

**11th National Convention on Statistics (NCS)**

EDSA Shangri-La Hotel

October 4-5, 2010

MEASUREMENT OF INTER-REGIONAL DIFFERENTIALS AND DEPENDENCIES  
IN THE PHILIPPINE ECONOMY BASED ON A MULTI-REGION'S INTER-  
REGIONAL INPUT-OUTPUT TABLE

by

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# **MEASUREMENT OF INTER-REGIONAL DIFFERENTIALS AND DEPENDENCIES IN THE PHILIPPINE ECONOMY BASED ON A MULTI-REGION'S INTER- REGIONAL INPUT-OUTPUT TABLE**

by

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## **1. INTRODUCTION**

This paper attempts to measure the economic differences within and among regions and the extent of inter-dependencies between regions in the Philippine economy. This study was made possible with the availability of an Inter-Regional IO (IRIO) table for the Philippines that was constructed by a local private research outfit to provide a foreign-sponsored research project with an all-encompassing database for its regional economic-environmental impact studies in the Philippines.

An IRIO table provides a compacted accounting framework designed to model and measure wide-ranging macro- and micro-economic relationships, intra-regionally and inter-regionally alike. Similar to a single-region IO table, an IRIO table can be used to estimate the magnitude of an external “shock” on major macroeconomic indicators such as output, value-added, income and employment. However, unlike its single-region counterpart, an IRIO table is able to capture and assess the inter-regional spillover and feedback effects arising from an exogenous change in demand for the output of any one of the study regions. In other words, constructing an IRIO table will not only allow us to estimate the stimulus to production outside the study region benefiting from, say, an increase in foreign demand for its output, but also the resultant impact on its output arising from the production stimulus it causes in the other study regions.

The paper is structured as follows. Section 2 outlines the IRIO model and the general methodology used to develop and compile the 5-region Philippine IRIO (PIRIO) table. Section 3 discusses the main results of the study, while Section 4 concludes.

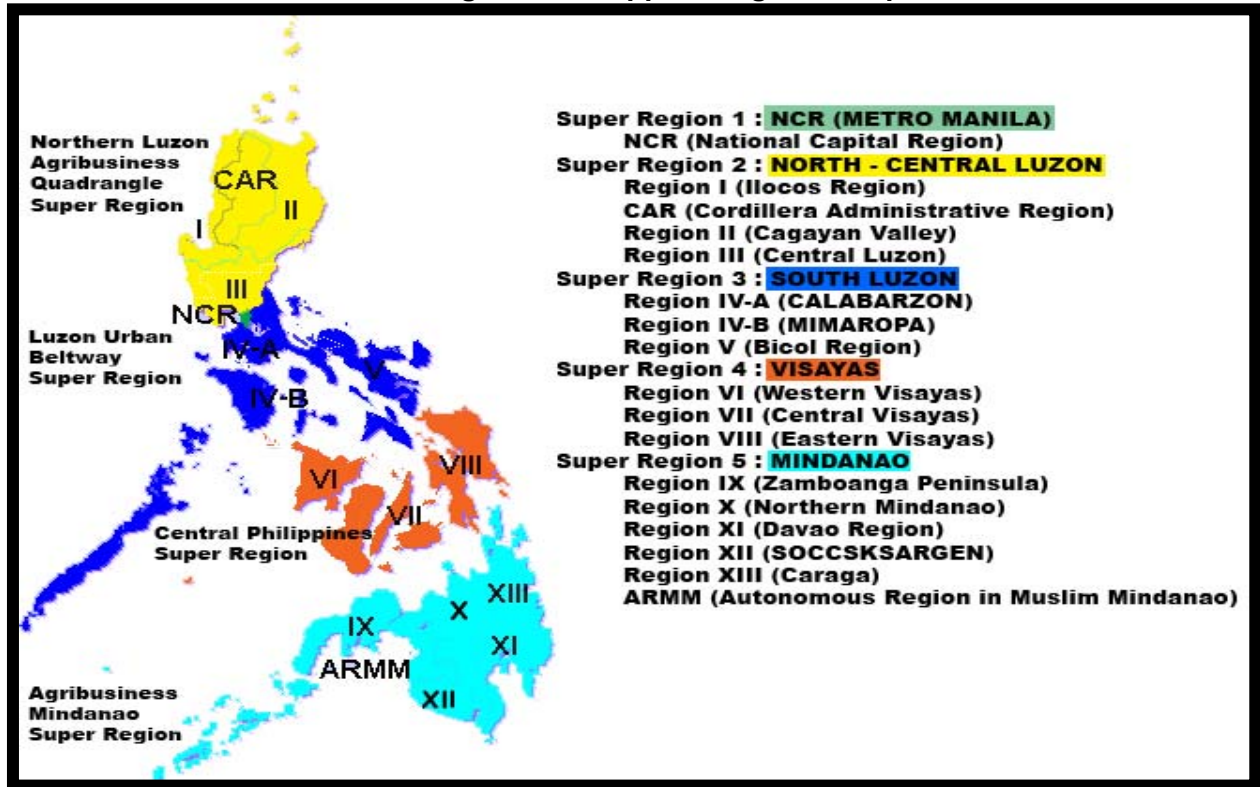
## **2. THE PHILIPPINE INTER-REGIONAL I-O MODEL**

### **2-1. Spatial Coverage**

For the purposes of this study, the Philippine archipelago is divided into five (5) larger regions comprising the 17 administrative regions of the country, as shown in Fig. 1 (Philippine Regional Map). These are:

- Region 1: National Capital Region (NCR) or Metropolitan Manila;
- Region 2: North–Central Luzon (NCL) covering regions I, II and III and CAR;
- Region 3: South Luzon (SOL) covering regions IV-A, IV-B and V;
- Region 4: Visayas (VIS) covering regions VI, VIII and VIII; and
- Region 5: Mindanao (MIN) covering regions IX, X, XI, XII, XIII and ARMM.

