$	.....	X^{7}	$Y^{.1}$	.....	Y^{7}	$-M^{T}_{FOB}$	

Abbreviations:

CE: Compensation of Employees

PT-S: Production Tax less Subsidies

D: Depreciation

OS: Operating Surplus

GVA: Gross Value Added

C: Private Consumption Expenditures

G: Government Consumption Expenditures

I: Investment (Gross Domestic Capital Formation)

E: Exports

M: Imports

Notations:

- $\mathbf{X^{11}}$ **:** Matrix of intra-regional flows of intermediate products within Region 1(10 x 5 matrix);
- $\mathbf{X^{17}}$ **:** Matrix of inter-regional flows of intermediate products between Regions 1 & 7;
- $\mathbf{F^{11}}$ **:** Matrix of intra-regional flows of final demand k within Region 1 (10 x 5 matrix), where each element is a flow of product i to final demand k within Region1, where k1 is private consumption expenditure; k2 is government consumption expenditure; k3 is gross fixed capital formation; k4 is change in inventory; and k5 is (foreign) exports;
- $\mathbf{F^{17}}$ **:** Matrix of inter-regional flows of products between Regions 1 and 7 (10 x 5 matrix) where each element is a flow of product i from Region 1 to final demand k in Region 7;
- $\mathbf{X^{W1}}$ **:** Matrix of imports of intermediate products consumed in Region 1;
- $\mathbf{F^{W1}}$ **:** Matrix of imports of final products consumed in Region 1;
- **(M)** **:** Vector of total imports of national economy, (negative entries)
- $\mathbf{V^{P1}}$ **:** Matrix of primary inputs in production (=GVA) in Region 1 (4x 10 matrix), where each element accounts for primary input p consumed by product sector j in Region 1, where p1 is compensation of employees; p2 is indirect taxes less subsidies; p3 is depreciation; and p4 is operating surplus.
- $\mathbf{V^{P\cdot}}$ **:** Vector of GVA of national economy, where $\sum$GVA = national GDP
- $\mathbf{F^{\cdot 1}}$ **:** Vector of total final demand in Region 1
- $\mathbf{X^{1\cdot} = X^{\cdot 1}}$ **:** Vector of gross outputs in Region1 = vector of gross inputs in Region 1;

Similarly, there are also 49 blocks for final demand transactions, with each final demand block in 10-product sector x 5 final demand categories dimension in each of 7 regions. Moreover, 10 separate blocks are allocated that explicitly record regional transaction with the ROW (imports). All in all, a total of 100 blocks that makes up the whole VIRIO IO Accounts. With each intermediate block in 10x10-sector dimension, the whole intermediate or input-output quadrant, therefore, is of magnitude. Fig 7.2 shows a truncated configuration of the final output of this research. It is a 7-region Inter-regional I-O Table for Vietnam's economy (to be hereafter referred to as VIRIO). The VIRIO table traces the (money) flows of products (or goods and services) between regions and between sectors in the national economy during the reference period. Reading along the rows, it shows the deliveries of one region's products to intermediate & final demand sectors in partner regions and to itself. Reading down the columns, it shows the input structure of production and the expenditure pattern of final demands in each region, further distinguished by source of inputs/expenditures.

7.2.2. Balance equations

The region's total output of product *i* is equal to the region's total input of producing product *j*, i.e.

$$X_i^R = X_j^S \quad (R \text{ or } S=1, 2, \ldots 7,\ i \text{ or } j = 1, 2, \ldots 10) \tag{7.1}$$

From the inter-regional accounting framework as illustrated above, the balance equation for the output of sector ***i*** in region R is given by, in its generalized form:

$$X_i^R = \Sigma X_{ij}^{RS} + \Sigma\ {}^{D}Y_{ik}^{RS} + E_i^{RW} \tag{7.2}$$

$$(R=S=1,2,\ldots 7);\ (i = j =1,2,\ldots 10);\ (k = 1, 2,\ldots 4)$$

Using Leontief's assumption of linearity in production cost functions, i.e. $a_{ij}=X_{ij} / X_j$, a input structural equations are regionally-defined, In matrix form, we have:

$$X = AX + [Y+E] \quad \text{OR} \quad X = (I-A)^{-1} [Y+E] \tag{7.3}$$

where: A is a 70 x 70 matrix of technical coefficients; Y is a 70 x 35 matrix of regional final demands; and X is a 70-sector vector of regional outputs.

7.2.3 Indicator of Impact measurement

7.2.3.1 Inter-regional spillover and feedback effects

Inter-regional I-O model has number of advantages over a state or single-region model:

An inter-regional I-O model includes I-O models of each region within the larger inter-regional structure. The intermediate and final demand structure of each region allows the user to calculate the differences underlying production and consumption structure among regions. The effects quantified by the model are the inter-regional spillover and feedback effects, as depicted in Fig 7.3 The inter-regional model eliminates the need of an additional mechanism to forecast in individual regions.

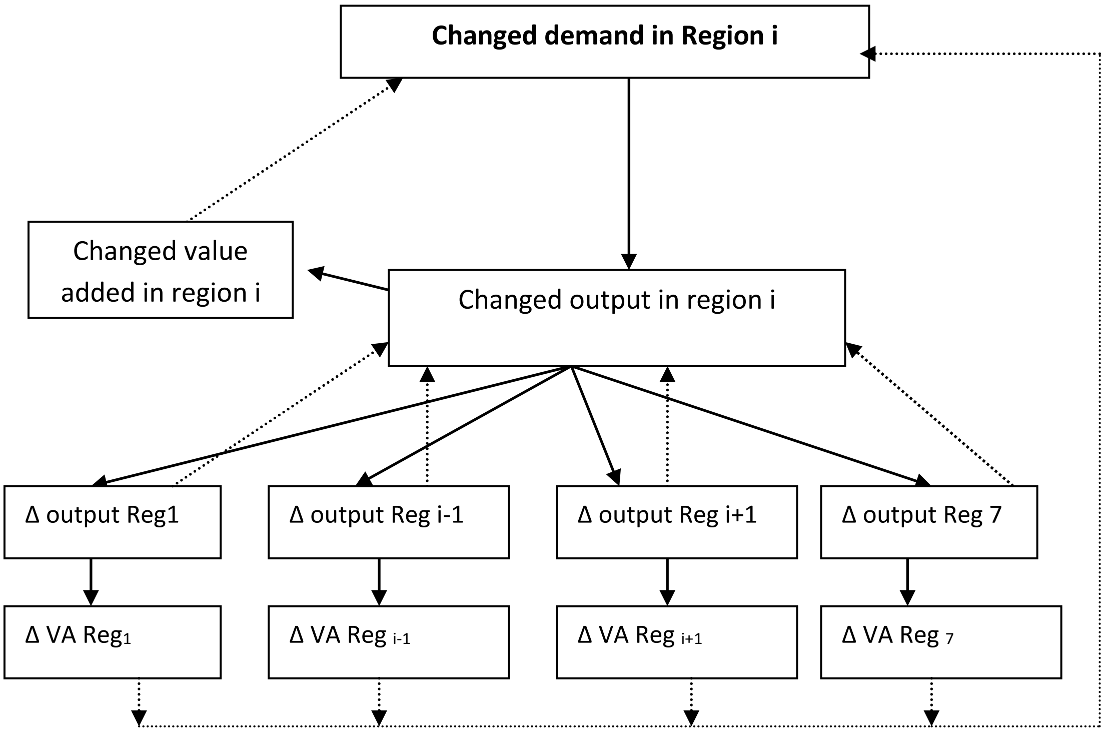


Fig 7.3 Spillover and feedback effects in a 7-regions model of Vietnam

The results of this study will show type I and type II multipliers from national, single, and inter-regional I-O models. Type I multiplier (the direct and indirect impacts) shows the economic activity induced by the initial change in final demand *and* the purchases of inputs from local industries to supply the change in final demand. Type II multiplier includes the direct effect, the indirect effect, and induced effect by the household consumption expenditure resulting from the income induced by the direct and indirect impacts of final demand change. Type II in the inter-regional I-O model includes two kinds of induced effects, both by consumption and production of other regions; type II multiplier is interpreted as enlarged Leontief inverse, the elementary of this type includes direct impact, indirect impact and induced impacts; they contain elements which are larger than those of type I multiplier, because they include extra output required to meet the consumption and the production of other regions.

