

**Construction of an Inter-Regional Input-Output Table for Vietnam  
by the Hybrid Approach: The Case of Ho Chi Minh City and the Rest of Vietnam**

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## **I. Introduction**

This paper is concerned with the general methodology adopted in the empirical investigation of regional economies by the input-output (I-O) approach. In this paper, special consideration is given to the mixed or the so-called hybrid approach of compiling the bi-region inter-regional I-O table for the Philippine economy as a pioneering research project between TUT- CERE.

The first sections of this paper present an overview of the status of I-O accounting in the Vietnam and a review of literature on regional I-O compilation techniques. Section IV describes the conceptual and accounting framework of the bi-regional I-O model used, followed by a fairly detailed discussion of the general procedure of compilation under the hybrid methodology. The non-survey technique of generating regional I-O coefficients is also being described and illustrated so that clear distinction between the two approaches could be made.

The next section deals with a summary discussion and illustration of the significant findings of the empirical study. It highlights an analysis of the relative differentials of calculated total (direct + indirect) output multipliers.

Finally, the paper concludes with some recommendatory measures geared towards improving I-O research methodologies, given the existing limitations of the hybrid approach.

## **II. Overview of National, Regional and Input-Output Accounts Compilation in Vietnam**

### **National Accounts**

In line with Vietnam's transition to market economy in 1986, the GSO shifted its framework of compiling the country's economic accounts from the Material Product System (MPS) to the U.N. System of National Accounts (SNA). As shown in Table 2, the GSO through its System of National Accounts Department (SNAD) started compiling the country's annual national accounts based on the UNSNA in the early 1990s. This initial activity was made possible with technical and financial assistance provided by UNDP. Later on, ADB provided technical assistance grant to help improve the compilation of the national accounts including the construction of I/O tables.

Currently available are national accounts time-series data from 1986 onwards. Compilation of quarterly national accounts started only in 1998.

### **Regional GDP**

At the regional level, the SNAD started compiling regional GDP in 1993 based on data provided by Provincial Statistical Offices (PSO). Currently, the country is divided into 8 economic regions, namely: Red river Delta, North East, South Central Coast, Central Highlands, North East South, North West, North Central Coast, and Mekong River Delta. regions

### **National I/O Tables**

Compilation of national I/O tables started also in the early 1990s with the compilation of the 1989 benchmark I/O table. The latest national I/O table relates to CY 2000 with sectoral dimension of 112 production sectors, 6 final demand and 4 primary input (or value added) components. In between 1989,1996 and 2000, annual I/O updating had been also undertaken to provide users with more current I/O data.

Currently, the national I/O table is of the competitive-imports type wherein no distinction is made between local and imported inputs. Due to lack of data on import transactions, the compilation of non-competitive I/O tables has been deferred. It is, however, expected that SNAD's ongoing activity of compiling the 2005 national I/O table will be able to compile an import matrix in order to generate a non-competitive type of I/O table. I/O analysis yields more meaningful results by using the non-competitive type.

**Table 1. History of National Accounts and I/O Compilation in Viet Nam**

Type of Economic Account	Start of Compilation ( based on SNA )	Frequency of Compilation	Compiler
<b>1) National Accounts</b>			
a) Annual	1992 ( UNDP sponsored)	annual	SNA Dept., GSO
b) Quarterly	1998	quarterly	SNA Dept., GSO
<b>2) Regional GDP</b>			
	1993	annual	SNA Dept., GSO
<b>3) National IO Tables</b>			
a) Benchmark	1989	1996,2000	SNA Dept., GSO
b) I/O Update	Annual updating starting in 1990		SNA Dept., GSO
<b>4) Regional I/O Tables</b>			
HO CHI MINH	1996	2000	Economic Institute of HCM, HCM PSO
Red River Delta Region	1996	one-time	Project Staff, LOICZ Project
<b>5) Interregional I/O Tables</b>			
HO CHI MINH City-The rest of	1996	2000	Private researcher group

Vietnam			NISSAN project
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### **Regional I/O Tables**

So far, two (2) regional I/O tables have been compiled since the new SNA was adopted by the Vietnam statistical system. One was a small (11-sector) table for the Red River region that was compiled by an independent group that was mainly utilized in an environmental impact project study. The other was for Ho Chi Minh (HCM) City that was compiled with financial assistance from the HCM Economic Institute. The HCM table is an intra-regional table that was constructed based on

\* The authors assume sole responsibility for the opinions expressed in this paper.