Figure 1. Philippine Regional Map



The above spatial grouping fits, more or less, with government's clustering of the country's administrative regions into four (4) super-regions to address the need for an effective and expeditious monitoring capability with regards to planning and policy formulation, decision-making and program and project implementation in the countryside. Fig. 1 (Philippine Regional Map) also shows the regional grouping and corresponding nomenclature of these 4 super-regions.

## 2-2. Table Size and Reference Period

Primarily taking into consideration data availability at the sub-national level, the basic 5-region PIRIO accounts was constructed, given the following sectoral dimensions:

1. Number of Production Sectors: 84
2. Number of Final Demand Sectors: 5
3. Number of Value Added Sectors: 4

The intermediate PIRIO account is thus a 420 (i.e., 84 products x 5 regions) x 420-sector sub-matrix of intra- and inter-regional transactions of goods and services during the period under study, while the final demand account is a 420 x 25-sector sub-matrix. The ROW (imports) intermediate account is an 84 x 420-sector sub-matrix of regional transactions of commodities with foreign countries (i.e. imports), while the ROW final demand account is an 84 x 25-sector sub-matrix.

The 229-sector classification in the 1994 national IO table served as the basis in grouping the 84 identified production sectors. Calendar Year 1994 was chosen as the reference period in harmony with the 1994 national IO table that was the latest available at the time of this study. Thus, the 1994 PIRIO table is numerically consistent with the 1994 national IO table.

### 2-3. Accounting Framework

The 5-region PIRIO model is presented in the form of the ideal Isard-type as can be observed in its truncated layout (Figure 2). The outlined IRIO model is a product-by-product matrix of the non-competitive, open and static type. It is non-competitive because it makes an explicit distinction between regionally-produced and non-regionally-produced products. Such a distinction provides a better reflection of the use of local production technology and inputs in the production of output in each region.

**Figure 2. Accounting Layout for the 5-Region PIRIO Table**

		TO	INTERMEDIATE DEMAND			FINAL DEMAND			ROW (M)	TGO
		R1	.....	R5	R1	.....	R5			
FROM		1...j...84	.....	1...j...84	1...k...5	.....	1...k...5			
R1	1 : i : 84	$X^{11}$	.....	$X^{15}$	$Y^{11}$	.....	$Y^{15}$	0	$X^{1-}$	
:	:	:	.....	:	:	.....	:	:	:	
R5	1 : i : 84	$X^{51}$	.....	$X^{55}$	$Y^{51}$	.....	$Y^{55}$	0	$X^{5-}$	
ROW	1 : i : 84	${}^1M^{W1}$	.....	${}^1M^{W5}$	${}^F M^{W1}$	.....	${}^F M^{W5}$	$-M^T$	0	
GVA	1 : p : 4	$V^{-1}$	.....	$V^{-5}$	0	.....	0	$D^1$	GDP	
TGI		$X^{-1}$	.....	$X^{-5}$	$Y^{-1}$	.....	$Y^{-5}$	$-M^1_{TGO}$		

The “openness” of the model is derived from the fact that economic activities are split into the intermediate and final demand categories. The transactions in the former category can be explained by the model, while the latter category contains exogenous transactions which must be initially known or given. The static nature of the model is a consequence of the absence of a time dimension from it.

The intra- and inter-regional flows as well as the regional transactions with the rest of the world (ROW) are all valued in current producers’ prices, i.e. net of trade and transport margins but gross of product taxes. The model contains 84 production sectors, 5 final demand categories and 4 primary inputs or value-added components in each region.

The notations used in Figure 2 are defined as follows:

$X^{11}$  is an 84x84 matrix, where each element is a flow of product i to product j within R<sup>1</sup>.

$X^{15}$  is an 84x84 matrix, where each element is a flow of product i from R<sup>1</sup> to product j in R<sup>5</sup>.

$Y^{11}$  is an 84x5 matrix., where each element is a flow of product i to final demand k within R<sup>1</sup>,

where  $k_1$  is private consumption expenditure;  $k_2$  is government consumption expenditure;  $k_3$

is gross fixed capital formation;  $k_4$  is change in inventory; and  $k_5$  is (foreign) exports.

$Y^{15}$  is an  $84 \times 5$  matrix, where each element is a flow of product  $i$  from  $R^1$  to final demand  $k$  in  $R^5$ .

$X^1$  is a column vector of 84 elements, with each element representing the gross output of product  $i$  in  $R^1$ .

$X^{51}$  is an  $84 \times 84$  matrix, where each element is a flow of product  $i$  from  $R^5$  to product  $j$  in  $R^1$ .

$X^{55}$  is an  $84 \times 84$  matrix, where each element is a flow of product  $i$  to product  $j$  within  $R^5$ .

$Y^{51}$  is an  $84 \times 5$  matrix, where each element is a flow of product  $i$  from  $R^5$  to final demand  $k$  in  $R^1$ .

$Y^{55}$  is an  $84 \times 5$  matrix, where each element is a flow of product  $i$  to final demand  $k$  within  $R^5$ .

$X^5$  is a column vector of 84 elements, with each element representing the gross output of product  $i$  in  $R^5$ .

$M^{W1}$  is an  $84 \times 84$  matrix, where each element is a flow of product  $i$  from the ROW to product  $j$  in  $R^1$ .