7.2.3.2 Regions' contributions to output multipliers

The results shows type I and type II multipliers, in other words these two types together show inter-industrial and inter-regional relationships. They quantify how one industry in one region affects other industries in this region as well as many other industries in many other regions plus the effect of consumption on production and on value added.

It is evident that in almost all regions type I multiplier is highest for *food processing and light manufacturing.* But it is interesting that for type II multiplier, *agriculture and food processing* are the industries with the highest multiplier. All this means that without the induced impact, food processing and light manufacturing are the sectors which have the largest influences on other industries.

On the other hand, when the induced impact is taken into account, agriculture and food processing are the two sectors that have the largest influence. Taken together, it is evident that food processing is the most important sector in the economy. It could be explained by the fact that the import of food in Vietnam is rather limited, Vietnamese people still prefer food 'made in Vietnam' to import food, which are much more expensive due to the fact that the import tariffs imposed on this kind of products have been rather high. Further, the export of processed food has become increasingly a large part of the export as a whole.

7.2.3.3 Regions' contributions to output multipliers in percentage induced by final demand

Other results show the impact of final demand elements on production. The interpretation of the multipliers for each element of the final demand for every region can be calculated. The result of the multiplier is very important in economic policy making process as it helps the policy makers to come up with the right decision in which element of final demand to stimulate. It can be seen from this study, for both type I and type II multipliers that gross fixed capital formation and export are two components in final demand that contribute most greatly to stimulate production in almost all regions.

This is in compliance with the characteristics of Vietnam's economy, in which not unlike in China's economy, the underlying factors of the growth are investment and export. It is evident that export is by far the most important stimulator and this is understandable as Vietnam's economy is one of the most open economies in the world (see box I.). Investment has for long time been important but the role of this factor could have been even more effective. Government and private consumption also have high multipliers in both types, meaning a good fiscal policy can be vital for the economy.

Box 1. Vietnam's Trade Openness

Vietnam's economy stands out for its openness, as measured by the ratio of total trade (imports plus exports) to GDP. As shown in the table below, comparing with other countries in the table, Vietnam's level of openness is behind only that of Malaysia.

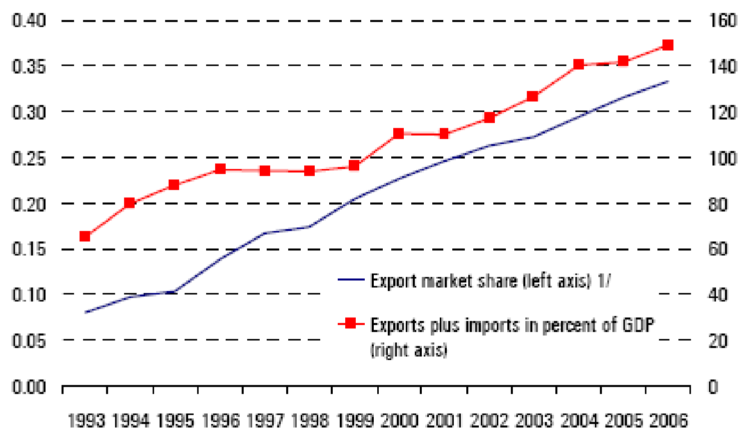
Trade Openness (% of GDP)

	Exports		Imports		Total trade	
	1990	**2004**	**1990**	**2004**	**1990**	**2004**
U.S.	9.2	9.8	10.6	15.1	19.8	24.9
Euro Zone	27.1	36.5	27.6	34.5	54.7	71.0
Japan	10.6	13.6	9.8	11.6	20.4	25.2
Emerging South America [1]	24.9	30.0	18.7	25.7	43.7	55.8
China	14.8	39.7	12.0	36.7	26.8	76.3
India	7.2	17.9	9.4	20.7	16.6	38.6
Indonesia	23.9	34.1	24.5	30.1	48.4	64.3
Korea	29.0	43.6	30.2	39.3	59.2	83.0
Malaysia	74.6	121.2	72.6	99.9	147.2	221.1
Philippines	25.9	51.4	31.6	60.6	57.5	112.0
Thailand	36.6	69.9	45.2	65.5	81.8	135.4
Vietnam	**32.6**	**67.3**	**30.9**	**74.6**	**63.6**	**141.9**

[1]Argentina, Brazil, Chile, Colombia, Ecuador, Paraguay, Peru, Uruguay, and Venezuela. Simple average.

Source: *IMF, Asia – Pacific Regional Outlook – September 2005*

Vietnam: Indicators of Trade Openness



Sources: IMF, *Direction of Trade;* and IMF staff calculations.
1/ Vietnam's exports as a percentage of world imports.

7.3 Analysis Results

7.3.1 Output multipliers for the national, inter-regional and single I-O models

This is focused on the interregional model but it is not out of question to take into account also the calculations of the multipliers in national and the single model. The national model provides a picture of the Vietnam's economy as a whole and the single model is a snapshot of every single region, while every region is taken as an independent economy itself.

The results of the multipliers from all three models do not come in conflict with each other, only gives better explanation of the economy.

So far from all the results it is evident that the food processing and light manufactures are two sectors most positively influencing the economy? The below table is not an exception either. Although it is certain that for all the 7 regions in all three models, the multipliers are highest in food processing and light manufactures, though the levels are quite different across the regions. This is in compliance with the characteristics of each region. Northern Vietnam containing regions 1, 2 and 3 is rather poorer than southern Vietnam. As it can be seen from the table, multipliers of these three regions are also lowest. In the northern part of the country, region 2, which is the Red River Delta in the recent years, has been rapidly industrialized with many industrial zones opened. Other regions of the northern part also followed the industrialization process in Red River Delta and changed towards opening more and more industrial zones on account of agricultural land. The industrial zones in these regions are more or less rather for 'decoration' than an effective way to a more sustainable and quality high growth. The multipliers in the table show that for the northern part of the country, except for other agricultural activities and food processing, the multipliers of all other sectors are higher than of regions 4-7. This is not in contrary with the comment above that the policies of the southern part of the country focus much more on industrialization while agriculture in the recent years has not been treated with adequate interest though it is evident from the multipliers that agricultural related sectors like food processing have the highest multipliers.

It is well known that the southern part of the economy including regions 4-7 is wealthier than the northern part. From the table, it is evident that in the southern part industry does not play such a big role as in the northern part. Thus we can come up with the conclusion that at this point of time; heavily focus on industrialization is not the best thing for Vietnam.

Rather, the policy makers should think of getting the best from the agricultural sector, especially in modernization the agricultural sector. Vietnam's economy is best characterized as an agricultural economy and this is the sector where Vietnam has competitive advantage over many other countries in the world. Focus blindly on the industrialization process would be fatal for the economy as agriculture will be neglected while it is notable that the structure of Vietnam's export is made from a big part of agricultural products.