**We want to mention about situations of Asian IRIO in this chapter.**

Nation	Single Region/Nation IO table		Inter-Regional IO	
	National	Regional	Bi-regional IO	Multi-regional IO
JAPAN	yes	yes	Yes(tokyo)	Yes(10 regions)
China	yes	yes	yes?	?(IDE)
S-Korea	yes	non	Non	Yes?
Philippines	yes	non	Yes?	Yes?
Indonesia	yes	?	?	Yes?
Thailand	Yes	Non	Non	Non
Vietnam	Yes	yes	yes (by hybrid approach)	yes (we are compiling multi-regional IO between HoChiMinh C, Danang C and rest of Vietnam)
Laos	Non	Non	Non	Non
Cambodia	Non	Non	Non	Non

### III. Review of Literature on Techniques of Constructing Regional I-O Tables

In a review of the history of regional I-O making, Jensen described the different stages in regional I-O construction. The early stages of the development of regional input-output tables involved the work of Isard in 1953 and then Isard and Kuenne in 1953. This involved the usage of unadjusted national coefficients. Then, the next stage involved the use of national coefficients as first approximations of regional coefficients (Moore and Petersen, 1955). The third stage which was called the classical era of regional input-output, gave rise to the existence of “genuine“ regional tables, based on regional data. Those who created genuine regional I-O tables

included Hirsch (1959) who created a regional I-O table for Boulder, then Miernyk et al in 1967. Other states which had regional I-O tables then were West Virginia (Miernyk , 1970); Philadelphia (Isard and Langford, 1969; Isard,Langford and Romanoff, 1966-68; Isard & Langford, 1971); Kansas ( Emerson and Hackmann 1971 ); Washington (Bourque et al 1967). According to Jensen, this was “ the era when professionalism in table construction was at its height, and when researchers shared a unity of purpose. Researchers were engaged in large empirical exercises to develop tables that carried their personal and professional imprimatur and warranty.

However, the high cost of time delays associated with survey-based tables caused the emergence of alternative non-survey techniques in regional I-O construction. One type of non-survey technique used was the usage of quotient-type, single-step methods that produced regional tables as mechanical mini-versions of national tables.

A third approach was the emergence of hybrid tables based on a mixture of survey and non-survey methods that harnessed the advantages of both approaches. Schaffer (1976), Jensen, Mandeville and Karunaratne in (1979) utilized these methods.

From hereon, the trend in regional input-output table construction focused on the derivation of the multipliers from the Leontief inverse, with definitional changes in multipliers. The conventional system of multipliers was still used by Miernyk (1965) and Richardson (1972). West and Jensen (1980) produced a consistent system of multipliers that was adopted in some countries and was similar to the system proposed by Blair and Miller (1985). Multi-regional multipliers were devised by Dipasquale and Polenske (1980) and then by Round in (1985). Therefore, regional input-output construction has proceeded from the classical context to the situation where several systems coexist in the production of regional tables and multipliers. According to Jensen, there is now a transition from the classical era where the integrity of the table was first priority and the application of the technique was a “ high level of exercise of substantial professional merit.“ The modern era in input-output appears to be heading toward the situation where the integrity of the table is of lower priority and instant results are the norm. Furthermore, Jensen added that the adoption and diffusion path of regional input-output analysis followed this pattern – first knowledge of the technique spread first to a wide range of researchers with interests in theoretical issues, extensions to the model, in experimental empirical applications in a wider context and in making the technique more relevant in a world with a dearth of readily applicable techniques of economic analysis. The experimental applications gained stature in professional circles due to the robustness of the technique and effective dissemination of techniques.

Two possible directions may be tapped with regards to the future of regional input-output construction. The first is the predominance of ready-made models that have “best quality short cut results“. More improvements have to be made on the theoretical and logical structure of such models. The second direction is the integration of survey data with non-survey data in a hybrid

or mixed-type of I-O tables. This is where the classic tradeoff between accuracy of the table and cost or computational expediency in the derivation of regional input-output tables could be attained.

#### IV. Construction of Bi-Region IRIO Table for the Vietnam

##### IV-1. Model Used

A single-region I-O model such as the 1994 NCR intra-regional table, as the initial output of the JSPS-sponsored I-O research project in the Vietnam, 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 in 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 capture feedback/spillover effects that are primarily attributable to inter-regional trading. In view of this perceived analytical constraint, a doable bi-region, and subsequently a multi-region, accounting framework was developed and adopted in the construction of inter-regional I-O tables.

Illustrated in *Figure 1* is a layout of the conventional bi-region inter-regional I-O model of the static, open type. It is actually a configuration of the accounting framework adopted in constructing the bi-region IRIO table wherein the Philippine territory was divided into two economic regions, namely: Ho Chi Minh or National Capital Region (NCR) and the Rest of Vietnam (ROP).

In accordance with the study's terms of reference, the basic table was designed to cover some 84 intermediate sectors, 8 final demand and 4 value added components. Year 1994 was purposely chosen as the reference period in order to synchronize the regional I-O compilation with that of the 1994 mother national I-O table. Thus, numerical consistency with the national I-O table is achieved.