$M^{W5}$  is an  $84 \times 84$  matrix, where each element is a flow of product  $i$  from the ROW to product  $j$  in  $R^5$ .

$F^{M^{W1}}$  is an  $84 \times 5$  matrix, where each element is a flow of product  $i$  from the ROW to final demand  $k$  in  $R^1$ .

$F^{M^{W5}}$  is an  $84 \times 5$  matrix, where each element is a flow of product  $i$  from the ROW to final demand  $k$  in  $R^5$ .

$M^T$  is a column vector of 84 elements, with each element representing the total imports of product  $i$  by all regions (with a negative sign).

$V^1$  is a  $4 \times 84$  matrix, where each element accounts for primary input  $p$  consumed by product sector  $j$  in  $R^1$ , where  $p_1$  is compensation of employees;  $p_2$  is indirect taxes less subsidies;

$p_3$  is depreciation; and  $p_4$  is operating surplus.

$V^5$  is a  $4 \times 84$  matrix, where each element accounts for primary input  $p$  consumed by product sector  $j$  in  $R^5$ .

$D^T$  is the total value of tariff or import duties and taxes generated by all regions.

$X^1$  is a row vector of 84 elements with each element representing the gross input of product sector  $j$  in  $R^1$ .

$X^5$  is a row vector of 84 elements with each element representing the gross input of product sector  $j$  in  $R^5$ .

$Y^1$  is a row vector of 5 elements with each element accounting for total of final demand sector  $k$  in  $R^1$ .

$Y^5$  is a row vector of 5 elements with each element accounting for total of final demand sector  $k$  in  $R^5$ .

$-M_{FOB}^T$  is the FOB value of total imports.

## 2-4. Basic Equations

A system of IRIO tables is balanced, implying that the supply and demand sides are equal. By referring to Figure 2, this equality can be translated into the following regional accounting identities:

$$\sum_{i=1}^{84} X_i^{R1} = \sum_{j=1}^{84} X_j^{R2} \quad (1), \quad \sum_{i=1}^{84} X_i^{R2} = \sum_{j=1}^{84} X_j^{R3} \quad (2), \quad \sum_{i=1}^{84} X_i^{R3} = \sum_{j=1}^{84} X_j^{R4} \quad (3), \quad \sum_{i=1}^{84} X_i^{R4} = \sum_{j=1}^{84} X_j^{R5} \quad (4), \quad \text{and}$$

$$\sum_{i=1}^{84} X_i^{R5} = \sum_{j=1}^{84} X_j^{R5} \quad (5)$$

Figure 2 can also be used to form the following balancing equations:

$$\mathbf{X}^1 = \mathbf{X}^{11} + \mathbf{X}^{12} + \mathbf{X}^{13} + \mathbf{X}^{14} + \mathbf{X}^{15} + \mathbf{Y}^{11} + \mathbf{Y}^{12} + \mathbf{Y}^{13} + \mathbf{Y}^{14} + \mathbf{Y}^{15} \quad (6)$$

$$\mathbf{X}^2 = \mathbf{X}^{21} + \mathbf{X}^{22} + \mathbf{X}^{23} + \mathbf{X}^{24} + \mathbf{X}^{25} + \mathbf{Y}^{21} + \mathbf{Y}^{22} + \mathbf{Y}^{23} + \mathbf{Y}^{24} + \mathbf{Y}^{25} \quad (7)$$

$$\mathbf{X}^3 = \mathbf{X}^{31} + \mathbf{X}^{32} + \mathbf{X}^{33} + \mathbf{X}^{34} + \mathbf{X}^{35} + \mathbf{Y}^{31} + \mathbf{Y}^{32} + \mathbf{Y}^{33} + \mathbf{Y}^{34} + \mathbf{Y}^{35} \quad (8)$$

$$\mathbf{X}^4 = \mathbf{X}^{41} + \mathbf{X}^{42} + \mathbf{X}^{43} + \mathbf{X}^{44} + \mathbf{X}^{45} + \mathbf{Y}^{41} + \mathbf{Y}^{42} + \mathbf{Y}^{43} + \mathbf{Y}^{44} + \mathbf{Y}^{45} \quad (9)$$

$$\mathbf{X}^5 = \mathbf{X}^{51} + \mathbf{X}^{52} + \mathbf{X}^{53} + \mathbf{X}^{54} + \mathbf{X}^{55} + \mathbf{Y}^{51} + \mathbf{Y}^{52} + \mathbf{Y}^{53} + \mathbf{Y}^{54} + \mathbf{Y}^{55} \quad (10)$$

Using Leontief's assumption of linearity or first-order homogeneity in the production functions, we can define the following regional input coefficients in matrix form, as follows:

$$\mathbf{A}^{11} = \mathbf{X}^{11} (\hat{\mathbf{X}}^1)^{-1} \quad (11) \quad \mathbf{A}^{21} = \mathbf{X}^{21} (\hat{\mathbf{X}}^1)^{-1} \quad (16) \quad \mathbf{A}^{31} = \mathbf{X}^{31} (\hat{\mathbf{X}}^1)^{-1} \quad (21)$$

$$\mathbf{A}^{12} = \mathbf{X}^{12} (\hat{\mathbf{X}}^2)^{-1} \quad (12) \quad \mathbf{A}^{22} = \mathbf{X}^{22} (\hat{\mathbf{X}}^2)^{-1} \quad (17) \quad \mathbf{A}^{32} = \mathbf{X}^{32} (\hat{\mathbf{X}}^2)^{-1} \quad (22)$$