Table 7.1 (a) Output multipliers for the national, inter-regional models

		National model	Inter-regional model						
			Reg 1	Reg 2	Reg 3	Reg 4	Reg 5	Reg 6	Reg 7
1	Crops	1.297	1.248	1.273	1.268	1.336	1.450	1.332	1.327
2	Other agricultural activities	1.436	1.443	1.385	1.453	1.439	1.645	1.423	1.448
3	Mining	1.254	1.270	1.564	1.324	1.349	1.399	1.216	1.254
4	Food processing	2.011	1.983	1.982	1.989	2.019	2.023	2.027	2.016
5	Light manufactures	1.738	1.666	1.935	1.823	2.010	1.812	1.651	1.783
6	Heavy manufactures	1.497	1.560	1.511	1.505	1.487	1.176	1.485	1.367
7	Machinery	1.422	1.372	1.490	1.548	1.454	1.394	1.411	1.402
8	Utility	1.341	1.323	1.410	1.384	1.426	1.273	1.339	1.323
9	Construction	1.556	1.607	1.644	1.684	1.697	1.599	1.455	1.521
10	Services	1.374	1.390	1.423	1.414	1.454	1.410	1.343	1.348

Table 7.1 (b) Output multipliers for single I-O models

		Single model						
		Reg 1	**Reg 2**	**Reg 3**	**Reg 4**	**Reg 5**	**Reg 6**	**Reg 7**
1	Crops	1.248	1.293	1.278	1.356	1.459	1.33	1.33
2	Other agricultural activities	1.442	1.406	1.464	1.457	1.633	1.421	1.45
3	Mining	1.27	1.582	1.329	1.354	1.375	1.214	1.254
4	Food processing	1.981	2.007	1.999	2.044	2.033	2.025	2.019
5	Light manufactures	1.664	2.025	1.862	2.085	1.824	1.646	1.791
6	Heavy manufactures	1.561	1.532	1.514	1.496	1.154	1.482	1.368
7	Machinery	1.372	1.52	1.576	1.472	1.375	1.41	1.404
8	Utility	1.323	1.433	1.395	1.443	1.266	1.337	1.324
9	Construction	1.607	1.691	1.712	1.732	1.57	1.45	1.525
10	Services	1.39	1.44	1.422	1.465	1.391	1.341	1.349

7.3.2 Income Multipliers

It can be seen from the table 7.2 that the production of Agricultural sector (consisting of agriculture, forestry and fishery) has the most positive impact on VA in most regions. Both types of multipliers confirm this evidence. Services are the second best sector and industries are the last sector that stimulates VA. This means the industrialization process that has been taken for almost two decades in Vietnam now is not effective. Investment, resources have flowed heavily into this sector but have not gained much value. Vietnam's economy's advantage remains in the agricultural sector. Comparing with agriculture of other economies, Vietnam's agriculture is not in the best shape but whether one likes it or not, agriculture still has a pivotal role in Vietnam's economy, agriculture still employs more than 60% of the total labour force. Modernization and industrialization of the economy is a good policy but this all should not happen at the expense of agriculture. Again, the result of the table shows that agriculture has not been given the adequate concern and thus the activity in the agricultural sector is not as effective as it should be. The VA of the agriculture remains lower than of the other sectors, which means land is still too much wasted.

Table 7.2 (a) Value added by region of two types (in Region I, II)

Code	Intermediate Consumption - Region I			Intermediate Consumption - Region II		
	1	2	3	1	2	3
	Agriculture	Industries	Services	Agriculture	Industries	Services
Type II VA multiplier	**1.271**	**0.813**	**1.113**	**1.612**	**1.122**	**1.423**
1	1.086	0.639	0.954	0.117	0.115	0.115
2	0.031	0.028	0.025	1.157	0.682	0.974
3	0.017	0.015	0.013	0.045	0.043	0.043
4	0.014	0.012	0.012	0.046	0.042	0.046
5	0.006	0.006	0.005	0.012	0.012	0.01
6	0.08	0.08	0.07	0.18	0.18	0.19
7	0.04	0.03	0.03	0.05	0.05	0.05
Type I VA multiplier	0.785	0.5	0.688	0.82	0.586	0.73
1	0.754	0.442	0.663	0.015	0.037	0.023
2	0.006	0.01	0.004	0.766	0.45	0.644
3	0.003	0.004	0.002	0.005	0.012	0.007
4	0.001	0.002	0.001	0.004	0.01	0.007
5	0.001	0.002	0.001	0.002	0.004	0.002
6	0.011	0.03	0.014	0.023	0.061	0.04
7	0.008	0.01	0.003	0.004	0.011	0.006

Table 7.2 (b) Value added by region of two types (in Region III, IV)

Code	Intermediate Consumption - Region III			Intermediate Consumption - Region IV		
	1	2	3	1	2	3
	Agriculture	Industries	Services	Agriculture	Industries	Services
Type II VA multiplier	**1.594**	**1.155**	**1.466**	**1.59**	**1.164**	**1.413**
1	0.151	0.145	0.147	0.101	0.102	0.089
2	0.02	0.025	0.02	0.029	0.025	0.028
3	1.254	0.782	1.123	0.049	0.06	0.038
4	0.031	0.03	0.031	1.283	0.834	1.132
5	0.003	0.004	0.003	0.004	0.004	0.004
6	0.1	0.13	0.11	0.09	0.1	0.09
7	0.03	0.04	0.03	0.03	0.03	0.03
Type I VA multiplier	**0.822**	**0.61**	**0.759**	**0.809**	**0.603**	**0.72**
1	0.021	0.046	0.026	0.016	0.033	0.014
2	0.002	0.008	0.003	0.001	0.004	0.003
3	0.774	0.481	0.693	0.008	0.022	0.004
4	0.003	0.007	0.005	0.764	0.495	0.674
5	0	0.001	0	0	0.001	0
6	0.018	0.054	0.026	0.016	0.038	0.023
7	0.004	0.013	0.005	0.004	0.01	0.003

Table 7.2 (c) Value added by region of two types (in Region V, VI, VII)

	Intermediate Consumption - Region V			Intermediate Consumption - Region VI			Intermediate Consumption - Region VII		
	1	2	3	1	2	3	1	2	3
Code	Agriculture	Industries	Services	Agriculture	Industries	Services	Agriculture	Industries	Services
Type II VA multiplier	**1.317**	**0.95**	**1.249**	**1.235**	**0.942**	**1.143**	**1.18**	**0.781**	**1.021**
1	0.132	0.123	0.116	0.043	0.044	0.042	0.044	0.04	0.042
2	0.013	0.018	0.014	0.026	0.028	0.021	0.009	0.01	0.007
3	0.03	0.027	0.026	0.029	0.029	0.023	0.014	0.012	0.01
4	0.098	0.084	0.084	0.019	0.018	0.017	0.013	0.012	0.011
5	0.877	0.518	0.856	0.013	0.015	0.008	0.005	0.005	0.004
6	0.12	0.14	0.12	0.94	0.67	0.93	0.07	0.07	0.06
7	0.04	0.04	0.04	0.16	0.14	0.1	1.03	0.63	0.89
Type I VA multiplier	**0.754**	**0.546**	**0.716**	**0.753**	**0.572**	**0.696**	**0.754**	**0.496**	**0.652**
1	0.028	0.045	0.019	0.006	0.011	0.008	0.005	0.011	0.007
2	0.002	0.006	0.002	0.005	0.01	0.003	0.002	0.004	0.001
3	0.005	0.007	0.003	0.006	0.009	0.002	0.003	0.003	0.001
4	0.019	0.026	0.012	0.003	0.004	0.003	0.002	0.004	0.002
5	**0.656**	**0.387**	**0.64**	0.004	0.007	0.001	0.001	0.002	0.001
6	0.037	0.063	0.033	**0.676**	**0.475**	**0.667**	0.013	0.031	0.013
7	0.008	0.013	0.006	0.052	0.056	0.012	**0.727**	**0.442**	**0.628**

7.4 Conclusions

In the past two decades, Vietnam's economy has modernized and sustained high growth. Living standards in Vietnam have rapidly increased as the result of the transition policy towards a market economy and of the integration into the world economy. The government has focused heavily on industrialization and modernization process and the aim is for Vietnam to be an industrialized economy in 2020. While many policies proved to have positive impact on the economy, there are still areas in which the policy seemed to have gone in the wrong direction. This chapter, with the help of the multipliers from the I-O based approach showed that one important area, agriculture, has been not received an adequate policy in order for it to develop to fully meet with its potentiality. The authors of this study strongly hope the findings above will help the policymakers to come up with ever more effective policies to help the economy reach high and quality growth.