Figure 1. BI-REGION (NCR-RO) IRIO ACCOUNTING FRAMEWORK

To	INTERMEDIATE DEMAND		FINAL DEMAND		GO
	NCR	ROP	NCR	ROP	
From	1 ... j ... 84	1 ... j ... 84	1 ... k ... 4 E (M)	1 ... k ... 4 E (M)	
	1				

NCR	$\begin{matrix} \vdots \\ i \\ \vdots \\ 84 \end{matrix}$	(I) $X_{ij}^{NN}$	(II) $X_{ij}^{NR}$	(III) $F_{ik}^{NN}$	$E_i^{NW}$ 0	(IV) $F_{ik}^{NR}$	0 0	$X_i^N$
ROP	$\begin{matrix} 1 \\ \vdots \\ i \\ \vdots \\ 84 \end{matrix}$	(V) $X_{ij}^{RN}$	(VI) $X_{ij}^{RR}$	(VII) $F_{ik}^{RN}$	0 0	(VIII) $F_{ik}^{RR}$	$E^{RW}$ 0	$X_i^R$
ROW	$\begin{matrix} 1 \\ \vdots \\ i \\ \vdots \\ 84 \end{matrix}$	(IX) $X_{ij}^{WN}$	(X) $X_{ij}^{WR}$	(XI) $F_{ik}^{WN}$	0 $(M_i^{WN})$	(XII) $F_{ik}^{WR}$	0 $(M_i^{WR})$	0
GVA	$\begin{matrix} 1 \\ \vdots \\ p \\ \vdots \\ 4 \end{matrix}$	(XIII) $V_{pj}^N$	(XIV) $V_{pj}^R$	(XV) 0	0 $MDT^N$	(XVI) 0	0 $MDT^R$	GDP
GI=GO		$X_j^N$	$X_j^R$	$\Sigma F_k^N$	$\Sigma E^N$ $\Sigma (M^N)$	$\Sigma F_k^R$	$\Sigma E^R$ $\Sigma (M^R)$	

Abbreviations: NCR: National Capital Region  
ROP: Rest of the Vietnam  
ROW: Rest of the World  
GVA: Gross Value Added

GO: Gross Output  
GI: Gross Input  
GDP: Gross Domestic Product  
MDT: Import Duties and Taxes

The balance equations, in matrix notations, can be formed from Figure 1, as follows:

$$X_i^N = X_{ij}^{NN} + X_{ij}^{NR} + F_{ik}^{NN} + E_i^{NW} + F_{ik}^{NR} \quad (1)$$

$$X_i^R = X_{ij}^{RN} + X_{ij}^{RR} + F_{ik}^{RN} + F_{ik}^{RR} + E_i^{RW} \quad (2)$$

where:

- $X_i^N$  : vector of NCR outputs
- $X_{ij}^{NN}$  : matrix of NCR product i consumed by NCR production sector j
- $X_{ij}^{NR}$  : matrix of NCR product i consumed by ROP production sector j
- $F_{ik}^{NN}$  : matrix of NCR product i consumed by NCR domestic final demand k
- $E_i^{NW}$  : vector of NCR export of product i to ROW
- $F_{ik}^{NR}$  : matrix of NCR product i consumed by ROP domestic final demand sector k
- $X_i^R$  : vector of ROP outputs
- $X_{ij}^{RN}$  : matrix of ROP product i consumed by NCR production sector j;
- $X_{ij}^{RR}$  : matrix of ROP product i consumed by ROP production sector j
- $F_{ik}^{RN}$  : matrix of ROP product i consumed by NCR domestic final demand sector k;
- $F_{ik}^{RR}$  : matrix of ROP product i consumed by ROP domestic final demand sector k
- $E_i^{RW}$  : vector of ROP export of product i to ROW

Based on Leontief's assumption of linearity in production cost functions, i.e.  $a_{ij} = x_{ij}/x_j$ , we have the following regionally-defined structural equations:

$$A^{NN} = X^{NN}/X^N \quad (3)$$

$$A^{NR} = X^{NR}/X^R \quad (4)$$

$$A^{RN} = X^{RN}/X^N \quad (5)$$

$$A^{RR} = X^{RR}/X^R \quad (6)$$

Equations (3) and (6) represent the intra-regional direct input coefficients, while equations (4) and (5) account for the inter-regional trade coefficients. Substituting these structural equations into equations (1) and (2), we have:

$$X^N = A^{NN}X^N + A^{NR}X^R + F^{NN} + E^{NW} + F^{NR} \quad (7)$$

$$X^R = A^{RN}X^N + A^{RR}X^R + F^{RN} + F^{RR} + E^{RW} \quad (8)$$

Simplifying equations (7) and (8), we have the Leontief's estimating equation for a 2-region inter-regional I-O model, in matrix form:

$$X = B * F \quad (9)$$

where: X is the matrix of total output requirements; B is the matrix of inter-regional inverse coefficients, further decomposed into sub-matrices B<sub>nn</sub>, B<sub>rr</sub>, B<sub>nr</sub> and B<sub>rn</sub>; and F is the matrix of final demand.

$$B_{nn} = \left[ I - A^{NN} - A^{NR} \left( I - A^{RR} \right)^{-1} A^{RN} \right]^{-1} \quad (10)$$

$$B_{rr} = \left[ I - A^{RR} - A^{RN} \left( I - A^{NN} \right)^{-1} A^{NR} \right]^{-1} \quad (11)$$

$$B_{nr} = A^{NR} \left( I - A^{RR} \right)^{-1} \quad (12)$$

$$B_{rn} = A^{RN} \left( I - A^{NN} \right)^{-1} \quad (13)$$

where the A's are the input coefficient matrices in the inter-regional table; N and R refer to NCR and ROP, respectively.