$$\mathbf{A}^{13} = \mathbf{X}^{13} (\hat{\mathbf{X}}^3)^{-1} \quad (13) \quad \mathbf{A}^{23} = \mathbf{X}^{23} (\hat{\mathbf{X}}^3)^{-1} \quad (18) \quad \mathbf{A}^{33} = \mathbf{X}^{33} (\hat{\mathbf{X}}^3)^{-1} \quad (23)$$

$$\mathbf{A}^{14} = \mathbf{X}^{14} (\hat{\mathbf{X}}^4)^{-1} \quad (14) \quad \mathbf{A}^{24} = \mathbf{X}^{24} (\hat{\mathbf{X}}^4)^{-1} \quad (19) \quad \mathbf{A}^{34} = \mathbf{X}^{34} (\hat{\mathbf{X}}^4)^{-1} \quad (24)$$

$$\mathbf{A}^{15} = \mathbf{X}^{15} (\hat{\mathbf{X}}^5)^{-1} \quad (15) \quad \mathbf{A}^{25} = \mathbf{X}^{25} (\hat{\mathbf{X}}^5)^{-1} \quad (20) \quad \mathbf{A}^{35} = \mathbf{X}^{35} (\hat{\mathbf{X}}^5)^{-1} \quad (25)$$

$$\mathbf{A}^{41} = \mathbf{X}^{41} (\hat{\mathbf{X}}^1)^{-1} \quad (26) \quad \mathbf{A}^{51} = \mathbf{X}^{51} (\hat{\mathbf{X}}^1)^{-1} \quad (31)$$

$$\mathbf{A}^{42} = \mathbf{X}^{42} (\hat{\mathbf{X}}^2)^{-1} \quad (27) \quad \mathbf{A}^{52} = \mathbf{X}^{52} (\hat{\mathbf{X}}^2)^{-1} \quad (32)$$

$$\mathbf{A}^{43} = \mathbf{X}^{43} (\hat{\mathbf{X}}^3)^{-1} \quad (28) \quad \mathbf{A}^{53} = \mathbf{X}^{53} (\hat{\mathbf{X}}^3)^{-1} \quad (33)$$

$$\mathbf{A}^{44} = \mathbf{X}^{44} (\hat{\mathbf{X}}^4)^{-1} \quad (29) \quad \mathbf{A}^{54} = \mathbf{X}^{54} (\hat{\mathbf{X}}^4)^{-1} \quad (34)$$

$$\mathbf{A}^{45} = \mathbf{X}^{45} (\hat{\mathbf{X}}^5)^{-1} \quad (30) \quad \mathbf{A}^{55} = \mathbf{X}^{55} (\hat{\mathbf{X}}^5)^{-1} \quad (35)$$

Equations (11), (17), (23), (29) and (35) represent the matrices of intra-regional direct input coefficients, while the rest stand for the matrices of inter-regional trade coefficients. Substituting these structural equations into equations (6) to (10), we have:

$$\mathbf{X}^1 = \mathbf{A}^{11} \mathbf{X}^1 + \mathbf{A}^{12} \mathbf{X}^2 + \mathbf{A}^{13} \mathbf{X}^3 + \mathbf{A}^{14} \mathbf{X}^4 + \mathbf{A}^{15} \mathbf{X}^5 + \mathbf{Y}^{11} + \mathbf{Y}^{12} + \mathbf{Y}^{13} + \mathbf{Y}^{14} + \mathbf{Y}^{15}$$

$$(36) \quad \mathbf{X}^2 = \mathbf{A}^{21}\mathbf{X}^1 + \mathbf{A}^{22}\mathbf{X}^2 + \mathbf{A}^{23}\mathbf{X}^3 + \mathbf{A}^{24}\mathbf{X}^4 + \mathbf{A}^{25}\mathbf{X}^5 + \mathbf{Y}^{21} + \mathbf{Y}^{22} + \mathbf{Y}^{23} + \mathbf{Y}^{24} + \mathbf{Y}^{25}$$

$$(37) \quad \mathbf{X}^3 = \mathbf{A}^{31}\mathbf{X}^1 + \mathbf{A}^{32}\mathbf{X}^2 + \mathbf{A}^{33}\mathbf{X}^3 + \mathbf{A}^{34}\mathbf{X}^4 + \mathbf{A}^{35}\mathbf{X}^5 + \mathbf{Y}^{31} + \mathbf{Y}^{32} + \mathbf{Y}^{33} + \mathbf{Y}^{34} + \mathbf{Y}^{35}$$

$$(38) \quad \mathbf{X}^4 = \mathbf{A}^{41}\mathbf{X}^1 + \mathbf{A}^{42}\mathbf{X}^2 + \mathbf{A}^{43}\mathbf{X}^3 + \mathbf{A}^{44}\mathbf{X}^4 + \mathbf{A}^{45}\mathbf{X}^5 + \mathbf{Y}^{41} + \mathbf{Y}^{42} + \mathbf{Y}^{43} + \mathbf{Y}^{44} + \mathbf{Y}^{45}$$

$$(39) \quad \mathbf{X}^5 = \mathbf{A}^{51}\mathbf{X}^1 + \mathbf{A}^{52}\mathbf{X}^2 + \mathbf{A}^{53}\mathbf{X}^3 + \mathbf{A}^{54}\mathbf{X}^4 + \mathbf{A}^{55}\mathbf{X}^5 + \mathbf{Y}^{51} + \mathbf{Y}^{52} + \mathbf{Y}^{53} + \mathbf{Y}^{54} + \mathbf{Y}^{55}$$

$$(40)$$

Solving equations (36) to (40), we have, in matrix form:

$$\begin{bmatrix} \mathbf{X}^1 \\ \mathbf{X}^2 \\ \mathbf{X}^3 \\ \mathbf{X}^4 \\ \mathbf{X}^5 \end{bmatrix} = \begin{bmatrix} \mathbf{A}^{11} & \mathbf{A}^{12} & \mathbf{A}^{13} & \mathbf{A}^{14} & \mathbf{A}^{15} \\ \mathbf{A}^{21} & \mathbf{A}^{22} & \mathbf{A}^{23} & \mathbf{A}^{24} & \mathbf{A}^{25} \\ \mathbf{A}^{31} & \mathbf{A}^{32} & \mathbf{A}^{33} & \mathbf{A}^{34} & \mathbf{A}^{35} \\ \mathbf{A}^{41} & \mathbf{A}^{42} & \mathbf{A}^{43} & \mathbf{A}^{44} & \mathbf{A}^{45} \\ \mathbf{A}^{51} & \mathbf{A}^{52} & \mathbf{A}^{53} & \mathbf{A}^{54} & \mathbf{A}^{55} \end{bmatrix} \begin{bmatrix} \mathbf{X}^1 \\ \mathbf{X}^2 \\ \mathbf{X}^3 \\ \mathbf{X}^4 \\ \mathbf{X}^5 \end{bmatrix} + \begin{bmatrix} \mathbf{Y}^1 \\ \mathbf{Y}^2 \\ \mathbf{Y}^3 \\ \mathbf{Y}^4 \\ \mathbf{Y}^5 \end{bmatrix}$$

$$(41)$$

where:

$$\begin{aligned} \mathbf{Y}^1 &= \mathbf{Y}^{11} + \mathbf{Y}^{12} + \mathbf{Y}^{13} + \mathbf{Y}^{14} + \mathbf{Y}^{15}, \mathbf{Y}^2 = \mathbf{Y}^{21} + \mathbf{Y}^{22} + \mathbf{Y}^{23} + \mathbf{Y}^{24} + \mathbf{Y}^{25}, \\ \mathbf{Y}^3 &= \mathbf{Y}^{31} + \mathbf{Y}^{32} + \mathbf{Y}^{33} + \mathbf{Y}^{34} + \mathbf{Y}^{35}, \mathbf{Y}^4 = \mathbf{Y}^{41} + \mathbf{Y}^{42} + \mathbf{Y}^{43} + \mathbf{Y}^{44} + \mathbf{Y}^{45}, \text{ and} \\ \mathbf{Y}^5 &= \mathbf{Y}^{51} + \mathbf{Y}^{52} + \mathbf{Y}^{53} + \mathbf{Y}^{54} + \mathbf{Y}^{55}. \end{aligned}$$

Simplifying equation (41), we have:

$$\begin{bmatrix} \mathbf{X}^1 \\ \mathbf{X}^2 \\ \mathbf{X}^3 \\ \mathbf{X}^4 \\ \mathbf{X}^5 \end{bmatrix} = \begin{bmatrix} \mathbf{I} & \mathbf{0} & \mathbf{0} & \mathbf{0} & \mathbf{0} \\ \mathbf{0} & \mathbf{I} & \mathbf{0} & \mathbf{0} & \mathbf{0} \\ \mathbf{0} & \mathbf{0} & \mathbf{I} & \mathbf{0} & \mathbf{0} \\ \mathbf{0} & \mathbf{0} & \mathbf{0} & \mathbf{I} & \mathbf{0} \\ \mathbf{0} & \mathbf{0} & \mathbf{0} & \mathbf{0} & \mathbf{I} \end{bmatrix} - \begin{bmatrix} \mathbf{A}^{11} & \mathbf{A}^{12} & \mathbf{A}^{13} & \mathbf{A}^{14} & \mathbf{A}^{15} \\ \mathbf{A}^{21} & \mathbf{A}^{22} & \mathbf{A}^{23} & \mathbf{A}^{24} & \mathbf{A}^{25} \\ \mathbf{A}^{31} & \mathbf{A}^{32} & \mathbf{A}^{33} & \mathbf{A}^{34} & \mathbf{A}^{35} \\ \mathbf{A}^{41} & \mathbf{A}^{42} & \mathbf{A}^{43} & \mathbf{A}^{44} & \mathbf{A}^{45} \\ \mathbf{A}^{51} & \mathbf{A}^{52} & \mathbf{A}^{53} & \mathbf{A}^{54} & \mathbf{A}^{55} \end{bmatrix}^{-1} \begin{bmatrix} \mathbf{Y}^1 \\ \mathbf{Y}^2 \\ \mathbf{Y}^3 \\ \mathbf{Y}^4 \\ \mathbf{Y}^5 \end{bmatrix} = \begin{bmatrix} \mathbf{B}^{11} & \mathbf{B}^{12} & \mathbf{B}^{13} & \mathbf{B}^{14} & \mathbf{B}^{15} \\ \mathbf{B}^{21} & \mathbf{B}^{22} & \mathbf{B}^{23} & \mathbf{B}^{24} & \mathbf{B}^{25} \\ \mathbf{B}^{31} & \mathbf{B}^{32} & \mathbf{B}^{33} & \mathbf{B}^{34} & \mathbf{B}^{35} \\ \mathbf{B}^{41} & \mathbf{B}^{42} & \mathbf{B}^{43} & \mathbf{B}^{44} & \mathbf{B}^{45} \\ \mathbf{B}^{51} & \mathbf{B}^{52} & \mathbf{B}^{53} & \mathbf{B}^{54} & \mathbf{B}^{55} \end{bmatrix} \begin{bmatrix} \mathbf{Y}^1 \\ \mathbf{Y}^2 \\ \mathbf{Y}^3 \\ \mathbf{Y}^4 \\ \mathbf{Y}^5 \end{bmatrix}$$