Chapter 8

Economic Integration and Trade Deficit: A Case of Vietnam

8.1 Introduction

In the last two decades, Vietnam has achieved the high rates of economic growth. The period of 2000-2009 witnessed the remarkable improvements in Vietnam's performance from real aspect to social issues and economic institution with the annual average growth of economy at about 7.3%. However, beside the over-excitement the country's economy faced with the constant increasing of chronic trade deficit that has resulted in the macroeconomic instability. In Vietnam, the chronic trade deficit has continuously increased since 2000. During the period 2000 - 2009, the average trade deficit of commodity was 31% and 35.8% if it was, estimated in US dollars and Vietnamese Dongs respectively (see Fig.8.1).

The price of imported goods used in the statistics data should be estimated in c.i.f price, which means that service is the proportional part in the price, including freight transport service and insurance. When Vietnam became the official member of the World Trade Organization (WTO) in 2007, the service sector felt down into the trade deficit induced by deficit in freight transport services and insurance services. In principle, imported goods must

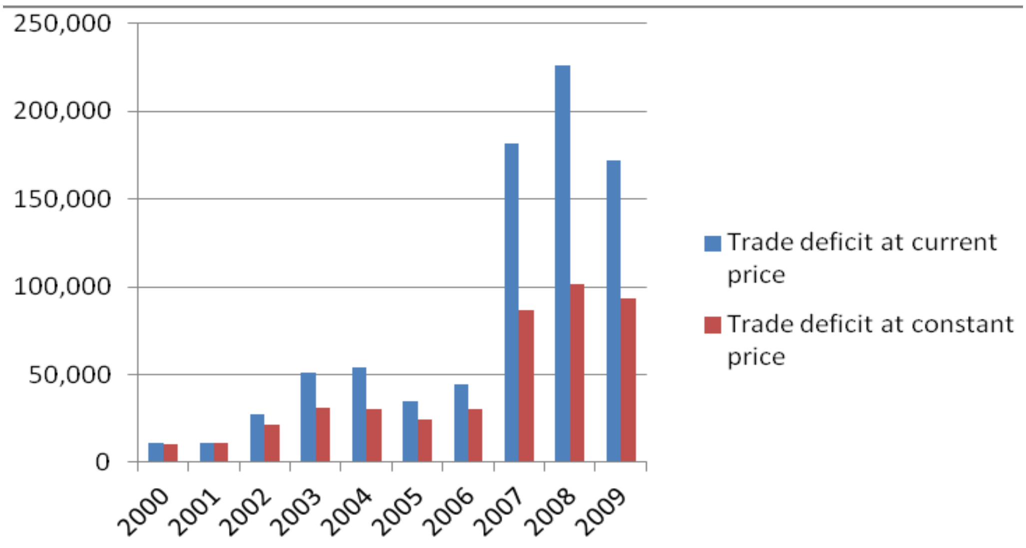


Fig 8.1 Trade deficits in commodity and service sectors 2000-2009

be estimated in *f.o.b* price, while the freight transport service and insurance are included in the service import. Hence, the total value of import will be calculated in *c.i.f* price. These considerations will help balance the macroeconomic and make data analyses much easier.

The import demand mainly was used for domestic's manufacturing (over 90%) in order to procedure to final products

This chapter attempts to present a quantitative analysis in order to figure out the reasons of continuous increase of trade deficit in the last decade in Vietnam. The analysis has been based on structure of the economy through Input-Output tables published by General Statistical Office and the Leontief and Keynes' theories.

In the chapter, we explain the output multiplier and power of dispersion on import so as to recommend policy-makers and planners to prioritize the key economic sectors and appropriate structure for the Vietnam's economy. The study also introduces a comparison between the power of dispersion on import and the effective rate of protection, from which Vietnamese policy makers can consider the most appropriate economic policy with respect to the WTO's commitments .

8.2 Methodology

8.2.1 Output multiplier and power of dispersion on import

That research has been done based on Keynes' theory on the relationship's extension of trade that, the Keynesian trade factors used to estimate the import demand in manufacturing for final demand. It led to confusion because in reality the domestic final demand often includes final consumptions, investment/saving and export. Input-Output table of Leontief was developed basing on Keynes' theory. An expansion of Keynesian in input-output table of Leontief developed base on each factor's impact of demand[3] .

The Leontief system was estimated as the equation below:

$$X - AX = C + I + E - M \tag{8.1}$$

Where X, C, I, E, M are the vectors of gross output, household consumption, gross capital formation, export and import respectively.

The equation (8.1) can be written as follows:

$$X - AX = C + I + E - M^{p} - M^{c} \tag{8.2}$$

[3]Bui Trinh, Pham Le Hoa, Bui Chau Giang (2009) Import multiplier in input-output analysis Journal of Science Vietnam National University, Hanoi, Volume 25, No. 5E

Where M^p is the import for intermediate input, M^c is the import of final products, $M = M^p + M^c$.

Expand the equation (8.2):

$$X - A^d X - A^m X = C^d + I^d + E + C^m + I^m - M \qquad (8.3)$$

Where $AX = A^d X - A^m X$

$A^m X = M^p$ and $M^c = C^m + I^m$. A^d is matrix of intermediate consumption of domestic products, while C^m, I^m are the final consumption and gross capital formation vectors of domestic products, respectively.

Putting $Y^d = C^d + I^d + E$ where Y^d denotes final demand of domestic products vector, now we can rewrite the equation (8.3) as follows:

$$X= (I-A^d)^{-1}.Y^d = (1+A+A^2+A^3+....)\ Yd \qquad (8.4)$$

Where $(I-A^d)^{-1}$ is the Leontief matrix multiplier that shows domestic product requirements for a unit increase in domestic final demand.

A backward linkage is a measure of the relation between an industry and the suppliers of its inputs from the entire production system. It measures the output increase which will occur in industries which supply inputs to the industry concerned. A backward linkage can be computed as the ratio of the sum of the elements of a column of the Leontief inverse to the average of the whole system. This ratio was described by Rasmussen (1957) as the index of the power of dispersion, μ_j, and is defined mathematically as follows:

$$\mu_j = \frac{\sum_{i=1}^{n} \ell_{ij}}{\frac{1}{n}\sum_{i=1}^{n}\sum_{j=1}^{n} \ell_{ij}} \qquad \textbf{(8.5)}$$

Where the ℓ_{ij} is the element of the inter-regional Leontief inverse. The higher the value of μ_j is, the stronger the influence of production sector *j* as a user of intermediate inputs.