#### IV-2. Methodology Employed

The hybrid approach of constructing regional I-O tables was adopted in this bi-region (NCR-ROP) IRIO study. This alternative method, which is a blending of survey and non-survey methods of I-O compilation, was followed in view of the availability of regional survey data for CY 1994 as the chosen reference period. The hybrid method starts with the compilation of the intra-regional tables of the competitive type by utilizing primary as well as secondary data. These include, among others, such major data sources as the 1994 Census of Establishments (1994 CE), the 1994 ad hoc I-O Survey of Establishments (IOSE) and the 1994 Family Income and Expenditure Survey (1994 FIE) . Their availability made possible the building of intra-regional structures on sectoral outputs and inputs as well as final expenditure patterns, given official time series data on regional gross domestic product (GRDP) and expenditure (GRDE) estimates serving as the control totals.

The second phase of the overall compilation work involved the conversion of the resulting competitive intra-regional table into a non-competitive type wherein distinction is made between regionally produced and non-regionally produced goods and services. Non-regionally produced commodities refer to imports either from abroad or from the other regions of the domestic economy or domestic inflows. The competitive-to-noncompetitive conversion process therefore requires the construction of two supporting tables, one for (foreign) imports and another to account for domestic inflows.

In view of the lack of existing data on foreign and domestic flows at the sub-national level, an indirect estimation technique was adopted in compiling the supporting tables on foreign and domestic inflows.

#### Indirect Estimation of (Foreign) Import Flows

The first step was to build the foreign imports table consisting of Blocks IX to XII as shown in Figure 1. Estimation of regional imports utilized import content ratios derived from the national I-O table on the assumption that consumption of imported commodities by regional sectors, whether intermediate or final, follows the same import usage pattern of corresponding national sectors. For the NCR I-O table, its foreign import content is estimated as:

$$X_{ij}^{WN} = m_{ij}^{WP} \cdot {}^C X_{ij}^{NN} \quad (14)$$

where:  $X_{ij}^{WN}$  is estimated import value of NCR product i consumed by NCR sector j;

$m_{ij}^{WP}$  is import content ratio of national product i consumed by national sector j;

${}^C X_{ij}^{NN}$  is competitive input value of NCR product i consumed by NCR sector j.

The same equation (14) is used in estimating the imports table for ROP.

The second step was to estimate domestic inflows using the well-known simple location quotient (SLQ) method.

Indirect Estimation of Domestic Flows: The SLQ Method

The SLQ method 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 of product  $i$  in region  $R$  is calculated as:

$$SLQ_i^R = \frac{Q_i^R/T^R}{Q_i^N/T^N} \quad (15)$$

where:  $Q_{ri}$  : output of industry  $i$  in region  $r$ ;

$Q_{ni}$  : output of industry  $i$  in the Nation;

$T_r$  : total output in region  $r$ ;

$T_n$  : total output in the Nation.

An SLQ is one measure of the region's self-sufficiency in production. Thus, from equation (15), if  $SLQ_i$  is less than unity, the region imports some of product  $i$  elsewhere from other regions. On the other hand, if  $SLQ_i$  is greater than 1.0, the region exports some of its industry's output. If  $SLQ_i$  is equal to 1.0, the region is viewed as self-sufficient with respect to output  $i$ .

In this study, SLQs are used to estimate inter-regional domestic inflows. These are applied along the rows of the intra-regional table generated in step 1 (i.e. non-competitive with respect to foreign imports) for sectors with SLQs of less than unity. That is, for the NCR economy,

$$X_{ij}^{RN} = SLQ_i^N \cdot {}^{ncm}X_{ij}^{NN} \quad (16)$$

where:  $X_{ij}^{RN}$  is the value of ROP's commodity  $i$  produced by its sector  $j$  consumed by NCR's sector  $j$  in production;  $SLQ_i^N$  is the calculated SLQ of product  $i$  in NCR; and  ${}^{ncm}X_{ij}^{NN}$  is the value of commodity  $i$  (net of foreign imports) consumed by NCR's sector  $j$  in production.

If  $SLQ_i$  is greater than or equal to 1.0, equation (16) is not applied because the region is assumed to be self-sufficient and therefore no domestic imports are needed. The resulting NCR's domestic inflows are recorded in block V (intermediate demand) and block VII (final demand). Similarly, ROP's inflows are reflected in block II (intermediate) and block IV (final).

In a 2-region IRIO model, domestic outflows need not be explicitly calculated because domestic inflows of one region are the domestic outflows of partner region. For example, block II (NCR's outflow to ROP's intermediate demand) should equal the estimated intermediate inflow matrix of ROP. Obviously, however, this equality do not hold true in a multi-region (say, 5-region) IRIO compilation, thus underscoring the need for indirect estimation of inter-regional trade (outflow and inflow) coefficients in the absence of actual trade flow data.

Blocks I, III, VI and VIII record the intra-regional consumption structures of regionally produced goods and services. Vectors E (exports) are independently estimated using indicators available from the Census of Establishments.