$$(42)$$

Or in its generalized form as:

$$\mathbf{X} = \mathbf{BY}$$

$$(43)$$

where  $\mathbf{X}$  is the matrix of regional outputs,  $\begin{bmatrix} \mathbf{X}^1 \\ \mathbf{X}^2 \\ \mathbf{X}^3 \\ \mathbf{X}^4 \\ \mathbf{X}^5 \end{bmatrix}$ ;  $\mathbf{Y}$  is the matrix of final demand,  $\begin{bmatrix} \mathbf{Y}^1 \\ \mathbf{Y}^2 \\ \mathbf{Y}^3 \\ \mathbf{Y}^4 \\ \mathbf{Y}^5 \end{bmatrix}$ ;

and  $\mathbf{B}$  is the interregional Leontief inverse matrix, 
$$\begin{pmatrix} B^{11}B^{12}B^{13}B^{14}B^{15} \\ B^{21}B^{22}B^{23}B^{24}B^{25} \\ B^{31}B^{32}B^{33}B^{34}B^{35} \\ B^{41}B^{42}B^{43}B^{44}B^{45} \\ B^{51}B^{52}B^{53}B^{54}B^{55} \end{pmatrix}.$$

In order to be able to measure the spillover and feedback effects caused by interregional trading, equation (41) can first be expanded to obtain the following simultaneous equations:

$$X^1 = (I - A^{11})^{-1}(A^{12}X^2 + A^{13}X^3 + A^{14}X^4 + A^{15}X^5 + Y^1) \quad (44)$$

$$X^2 = (I - A^{22})^{-1}(A^{21}X^1 + A^{23}X^3 + A^{24}X^4 + A^{25}X^5 + Y^2) \quad (45)$$

$$X^3 = (I - A^{33})^{-1}(A^{31}X^1 + A^{32}X^2 + A^{34}X^4 + A^{35}X^5 + Y^3) \quad (46)$$

$$X^4 = (I - A^{44})^{-1}(A^{41}X^1 + A^{42}X^2 + A^{43}X^3 + A^{45}X^5 + Y^4) \quad (47)$$

$$X^5 = (I - A^{55})^{-1}(A^{51}X^1 + A^{52}X^2 + A^{53}X^3 + A^{54}X^4 + Y^5) \quad (48)$$

Equations (44) through (48) can then be further expanded and rearranged to obtain the following matrixes:

$$\begin{pmatrix} X^1 \\ X^2 \\ X^3 \\ X^4 \\ X^5 \end{pmatrix} = \begin{pmatrix} F^1 & 0 & 0 & 0 & 0 \\ 0 & F^2 & 0 & 0 & 0 \\ 0 & 0 & F^3 & 0 & 0 \\ 0 & 0 & 0 & F^4 & 0 \\ 0 & 0 & 0 & 0 & F^5 \end{pmatrix} \begin{pmatrix} I & S^{12} & S^{13} & S^{14} & S^{15} \\ S^{21} & I & S^{23} & S^{24} & S^{25} \\ S^{31} & S^{32} & I & S^{34} & S^{35} \\ S^{41} & S^{42} & S^{43} & I & S^{45} \\ S^{51} & S^{52} & S^{53} & S^{54} & I \end{pmatrix} \begin{pmatrix} M^1 & 0 & 0 & 0 & 0 \\ 0 & M^2 & 0 & 0 & 0 \\ 0 & 0 & M^3 & 0 & 0 \\ 0 & 0 & 0 & M^4 & 0 \\ 0 & 0 & 0 & 0 & M^5 \end{pmatrix} \begin{pmatrix} Y^1 \\ Y^2 \\ Y^3 \\ Y^4 \\ Y^5 \end{pmatrix} \quad (49)$$

where:  $M^1 = (I - A^{11})^{-1}$ ,  $M^2 = (I - A^{22})^{-1}$ ,  $M^3 = (I - A^{33})^{-1}$ ,  $M^4 = (I - A^{44})^{-1}$  &  $M^5 = (I - A^{55})^{-1}$

$S^{12} = M^1 A^{12}$  ;  $S^{13} = M^1 A^{13}$  ;  $S^{14} = M^1 A^{14}$  ;  $S^{15} = M^1 A^{15}$

$S^{21} = M^2 A^{21}$  ;  $S^{23} = M^2 A^{23}$  ;  $S^{24} = M^2 A^{24}$  ;  $S^{25} = M^2 A^{25}$

$S^{31} = M^3 A^{31}$  ;  $S^{32} = M^3 A^{32}$  ;  $S^{34} = M^3 A^{34}$  ;  $S^{35} = M^3 A^{35}$  ;

and

$S^{41} = M^4 A^{41}$  ;  $S^{42} = M^4 A^{42}$  ;  $S^{43} = M^4 A^{43}$  ;  $S^{45} = M^4 A^{45}$

$S^{51} = M^5 A^{51}$  ;  $S^{52} = M^5 A^{52}$  ;  $S^{53} = M^5 A^{53}$  ;  $S^{54} = M^5 A^{54}$

$F^1 = [I - (S^{12}S^{21} + S^{13}S^{31} + S^{14}S^{41} + S^{15}S^{51})]^{-1}$

$F^2 = [I - (S^{21}S^{12} + S^{23}S^{32} + S^{24}S^{42} + S^{25}S^{52})]^{-1}$

$F^3 = [I - (S^{31}S^{13} + S^{32}S^{23} + S^{34}S^{43} + S^{35}S^{53})]^{-1}$

$F^4 = [I - (S^{41}S^{14} + S^{42}S^{24} + S^{43}S^{34} + S^{45}S^{54})]^{-1}$

$F^5 = [I - (S^{51}S^{15} + S^{52}S^{25} + S^{53}S^{35} + S^{54}S^{45})]^{-1}$

The unknowns M, S, and F account for the intra-regional linkages, inter-regional spillover and feedback effects, respectively.