On the other hand, the equation (8.3) can be formulated as follows:

$$X - A^m.X= A^d.X +C^d +I^d+E+C^m+I^m-M=TDD -M^p \qquad (8.6)$$

Where total domestic demand including intermediate expenditure, final consumptions, investment and export (TDD)

$TDD = A^d.X + C^d + I^d + E$, we obtain:

$$X = (I-A^m)^{-1}.(TDD - M^p) \quad (8.7)$$

or: $$X = (I-A^m)^{-1}.(TDD + C^m + I^m + E - M^p) \quad (8.8)$$

Matrix $(I-A^m)^{-1}$ is the import multiplier matrix. Equations (8.5) and (8.6) present the demand of import multiplier by domestic demand. The input-output table should be built as non-competitive import type in which intermediate demand and final demand have been separated into domestic products and import. Then the existing input-output table for Vietnam should be mathematically changed to non-competitive import type. A^m and A^d are calculated as follows:

$$A^mX = \Phi.A.X \text{ and } A^dX = (I-\Phi).A.X \quad (8.9)$$

where $m_i = M_i/TDD_i$,

M_i is imported good i and

TDDi is the total domestic demand of good i excluding export and

$m_i \leq 1$ Φ is the diagonal matrix of import coefficient m_i

M^c can be defined as $M^c = (I-A^m)^{-1}$. C^d and M^c is the import multiplier matrix that is induced by domestic final consumption.

$M^e = (I-A^m)^{-1}. E$. Where M^e is the import multiplier matrix induced by export.

Meanwhile $M^I = (I-A^m)^{-1}. I^d$, And M^I is the import multiplier matrix induced by the accumulation from domestic products.

8.2.2 Effective Rate of Protection (ERP)

The Effective Rate of Protection ("ERP") is an indicator to measure the effects of tariff on inputs as well as outputs. It gives a percentage increase in domestic value added over the free-trade level, an increase made possible by the country's tariff structure. In other words, ERP of product i is defined as the difference between its value added (per unit of output) at domestic price, (i.e., inclusion of tariffs on the finished product and the intermediate inputs) and its corresponding value added at world price (i.e., price prevailing under free trade).

Normally, a nation imports a raw material free of tax or imposes a lower tariff rate (nominal tariff) on the importation of input, than on importation of the final commodity produced with the imported input. They nation usually do this in order to protect their domestic producers and to encourage domestic processing and employment. How the degree of ERP for domestic product should be considered then? And which kinds of goods that are imposed import tariff in order to provide ERP for those in domestic economy with high multiplier.

The "ERP" shows the degree of protection through "nominal rate of protection (NRP)". It is formulated as follows:

$$ej = \frac{V(do)j - V(fo)j}{V(fo)j} \tag{8.10}$$

where *V(do)j* *is the value added at domestic price in industry j*

V(fo)j *is the value added at world price in industry j*

ej *is* effective rate of protection of industry *j*

The comparison between import multiplier, power of dispersion on import and ERP aims at recommending policy-decision makers to define key economic sectors that have higher economic multiplier (more than 1) and lower power of dispersion on import (less than 1). This helps them to issue some appropriate import tariff policy that, at the same time, ensures the process of economic integration and the protection of domestic production.

8.3 Study Results

8.3.1 Output multiplier and power of import dispersion

From the calculation above and using 2007 input-output table of Vietnam published by GSO, the Table 8.1 shows the import multiplier and the power of dispersion on import of 16 aggregative sectors. It is clearly seen that there were only 2 sectors, namely agriculture services and food, beverage and tobacco manufactures whose output multipliers were higher than one and the power of dispersion on import were lower than one. Most of the manufacturing sectors enjoyed the high power of dispersion on import which means the more these sectors developed the greater their dispersion was on import.

Table 8.1 Output multiplier and power of dispersion on import

	Output multiplier	Power of dispersion on import
Agriculture	1.0293	0.9643
Fishery	1.3505	1.0276
Forestry	0.8934	0.9959
Mining & quarrying	0.7774	1.0039
Food, beverage and tobacco manufactures	1.4492	0.9564
Other consumer goods	1.2093	1.3754
Industrial material	1.2644	1.3595
Capital goods	1.2475	1.3279
Electricity, gas and water	0.7220	0.9011
Construction	1.1949	1.2884
Wholesale and retail trade	0.7303	0.9406
Transport services	1.0476	1.1619
Post and telecommunication	0.7748	0.9090
Finance, insurance, real estate, business services	0.7577	0.8853
Other private services	0.8133	0.9959
Government services	0.7384	0.9169

Notes: bolded numbers means Good; Italic numbers : Not good

Meanwhile, the service sectors had both low power of dispersion on import and economic multiplier. A research conducted by The Hanoi National University in 2010 [43-44] proved that if the efficient of productivity could be improved and 20% of export ratio was shifted from industry sector to services sector, the average economic multiplier would be greater than one and the ratio of service sector would make up 50% of GDP. This has been questioned whether the economic structure with the first priority of industry sector, followed by services and agriculture Sectors is the correct one.

The Fig 8.2 shows that in the period of 1989 to 2007, the "import multiplier" increased from 1.26 to 1.34. It means that the increase of one unit of domestic demand led to 1.26 unit of import and this went up to 1.34 unit of import for the same increase unit of domestic demand. The power of dispersion on import of one sector is the average of its import multiplier. The sector has the power of dispersion on import less than unit which implies that means induced impact on import is lower than the average of the whole economy and vice versa.

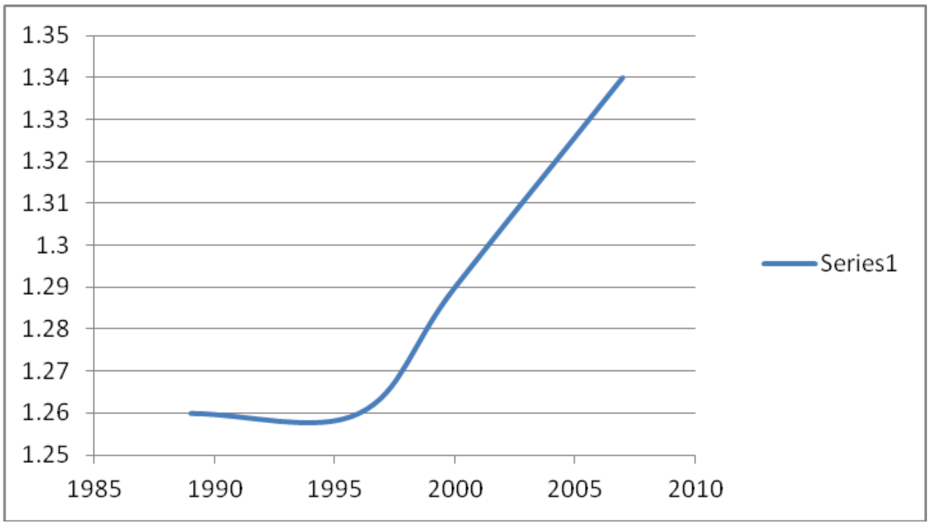


Fig 8.2 Average import multiplier per one unit of domestic demand 1989-2007

The result shown in Table 8.2 indicates that the power of dispersion on import of almost manufacturing, processing and construction industries have increased by time. Especially, consumer goods production, material manufacturing industry and machinery manufacturing industry were still currently enjoying the increasing power of dispersion on import.

The results in Fig 8.3 show the remarkable change in structure of the import demand amongst proportions of domestic products demand. Currently, the accumulation of locally produced products consumption has the highest stimulation over import, but not the consumption of domestic products. If domestic products accumulation increases by one unit, the import will reach 1.69 units. It means that the ineffective investment will require the greater import. The result from a series of research using ICOR (Incremental Capital Output Ratio) ratio proved that the effectiveness of investment is very low at present. Hence, the low effectiveness of investment is one of the reasons that induce high trade deficit.