As in national I-O compilation, the final step is the balancing or “arbitraging” work that involves reconciling the inherent economic accounting identities, i.e. (1) total output of sector  $i$  (in the rows) should equal to total input of sector  $j$  (in the columns) where  $i = j$ , and (2) total GVA (or GRDP) = total final demand (or GRDE). Moreover, prime consideration should be given in maintaining numerical consistency between the generated IRIO table and the national I-O table.

#### IV-3. Distinction Between Hybrid & Single Non-Survey Technique

##### SLQ Method of Regionalizing National I-O Coefficients

The widely used non-survey technique of producing regional I-O tables is the SLQ method. It is one expedient, single-step method of regionalizing nationalizing I-O coefficients. In equation form,

$$a_{ij}^r = SLQ_i^r \cdot a_{ij}^n \quad (17)$$

where:  $a_{ij}^r$  is the ratio of product  $i$  consumed by industry  $j$  in region  $r$ ;  $a_{ij}^n$  is national input ratio of product  $i$  consumed by industry  $j$ ; and

$$SLQ_i^r = \begin{cases} SLQ_i^r & \text{if } SLQ_i^r < 1.0 \\ 1.0, & \text{if } SLQ_i^r \geq 1.0 \end{cases} >$$

In this case study, the estimation of SLQs using equation (15) was based on available data on regional gross outputs. On the other hand, data on regional employment by industry, which are normally generated more timely than output statistics, could be used as proxy indicators of regional economic activity. It can be observed from equation (15) that in those cases where  $SLQ_i$  is less than 1.0,  $a_{ij}^r$  is less than  $a_{ij}^n$  for all  $j$  industries. The positive difference is a measure of the extent of importing the  $i$ th sector’s output and this is transferred to the import row of the non-competitive-type of I-O table. If  $SLQ_i$  is greater than or equal to 1.0, then  $a_{ij}^r$  and  $a_{ij}^n$  are equal, and the region is assumed to be self-sufficient with respect to output  $i$ . As an illustration, a hypothetical 3-sector national I-O coefficient table (Table 1) is shown below with calculated regional SLQs. And using equation (17), the following table of input coefficients for Region R is generated (Table 2) In Table 2, cell entries for row and column sectors (1, 2, 3) represent region R’s input coefficients of locally or regionally produced goods and services. Imports row represent (foreign + domestic) imported inputs required in production.

It can be observed from Tables 1 and 2 that, while their respective cell elements differ due to the SLQ adjustment process, total intermediate input (TII) coefficients in both regional and national tables remain to be equal. Hence, there exist no technology differentials in terms of total intermediate input consumption between national and regional industries. In effect, regional and national GVA ratios are also equal.

One glaring advantage of the single-step SLQ approach is that it is a simple and fast method and therefore less costly than the survey and hybrid methods. Its accuracy depends on the reliability of the estimated regional SLQs. On the other hand, one disadvantage of the SLQ method is that, since it deals only with regionalizing national I-O coefficients, it is constrained by its inability to generate a full regional I-O table, unlike in the hybrid approach.

Table 1. National Input Coefficients and Region R's SLQs

SLQ <sup>R</sup>		1 <sup>st</sup> Industry	2 <sup>nd</sup> Industry	3 <sup>rd</sup> industry
1.2	1	0.10	0.30	0.10
0.6	2	0.25	0.15	0.10
1.0	3	0.05	0.15	0.20
	TII	0.40	0.60	0.40

TII = total intermediate inputs

Table 2. Generated Input Coefficients for Region R I/O Table

	1 <sup>st</sup> Industry	2 <sup>nd</sup> Industry	3 <sup>rd</sup> industry
1	0.10	0.30	0.10
2	0.15	0.09	0.06
3	0.05	0.15	0.20
Imports	0.10	0.06	0.04
TII	0.40	0.60	0.40

Table 3 summarizes the distinction between the hybrid and non-survey method of producing regional I-O 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 of regional tables. The hybrid approach used actual regional data, while the non-survey method adopts the national I-O coefficients as the first approximation of the production structure of the region under study. It can thus be concluded that, with actual regional data on hand, the hybrid method is able to portray regional variations in sectoral input structures in the compilation of the basic tables, unlike in the non-survey method wherein structure of regional technology is “borrowed” from the national I-O table.

Table 3. Distinction Between Hybrid and Non-Survey Methods

Procedure	Output Tables	Methodology	
		Hybrid (HB)	Non-Survey (NS)
STEP I Compilation of Single Region IO table (Ho Chi Minh, Rest of Vietnam)	1. Competitive Table	Used actual regional data	Adopted national I-O coefficients
	2. Foreign Imports Table	Used national import content coefficients	Adopted national import content coefficients
	3. Non-competitive Table (net of foreign imports)	Output 1 minus Output 2	Adopted national I-O coefficients
STEP II Estimation of inter -	4. Domestic Inflow Table	Used SLQ method	Used SLQ method

regional commodity flow			
STEP III Integration and compilation of Inter- Regional IO	5. Non-competitive (net of foreign imports & domestic inflows)	Output 3 minus Output 4 (In values & coefficients)	Output 3 minus Output 4 (In coefficient form only)

Generation of Outputs 2 through 5 follows similar estimation procedures for both methods but with different numerical results because these are derived from the basic tables (competitive) that emanated from different sources.