## 2-5. Compilation Methodology

The hybrid or mixed approach was adopted in constructing the PIRIO 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. For example, indirect methods are applied in estimating inter-regional and inter-national trade because actual data on foreign and domestic exports (or outflows) and imports (or inflows) at the sub-national level are inadequate to meet the rigid requirements of IO accounting.

Four (4) general work phases were undertaken, in sequential order, in order to generate the 1994 PIRIO table, as follows:

- Phase I: Compilation of Competitive Intra-Regional I-O tables;
- Phase II: Derivation of Non-Competitive Intra-Regional I-O Tables;
- Phase III: Estimation of Inter-Regional Domestic Flows; and
- Phase IV: Integration process of Phases II & III Outputs to generate PIRIO Table

### **Phase I. Compilation of Intra-Regional Tables (Competitive Type)**

This work phase involves 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 for the 5 regions were initially compiled based on actual data obtained from various source agencies such as the National Statistics Office, Bureau of Agriculture Statistics, the Central Bank of the Philippines and the National Statistical Coordination Board, among others. Data from an ad hoc IO Survey of Establishments (IOSE) conducted in 1994 to provide the output and input details in the compilation of the 1994 national IO accounts was also referred to in constructing the regional MAKE and USE tables.

The MAKE or output table is an industry x product matrix showing the distribution of the value of products produced by industries during the reference year. 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 MAKE table is valued in producers' prices while the USE table is valued in purchasers' prices.

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 1994 CE.

The penultimate step is to reconcile or balance the resulting product x industry USE table at producers' prices, after which the conversion process from a product x industry USE table to a symmetric product x product USE table follows.

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:

$$\mathbf{A}_{pp} = \mathbf{B}_{pi}\mathbf{D}_{ip} \quad (50)$$

where:  $\mathbf{A}_{pp}$  = product-by-product matrix of input coefficients;  $\mathbf{B}_{pi}$  = product-by-industry matrix of input coefficients; and  $\mathbf{D}_{ip}$  = industry-by-product matrix of MAKE coefficients.

## **Phase II: 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. (e-m) where e refer to exports that include domestic outflows and m is imports that 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 NSO), 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, the compilation of the foreign and domestic trade vectors made use of sound estimation techniques in addition to available, albeit limited, trade information. These include the simple location quotient (SLQ) method of estimating regional inflows, the use of estimated trade coefficients and import content ratios derived from the national IO table.

The non-competitive type of intra-regional table is derived by subtracting the resulting satellite tables on regional imports and domestic inflows from their respective regional competitive-type tables. Thus, in a non-competitive table, inter-sectoral transactions within the region refer only to purely regionally-produced products. 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 III: Estimation of Inter-Regional Product Flows**

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 4 recipient regions. 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 of product  $i$  in recipient region  $S$  to its total domestic demand of product  $i$ . In equation form,

$$OF_i^{RS} = DXP_i^R * \frac{DD_i^S}{\sum_{S=1}^4 DD_i^S} \quad (51)$$

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:

$$TC_i^{RS} = \frac{OF_i^{RS}}{DD_i^S} \quad (52)$$

where:  $TC_i^{RS}$  = trade coefficient of product  $i$  between region  $R$  and  $S$ ;

It should be noted here that the estimation of TCs between regions was carried out for all products including the services sectors. Thus, in this 5-region, 84-sector PIRIO table, a total of 1,344 TCs (=16 partner regions x 84 sectors) were calculated. These TCs were applied along their respective row sectors in each of the 5 intra-regional tables of the non-competitive type.

#### **Phase IV: Integration and Calculation of Coefficient Tables**

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

### **3 . EMPIRICAL RESULTS**

This section highlights some of the significant findings on the intra- and inter-regional analysis of the regional economies under study. The analysis is based on the empirical 5-region intra-regional and inter-regional (PIRIO) tables at the aggregated 16-sector levels of product classification.

#### **3-1. Supply and Demand Situation**

A situational analysis of regional supply and demand shows that in 1994 the NCR economy accounted for one-third (33.8%) of the 5-region's estimated total supply of US\$190.4 billion, followed by Southern Luzon contributing 22.5%. By supply source, Table 3-1 shows that regional production accounted for the biggest bulk of total supply averaging 73%, while imports from within the domestic economy and from abroad accounted for the remaining 27%.