Beside, increasing one unit of export product results in increasing 1.5 units of import which is higher than the previous period (17%). Meanwhile, the expenditure for the final consumption of domestic products dispersing on import falls off by 1.26 against 1.4 in the last ten years. It implies that some imported intermediate input of domestic products have been replaced by other domestic intermediate inputs.

This above analysis has proven the considerable increase of power of dispersion on import of export and domestic products accumulation. All of these have made people to carefully consider some solution like "Devaluation of Vietnam dong in order to stimulate export and restraint import". In some cases, this solution will have positive impacts for other economies such as China's but not Vietnam's economy because in reality the trade deficit of Vietnam is mainly induced by trade balance with China .

Table 8.2 Power of dispersion on import of sectors for one unit of final domestic demand from 1989-2007

	1989	1996	2000	2007
Agriculture	0.8750	0.9066	0.9035	0.9643
Fishery	1.0141	0.9106	1.0086	1.0276
Forestry	0.8877	0.8687	0.8774	0.9959
Mining & quarrying	1.0110	0.9493	0.8703	1.0039
Food, beverage and tobacco manufactures	0.9264	0.8829	0.9035	0.9564
Other consumer goods	1.0521	1.0513	1.1627	1.3754
Industrial material	1.1066	1.0718	1.2086	1.3595
Capital goods	1.1762	1.3769	1.3556	1.3279
Electricity, gas and water	1.0726	1.0948	0.9596	0.9011
Construction	1.1382	1.1319	1.2584	1.2884
Wholesale and retail trade	0.8394	0.8900	1.0315	0.9406
Transport services	1.1359	1.0940	1.0465	1.1619
Post and telecommunication	0.9833	0.9659	0.9454	0.9090
Finance, insurance, real estate and business services	0.9833	0.8987	0.9327	0.8853
Other private services	0.9232	0.8995	0.9430	0.9959
Government services	0.8750	0.8979	0.9541	0.9169

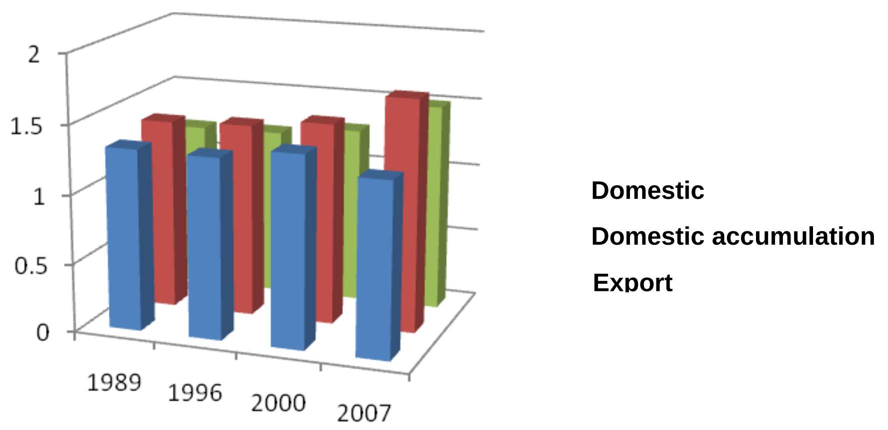


Fig 8.3 Power of dispersion on import induced by domestic demand factors

Fig 8.4 presents the export of manufacturing & processing industry stimulated the import quite strongly, of which export of material manufacturing industry products, of consumer goods producing and machinery manufacturing industry products had the highest power of dispersion on import. So was the export of transport services.

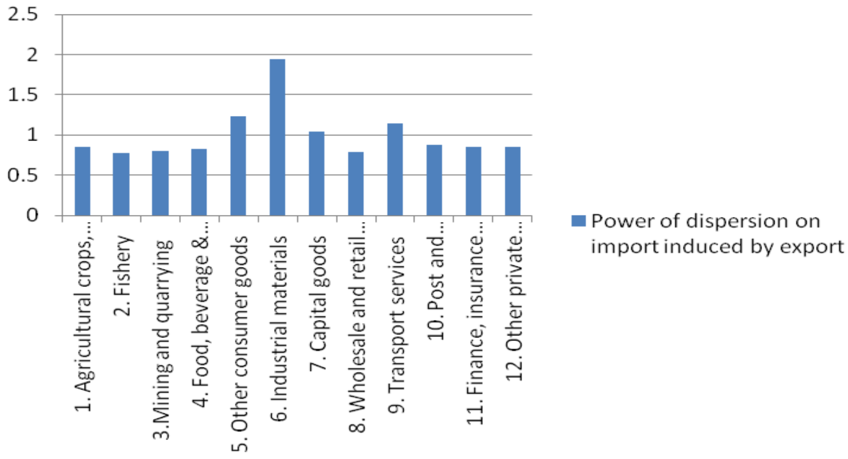


Fig 8.4 Power of dispersion on import induced by export

8.3.2 Effective Ratio Protection

The results of the study presented the effective ratio protection for manufacturing decreased faster than nominal rate of protection. The ERP decreased from 21.4% in 2005 to 4% in 2009, while the NRP decreased from 10% to 3.88% the same period of years (see Fig 8.5)

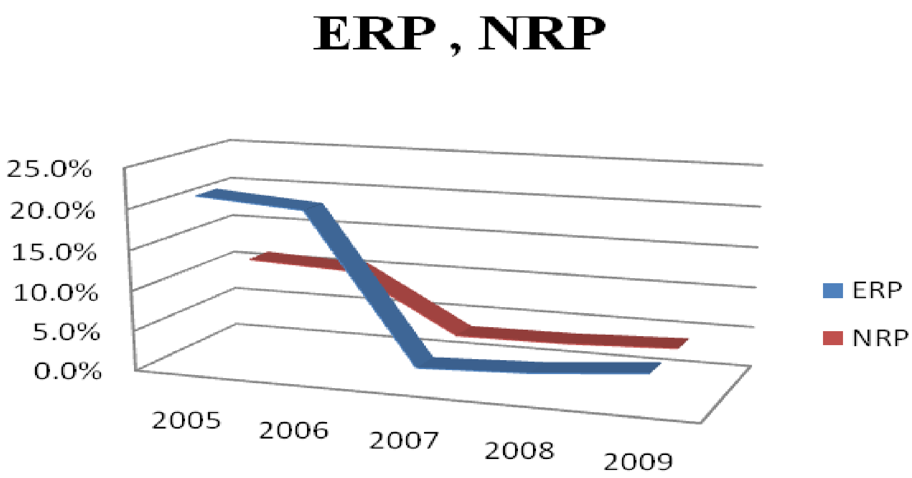
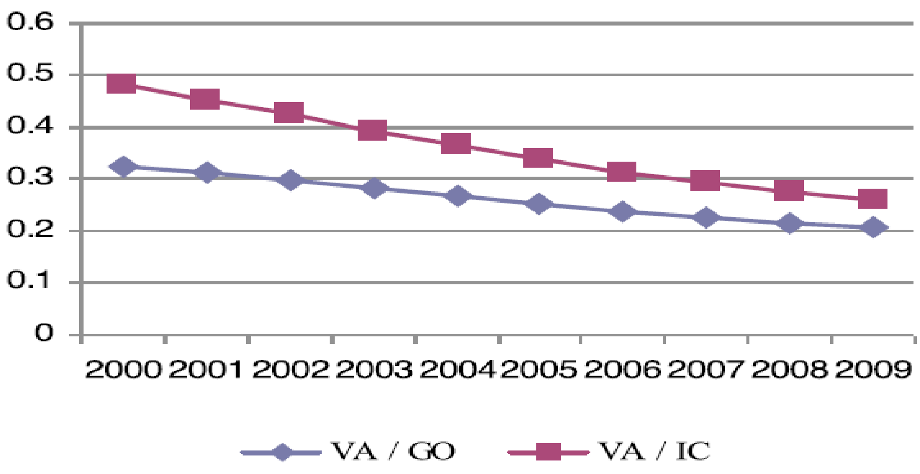


Fig 8.5 ERP and NRP in the period of 2005 - 2009

The results above show that Vietnam was integrating into global economy with the haste when the ERP fell off very fast. The reasons might include:

The protection of domestic products was not considered when imposing tariff on imported goods.