#### V. Output Multipliers Generated Under Hybrid & Single Non-Survey Methods

Shown in Table 4 below is a comparison of calculated total (direct plus indirect) output multipliers based on the hybrid (HB) and non-survey (NS) methods, respectively. Total output multipliers are the total output requirements induced by a unit increase in final demand and these are the column sums of their respective inverse coefficient matrices. The HB inverse matrices were calculated based on the full intra-regional I-O tables for NCR and ROP constructed using the HB approach, while the NS inverses were computed from the regional coefficients derived using the SLQ-based non-survey technique as described and illustrated in section IV-3.

It can be observed from Table 4 and illustrated in Figure 2 that, at the 11-major sector level of classification, it appears that, in the NCR, HB-based output multipliers in all sectors except agriculture, fishery and forestry (sector 1) are relatively lower (negative signs) than non-survey-based with the encircled sectors electricity, gas and water (sector 4), trade (6) and mining (sector 2) exhibiting double-digit negative differentials. Or alternatively, NS-based multipliers are observed to be overstated.

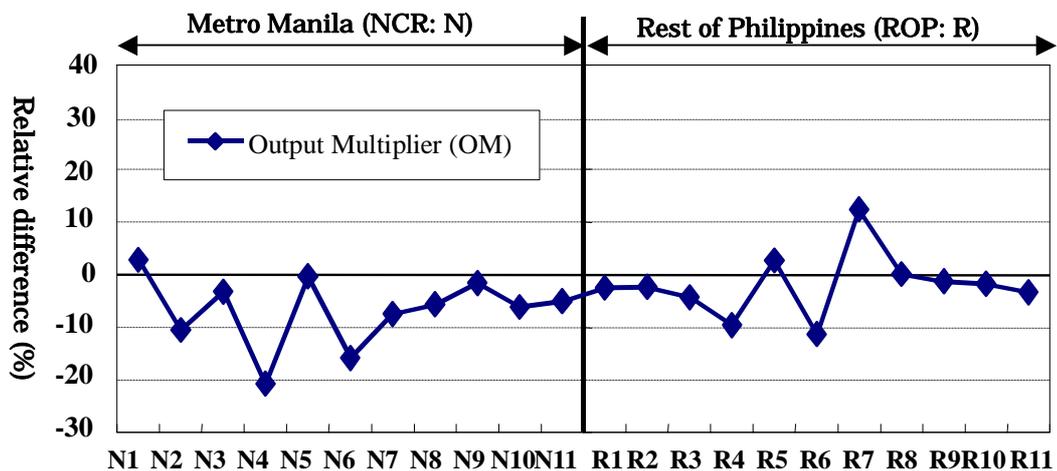
One probable reason for the overstatement of NS multipliers is the use of national input coefficients as proxies to regional input structures. For example, the electricity, gas and water sector in the NCR registered an HB-based multiplier much lower than the NS-based (HB=1.167 vs. NS=1.471) because production in these sectors is predominantly carried out outside of the NCR or the Ho Chi Minh area. The NCR economy is therefore a net importer of these utility services; hence its actual regional input coefficient should be expected to be lower than the national average coefficient used in the initial approximation of NS-based regional coefficients.

**TABLE 4. COMPARISON OF TOTAL OUTPUT MULTIPLIERS: HB vs. NS,  
1996**

SECTOR		NCR>>>HCM			ROP>>>ROV		
CODE	DESCRIPTION	HB	NS	Relative Difference (%)	HB	NS	Relative Difference (%)
1	Agriculture, fishery & forestry	1.243	1.209	2.8	1.305	1.338	-2.5

2	Mining & quarrying	1.292	1.443	-10.5	1.419	1.452	-2.3
3	Manufacturing	1.323	1.367	-3.2	1.545	1.615	-4.3
4	Electricity, gas, steam & water	1.167	1.471	-20.7	1.362	1.507	-9.6
5	Construction	1.361	1.365	-0.3	1.414	1.377	2.7
6	Trade	1.302	1.548	-15.9	1.377	1.551	-11.2
7	Transport, Storage & Communication	1.288	1.393	-7.5	1.563	1.390	12.5
8	Finance	1.233	1.306	-5.6	1.282	1.281	0.1
9	Real Estate & Ownership of Dwellings	1.130	1.147	-1.5	1.147	1.161	-1.2
10	Other Private Services	1.379	1.468	-6.1	1.497	1.522	-1.6
11	Government Services	1.308	1.377	-5.0	1.304	1.349	-3.3

Figure 2. Relative Differences of Output Multiplier s: Hybrid vs. Non-Survey Method



#### Industrial sectors in NCR, ROP, 1994

In the ROP, HB-based multipliers are observed to be also lower than the NS-generated except for construction (5), transport, storage and communication (7), and finance (8) with the encircled sector of trade (6) registering a double-digit negative difference.

It can thus be inferred from the above findings that the use of national I-O coefficients as initial approximations of regional coefficients tends to overstate the resulting total output multiplier effects.

>>>> Can we estimate 1996's and 2000's of them? And Sector level will be 3-7-11-26(Same as Tokyo & Manila IO sectors)?

#### VI. Concluding Remarks

The hybrid approach, as the tradeoff between the survey and non-survey methods, was used in this study in view of the available, albeit limited, data required in compiling the 1994 regional I-O tables. It has been propounded that the only unique distinction between the hybrid method adopted in this study and the single-step, non-survey technique lies in the building of the basic tables, i.e. the regional input structures of the competitive type. While the hybrid approach utilizes actual regional I-O data, the non-survey method relies on national I-O coefficients as proxies to regional input structures.

A comparative assessment was further conducted of the empirical results using the hybrid and the non-survey methods. It has been inferred in this study that, on the assumption that actual regional data used in the hybrid approach are reliable, the use of national coefficients as initial approximations of regional input structures tends to overstate the total output multipliers.

#### Limitations of Hybrid Technique Used in Terms of Data Quality

- 1) Due to lack of actual survey data on inter-regional flows that conform to the conceptual framework of I-O accounting, i.e. the producer-to-user concept, the indirect SLQ method of measuring inter-regional trade was adopted.
- 2) Due to absence of data on (foreign) imports at the regional level, national import content ratios were used in building the imports table on the assumption that regional sectors follow the same import consumption pattern as the national sectors.
- 3) The building of detailed I-O structures is constrained by the limited scope and coverage of the ad hoc I-O survey for the national I-O, which is basically a small, purposive sample survey. It therefore underscores the need to improve the sampling design and spatial coverage of the survey.

#### Recommended Future Directions

Given the above major constraints of the hybrid approach adopted in this study, the following major statistical activities should be conducted to improve the adequacy and reliability of intra-regional and inter-regional I-O table compilation in the Vietnam:

Study to regionalize data collection/processing of foreign trade;

Conduct of ad hoc survey on inter-regional trade, given the I-O framework;

Improvement of the survey design of I-O ad hoc survey of establishments (IOSE) to be able to generate detailed I-O indicators at the regional level; and

To be able to conduct inter-temporal analysis, timely updating of regional I-O tables should be carried out.

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ANNEX A-1. REGIONAL COMPOSITION OF THE VIETNAM

REGION		PROVINCES/CITIES COVERED
NATIONAL CAPITAL REGION (METRO MANILA)  (NCR)		1. MANILA 2. QUEZON CITY 3. PASAY CITY 4.. KALOOKAN CITY 5. MAKATI CITY 6. MANDALUYONG CITY 7. PASIG CITY 8. MARIKINA CITY 9. VALENZUELA CITY 10. PARANAQUE CITY 11. LAS PINAS CITY 12. MUNTINLUPA CITY 13. PATEROS 14. TAGUIG 15. SAN JUAN 16. MALABON 17. NAVOTAS
REST OF PHILIPPINES (ROP)	CAR CORDILLERA	ABRA BENGUET IFUGAO KALINGA MOUNTAIN PROVINCE APAYAO
	I ILOCOS REGION	ILOCOS NORTE ILOCOS SUR LA UNION PANGASINAN
	II CAGAYAN VALLEY	BATANES CAGAYAN ISABELA NUEVA VIZCAYA QUIRINO
	III CENTRAL LUZON	BATAAN BULACAN NUEVA ECIJA PAMPANGA TARLAC ZAMBALES
	IV SOUTHERN TAGALOG	BATANGAS CAVITE LAGUNA MARINDUQUE OCCIDENTAL MINDORO ORIENTAL MINDORO PALAWAN QUEZON RIZAL ROMBLON AURORA
	V BICOL REGION	ALBAY CAMARINES NORTE CAMARINES SUR MASBATE SORSOGON

ANNEX A-2. REGIONAL COMPOSITION OF THE VIETNAM (Continued)

<b>REST OF PHILIPPINES (ROP)</b>	VI	WESTERN VISAYAS	AKLAN ANTIQUÉ CAPIZ ILOILO NEGROS OCCIDENTAL GUIMARAS
	VII	CENTRAL VISAYAS	BOHOL CEBU NEGROS ORIENTAL SIQUIJOR
	VIII	EASTERN VISAYAS	EASTERN SAMAR LEYTE NORTHERN SAMAR SAMAR (WESTERN SAMAR) SOUTHERN LEYTE BILIRAN
	IX	WESTERN MINDANAO	BASILAN ZAMBOANGA DEL NORTE ZAMBOANGA DEL SUR
	X	NORTHERN MINDANAO	BUKIDNON CAMIGUIN MISAMIS OCCIDENTAL MISAMIS ORIENTAL
	XI	SOUTHERN MINDANAO	DAVAO (DAVAO DEL NORTE) DAVAO DEL SUR DAVAO ORIENTAL SOUTH COTABATO SARANGANI COMPOSTELA VALLEY
	XII	CENTRAL MINDANAO	LANAO DEL NORTE COTABATO (NORTH COTABATO) SULTAN KUDARAT COTABATO/MARAWI CITIES
	XIII	CARAGA	AGUSAN DEL NORTE AGUSAN DEL SUR SURIGAO DEL NORTE SURIGAO DEL SUR
	ARMM	AUTONOMOUS REGION IN MUSLIM MINDANAO	LANAO DEL SUR MAGUINDANAO SULU TAWI-TAWI