(Source: GSO, CIEM)

Fig 8.6 The changes of ratio value added over gross output and intermediate cost

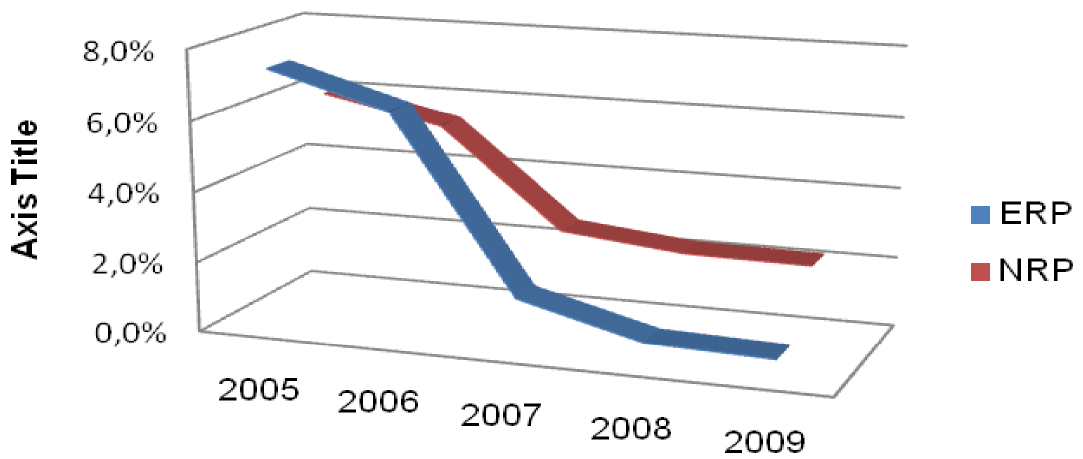


Fig 8.7 ERP and NRP of Agriculture, Forestry and Fishery

The ratio between value added per gross output and ratio between value added per intermediate consumption was continuously decreasing (see Fig. 8.6), through the years while the intermediate inputs were mainly imported.

However, in comparison with other countries in the period of 1995-1997, the ERP of Vietnam was higher than Korea's -27%; Malaysia's -13%, Philippines' -10% and Thailand's -72%. As stated above, the sectors including agriculture, forestry and fishery sectors have high economic multiplier and low import multiplier. These groups of sector should be considered as priority ones; however, they had ERP decreasing through the years (see Fig. 8.7), even some sectors had minus ERP. It implies that, those competing-sectors were losing their competiveness induced by protection policy of Vietnam, and consequently the high trade deficit was unavoidable.

Especially, livestocks sectors have impressive economic multiplier and power of dispersion on import, but ERP are minus (see Table 8.2)

Table 8.3 Comparison between ERP, economic multiplier and power of dispersion on import of livestocks sectors

	ERP, 2007	Import multiplier	Power of dispersion on import
Buffalo, cow	**-1.8%**	**1.1491**	**0.72428**
Pigs	**-18.2%**	**1.7945**	**0.75176**
Poultry	**-1.1%**	**1.6159**	**0.74834**

8.4 Conclusions

This chapter has pointed out both the direct and indirect reasons of trade deficit in Vietnam for the period 2000-2009. The main reason discovered was not originated from the final demand which comprised only 10% of total imported commodities of the whole economy. It was because of the degradation of manufacturing industry with low productivity, poor technology and the continuous increase of intermedaite inputs per gross output during this period .

To achieve remarkable improvement on economy, each country needs to do much more than just invest money in building factories and industrial zones. Instead, it requires an entirely different way of developing the economy. The era of assembling products designed by developped countries, with imported technology should be replaced by investing more heavily in R&D on their own and employing highly educated and skilled workers to turn those investments into new products and profits.

The protection policy of Vietnam was arbitrarily implemented creating disadvantages for the competing-sectors, even their ERP were minus. The results of study proved that the sectors including agriculture, forestry and fishery had high economic multiplier and low import multiplier. These groups of sectors should be considered as priority sector enjoying production protection through ERP.

The power of dispersion on import was continuously increasing induced by export. Hence, the suggestion that “strengthen export and restrict import is needed” seems to be a paradox. In order to issue an appropriate and comprehensive development economic policy,

policy-makers must be carefully considerate not to take models of the United States or Japan economies’ policy for Vietnam such as devaluated Vietnam dong. The results have been presented above clearly proved that the devaluation of Vietnam dong will have negative impact for the Vietnam’s economy.

Chapter 9

Conclusions

9.1 A Brief Summary

Since developed by Professor Wassily Leontief in the late 1930s, the basic concepts set forth by Leontief are still key components of many types of economic analysis until now.

In the development of more general or economy wide models, the initial addition to standard input-output systems has been viewed as the social account matrix most closely associated with Stone (Pyatt and Round, 1985; see also Hewings and Madden, 1985). After that, in the 1968 System of National Account (SNA) and 1993 SNA put forward main rules for compiling input-output table. Of course in 1993 SNA only referred to supply and use tables in order to substitute the input-output table; while 1968 SNA recommends the supply and use tables as intermediate steps for compiling the input-output table. Most Asean countries until this moment use the input-output table in order to apply for economic analyzing and expansion to social account matrix, demographic-economic model or inter-regional input-output framework.

This dissertation has presented two major research on field of “IOS”. The first field of “IOS” is “compilation and expansion of IOS” and second field is the “application of IOS”. The first field includes the compilation official National input - output table of Vietnam, update the National input - output table by hybrid approach , approach for converting from supply and use table to input-output table, the way in order to estimate the input-output table from competitive-import type to non-competitive- import type in occasion limitation data of Vietnam; this part includes also some types of input-output expansion such as social accounting matrix, inter-regional input-output framework. The second field presented some applications of National and Regional wide(inter-regional) IOS for analyzing the economic structure, inter-industrial effects, effective rate of protection and import multipliers of National economic and internal, external and inter-regional feedback effect for inter-regional cooperations.

Chapter 2 overviews technical arspects for feasiblie IO compilations. Regarding to IO compilation, Table 2.13 ilustrates one of the main summary of overviewing feasible compilation of Hybrid IOT. Traditional approach of Benchmark IO compilation in Vietnam by the Governemnt has been clarified Hy-brid survey and Hybrid Compiled IOT (SNA based IOT). This approach is also same as USA's IOT compilation. From this chapter, we also get solution that second best (or feasible) IO compilation should be based on Hybrid survey and Hybrid compiled IOT.