ANNEX B-1. SECTOR CLASSIFICATION SCHEME

11-SECTOR CLASSIFICATION		84-SECTOR CLASSIFICATION		229-SECTOR
Code	Description	Code	Description	NATIONAL IO CODES
<b>PRODUCTION SECTORS:</b>				
01	AGRICULTURE FISHERY AND FORESTRY	01	Palay (paddy)	001
		02	Fruits	005-009
		03	Other edible crops	002-004;010-011;015-016
		04	Non-edible crops	012-014;017-018
		05	Agricultural services	024
		06	Dairy farming and livestock raising	019-023
		07	Fishing	025-026
		08	Forestry	027
02	MINING AND QUARRYING	09	Coal mining	033
		10	Crude petroleum and natural gas	034
		11	Metal ore mining	028-032
		12	Non-metal ore mining and quarrying	035-037
03	MANUFACTURING	13	Meat and meat products	038-039
		14	Dairy Products	040-043
		15	Rice & corn, flour & bakery products	050-053
		16	Sugar, chocolates & sugar confections	054-055
		17	Fish preparations	045-046
		18	Oil and fats	047-049
		19	Animal feeds	059
		20	Coffee and tea, processed	058
		21	Other food manufactures	044;056-057;060-062
		22	Beverages	063-065
		23	Tobacco products	066-068
		24	Spinning and weaving	069
		25	Knitting	070
		26	Wearing apparel & other fabricated textiles	071-081
		27	Timber and wooden products	085-092
		28	Wooden furnitures	093-095
		29	Pulp, paper & paper products	096-098
		30	Printing and publishing	099-101
		31	Leather and leather products	082-084
		32	Basic industrial chemicals	102
		33	Fertilizers	103
		34	Pesticides	105
		35	Drugs and medicines	107
		36	Soap, detergent and toiletries	108-109
		37	Other chemicals and chemical products	104;106;110
		38	Plastic products	116
		39	Rubber products	113-115
		40	Petroleum refineries	111
		41	Coke and other petroleum and coal products	112
		42	Pottery, china and earthenware	117
		43	Glass and glass products	118-120
44	Cement manufacture	121		
45	Other non-metallic mineral products	122-124		
46	Iron and steel	125		
47	Iron and steel products	126		
48	Non-ferrous metal products	127-128		
49	Fabricated metal products	129-136		
50	Non-electrical machinery and equipment	137-142		
51	Household electrical appliances	144;147		
52	Other electrical machinery, apparatus and parts	143;145-146;148-151		
53	Motor vehicles	152		
54	Motorcycles, bicycles and parts	153-155		
55	Shipbuilding and repairing	156		
56	Other transport equipment	157		
57	Precision instruments	158-160; 165		
58	Metallic furniture	161		
59	Other manufactured products	162-164;167-169		

ANNEX B-2. SECTOR CLASSIFICATION SCHEME (Continued)

04	ELECTRICITY, GAS AND STEAM AND WATER SERVICES	60	Electricity generation and distribution	171
		61	Gas and steam	172
		62	Waterworks and supply	173
05	CONSTRUCTION	63	General building construction	}
		64	General engineering construction	} 170
		65	Special trade construction	}
06	TRADE	66	Wholesale and retail trade	174
07	TRANSPORTATION, STORAGE AND COMMUNICATION	67	Railway transport services	175
		68	Road transport	176-180
		69	Water transport	181-182
		70	Air transport	184
		71	Storage & other transport-related services	183;185-187
		72	Postal and telecommunication services	188-190
08	FINANCE & INSURANCE	73	Financial and insurance services	191-195
09	REAL ESTATE & OWNER- SHIP OF DWELLINGS	74	Real estate services	196-197
		75	Ownership of dwellings	198
10	PRIVATE SERVICES	76	Restaurants & other eating & drinking places	224
		77	Hotels and other lodging places	225-226
		78	Business services	119-207
		79	Minor repair of motor vehicles	218
		80	Miscellaneous repair services	219
		81	Private education services	209
		82	Private health services	210-211
		83	Other private services	208;212-217;220-223
11	GOVERNMENT SERVICES	84	Government services	227-229
<b>FINAL DEMAND SECTORS:</b>				
PCE		PCE	Private Consumption Expenditures	PCE
GCE		GCE	Government Consumption Expenditures	GCE
GFCF		GFCF	Gross Fixed Capital Formation	GFCF
CS		CS	Change in Stocks (Inventories)	CS
FXP		FXP	Foreign Exports	E
FMP		FMP	Foreign Imports	M
DXP		DXP	Domestic Exports	***
DMP		DMP	Domestic Imports	***
<b>VALUE ADDED SECTORS:</b>				
CE		CE	Compensation of Employees	CE
DPN		DPN	Depreciation	DEP
IT-S		IT-S	Indirect Taxes less Subsidies	IT-S
OVA		OVA	Other Value Added	OVA