Table 2.13 Feasible compilation of Hybrid IOT

Point I			I. Level of Consistency with Symetric Input Output Table (SIOT) Compilation			
			(1) Level of consistentcy with input output structure	Direct estimation of SIOT based on survey data	Transforamtion from Asymmetry Table into SIOT	
			(2) Level of treatment of secondary product adjustment for estimation	Treatment of secondary product adjustment for estimation		No-treatment of secondary product adjustment for estimation
			(3) Level of consistency with SNA	Not-using Supply (Make) and Use Table (Not consist with SNA)	Using Supply (Make) and Use Table (consist with SNA)	
			(4) Level of hamonized sector classification (CPC, ISIC)	Treatment of secondary product adjustment for estimation		No-treatment of secondary product adjustment for estimation
Point III			III. Type of IOT	Dirct SIOT compilation (Activity-by-Activity, Commodity-by-Commodity Table)	Indirct SIOT compilation from asymmetry data (Commodity-by-Industry, or Industry-by-Commodity based data)	
Point II					Hybrid SIOT compilation	Indirect SIOT compilation from sedondary rectangrar form based data.
II. Level of Using Original Information	(1) Using survey based data for all of component	Survey Based IOT	Full survey based SIOT	Full survey and Direct compiled IOT (No-SNA based IOT)	Full survey and Hybrid compiled IOT (SNA-base IOT)	Full survey and Indrect compiled IOT (Not consistency with IO structure)
	(2) Using survey based data for main component					
	(3) Bollowing processing data from other sources for main component		Hybrid SIOT	Hybrid survey and Direct compiled IOT (No-SNA based IOT)	Hybrid survey and Hybrid compiled IOT (SNA-base IOT)	Hybrid and Indrect compiled IOT (Not consistency with IO structure)
	(4) Bollowing processing data and coefficient from other sources for all of component		Non-survey based SIOT	Non survey and Direct compiled IOT (No-SNA based IOT)	Non survey and Hybrid compiled SIOT (SNA based IOT)	Up-dated and Indrect compiled IOT (Not consistency with IO structure)

Chapter 3 presents the approach for compiling social account matrix in Vietnam without survey. The methodology of chapter 4 is based on Sonis and Hewings (1993) inter-regional economic systems analysis of Miyazawa (1966,1971); Moreover, instead of doing research on interaction between regions, this paper lays emphasis on linkages of manufacturing and non-manufacturing. The linkages in the economy of Vietnam are based on three national I-O tables (1989, 1996 and 2000). The independencies and interdependencies between groups of manufacturing sectors and non-manufacturing sectors are considered in input-output system. This chapter lays focus on the current phases of the economic transition of Vietnam (1986-2004) by exploring the three national input-output tables (1989, 1996 and 2000). The interrelationships between the structural change groups of manufacturing industries and non-manufacturing industries is examined using internal and external multipliers. The primary focus in this study is on measures of inter-industries linkages within and between two different economic production groups, manufacturing and non-manufacturing, and total output requirement decomposed by direct, indirect, induce impacts on output thought these linkages following time. Further, price impacts also are estimated based on input-output tables at a constant price (1994 price).

There are different ways to develop input-output framework initiated by W. Leontief. Those may be the Social Accounting Matrix (SAM) extended by Richard Stone, the Inter-regional input output framework developed by Miyazawa, Demographic-economic modeling with income multiplier matrix proposed by Miyazawa, Sonis and Hewing; and the Hybrid Input – Output table linking Environment and Economic activities started by Miller and Blair. Kalecki (1954) divided value added into labor income and capital income as compensation of employees and capitalists. In his demographic-economic modeling, Miyazawa (1976) divided the value added by income groups and classified their consumption accordingly. Further, Miyazawa traces the development of the income multiplier from the relatively simple Keynesian structure to the full interrelational income multiplier for income groups. However, in his study, Miyazawa did not pay much attention to capital income and investment activity as well as their induced effects on the economy.

Chapter 5 tries to reorganize value added flows, in which it consists of net income from capital and net income from labor. In addition, the later is further divided into two sub-income groups, i.e. rural and urban. It is assumed that net income from capital is used to reinvest only while net income from each group of labor (including compensation of employees plus redistribution of operating surplus) is used completely for consumption and savings. Under these assumptions, demographic-economic modeling of Miyazawa could be extended for calculating interrelational income multiplier matrix. In addition, investment multiplier as well as income and consumption multipliers for each groups are also computed and analyzed. Based on Miyazawa interrelational income multiplier concept, we try to understand how the income of one group can be generated by another group's income in the context of Vietnam presently.

The structure of interregional linkages have been common topics of discussion in regional analysis; attention has been directed to problems of interregional feedback effects and the degree to which change originating in one region has capacity to influence activity levels in another region, in turn, will effect activity back in the region of origin.

While Miller (1966, 1969) proposed a formulation of the feedback process to handle this problem, Miyazawa suggested an innovative way of partitioning the system of regions that resulted in the identification of what are now referred to as internal, external multipliers interregional feedback effects.

From time to time, Input - Output model systems have been applied in estimating economic – environment linkages. Further, the economic interregional input output model system can be applied in analysis impacts on residuals generated by interregional economic activities.

Chapter 6 will be processed with case study of HoChiMinh City (HCMC) and the Rest of Vietnam (ROV) based on interregional input-output approach. The Vietnam interregional input-output table was constructed by the hybrid approach from National competitive input-output table and HoChiMinh competitive input-output table in 2000. The national IO tables was compiled by Vietnam General Statistical Office (GSO) and published in 2003, The HoChiMinh input output table was compiled as a joint undertaking between HCMC Province statistical Office GSO with financial assistance provided by the HCMC's people and Provincial committees. This particular study was made possible with the availability of the just-completed research project on the compilation of the 2000 Bi-region Inter-Regional IO (IRIO) Tables for the Vietnamese economy, with HoChiMinh City as the area of interest. As such, this two-region table specifically divided the country into: Region 1 - HoChiMinh City, and Region 2 – the Rest of Viet Nam. The resulting IRIO table shows, in its compact form, the intra- as well as the inter-regional economic transactions at the two-region level of spatial delineation.

Chapter 7 is an attempt of a private research group to extend the use of the official Vietnam national I-O tables. The National I-O tables provide information on inputs and outputs of goods and services among industries, final demand and value added. In this study, domestic trade flows and foreign trade flows, the flows of goods and services between various economic sectors within each region and among different regions must be estimated as these flows are not reflected in the national I-O table. These flows are the attributes differentiating an inter-regional I-O model from a single-region model.

Chapter 8 present some applies in order to search why is Vietnam trade deficit higher by time.

9.2 Future direction

The official National input-output system were compiled at Vietnam in 1989, 1996, 2000, 2007 but these tables were compiled with type of competitive-import, that mean the import were not shared from intermediate consumption and domestic final demands, this problem sometimes does not require analyzing on the high deficit countries' economic situation. That is why we have to move from the input-output table at competitive-import type to non-competitive type.

The 1993 SNA recommendation needs only to compile supply and use tables substitute input-output table, but almost ASEAN countries till now use input-output tables for researching their economy, moreover the supply and use tables is very difficult for moving to non-competitive type and inter-regional effects.

In fact, the use of the input-output system for analyzing in Vietnam is very limited. Almost of the reason would be supposed that capacity level of compilation and utilization of Integrated database for policy modeling in Vietnam is still very low. One reason is the taking huge sank cost of knowledge asset for IO compilation and utilization. In Vietnam, due to the serious governmental bureaucracy and poor capacity level for applied scientists, there have been the lack of actual opportunity of institutional collaboration for knowledge sharing within practical expart and academic people in Vietnam, it is still not popular method for understanding regional ecomoic feature and other is that it is difficult to approach to regional IO data for regional economic analysist. For example, some Vietnamese doctors go back from Japan, Australia and other developed countries after obtaining PhD on CGE model or a similar degree. However, unfortunately, almost of them don't have the experience to learn actual essence of economic statistics.

Many regional economist or Engineer economist in Vietnam and other Asian countries have just done the descriptive analysis on regional development problem when they approach this topic. Under the limitation of access to regional IO for many economist in Vienam and outside Vietnam in Asian, it is meaningful to consider how to estimate IO data from existence of data. In current international society (espessilaly Asian-Pasific region), now is the important time to re-consider technical compatibility of statistic harmonization for policy analysis of international integration.

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