**Table 3-1. Supply and Demand Structures of Regional Economies: Philippines, 1994**

ITEM	R 1: NCR		R 2: NCL		R 3: SOL		R 4: VIS		R 5: MIN		TOTAL	
	\$ B	%	\$ B	%	\$ B	%	\$ B	%	\$ B	%	\$ B	%
<b>I. TOTAL SUPPLY</b>	<b>64.3</b>	<b>100.0</b>	<b>28.0</b>	<b>100.0</b>	<b>42.9</b>	<b>100.0</b>	<b>26.4</b>	<b>100.0</b>	<b>28.8</b>	<b>100.0</b>	<b>190.4</b>	<b>100.0</b>
	<i>33.8%</i>		<i>14.7%</i>		<i>22.5%</i>		<i>13.9%</i>		<i>15.1%</i>		<i>100.0%</i>	
<b>A) Production</b>	<b>45.8</b>	<b>71.1</b>	<b>19.6</b>	<b>69.8</b>	<b>31.2</b>	<b>72.8</b>	<b>19.7</b>	<b>74.8</b>	<b>22.7</b>	<b>78.7</b>	<b>139.0</b>	<b>73.0</b>
	<i>32.9%</i>		<i>14.1%</i>		<i>22.4%</i>		<i>14.2%</i>		<i>16.3%</i>		<i>100.0%</i>	
<b>B) Imports</b>	<b>18.6</b>	<b>28.9</b>	<b>8.5</b>	<b>30.2</b>	<b>11.7</b>	<b>27.2</b>	<b>6.6</b>	<b>25.2</b>	<b>6.1</b>	<b>21.3</b>	<b>51.5</b>	<b>27.0</b>
	<i>36.1%</i>		<i>16.5%</i>		<i>22.7%</i>		<i>12.8%</i>		<i>11.8%</i>		<i>100.0%</i>	
1) Regional Inflows	8.7	13.6	4.3	15.5	3.9	9.1	4.3	16.3	3.7	12.8	25.0	13.1
2) ROW	9.8	15.3	4.1	14.7	7.8	18.1	2.3	8.8	2.5	8.5	26.5	13.9
<b>II. TOTAL DEMAND</b>	<b>64.3</b>	<b>100.0</b>	<b>28.0</b>	<b>100.0</b>	<b>42.9</b>	<b>100.0</b>	<b>26.4</b>	<b>100.0</b>	<b>28.8</b>	<b>100.0</b>	<b>190.4</b>	<b>100.0</b>
<b>A) Domestic Demand</b>	<b>49.0</b>	<b>76.2</b>	<b>23.3</b>	<b>83.2</b>	<b>28.8</b>	<b>67.1</b>	<b>20.8</b>	<b>78.9</b>	<b>21.7</b>	<b>75.4</b>	<b>143.7</b>	<b>75.4</b>
	<i>34.1%</i>		<i>16.2%</i>		<i>20.0%</i>		<i>14.5%</i>		<i>15.1%</i>		<i>100.0%</i>	
1) Intermediate	22.9	35.6	8.9	31.9	16.3	38.0	8.9	33.8	9.4	32.6	66.4	34.9
2) Final	26.1	40.6	14.4	51.3	12.5	29.2	11.9	45.1	12.3	42.8	77.3	40.6
2.1) Consumption	18.7	29.1	11.2	39.9	10.1	23.6	10.1	38.4	9.9	34.5	60.1	31.5
2.2) Investment	7.4	11.5	3.2	11.5	2.4	5.6	1.8	6.7	2.4	8.3	17.2	9.0
<b>B) Exports</b>	<b>15.3</b>	<b>23.8</b>	<b>4.7</b>	<b>16.8</b>	<b>14.1</b>	<b>32.9</b>	<b>5.6</b>	<b>21.1</b>	<b>7.1</b>	<b>24.6</b>	<b>46.8</b>	<b>24.6</b>
	<i>32.7%</i>		<i>10.0%</i>		<i>30.1%</i>		<i>12.0%</i>		<i>15.2%</i>		<i>100.0%</i>	
1) Regional Outflows	8.6	13.4	2.4	8.4	8.0	18.6	2.5	9.6	3.5	12.1	24.9	13.1
2) ROW	6.7	10.4	2.3	8.3	6.1	14.3	3.0	11.5	3.6	12.6	21.8	11.5

The Mindanao economy registered the highest production-supply ratio of 78.7%, suggesting its higher degree of self-sufficiency than the other regions. This finding is attributed to its heavy reliance on the less import-dependent agricultural production. In contrast, the economy of North-Central Luzon (NCL) appeared to be the most import-dependent economy, as 30.2% of its total supply requirements were sourced from outside, either from abroad or from partner regions.

From the demand side, domestic demand accounted for 75.4% of total demand, on the average. NCL exhibited the highest domestic-total demand ratio of 83.2%, owing to the region's low export performance compared with the other regions. In the NCR economy, domestic demand shared 76.2%, broken down into: 35.6% intermediate or industry demand and 40.6% final demand. Its exports demand accounted for the remaining 23.8%, broken down into: 10.4% foreign and 13.4% in the form of domestic outflows. Southern Luzon that includes the CALABARZON area registered the highest export demand ratio of 32.9%, broken down into: 14.3% foreign and 18.6% domestic. In effect, its domestic demand ratio registered the lowest (67.1%).

### 3-2. Output Structures

The NCR accounted for 32.9% of the country's total gross production of US\$139.0 billion in 1994, followed by South Luzon with 22.5% share. Mindanao ranked next with 16.3% and the Visayas and North-Central Luzon regions occupying the tail end with identical 14% shares (Table 3-2).

Production in the NCR is mainly concentrated in the industry and services sectors, with backyard crop production and sustenance fishing registering negligible proportions. At the 16-sector level of aggregation, the top producing sectors are: food, beverage & tobacco manufacture (05), finance, real estate & business services (14), manufacture of other consumer goods (06), and trade (11) with 20.2%, 12.5%, 10.9% and 10.8% shares, respectively.

**Table 3-2. Regional Output Structures by Sector**

PRODUCTION SECTOR		R1: NCR	R2: NCL	R3: SOL	R4: VIS	R5: MN	TOTAL
		%	%	%	%	%	%
1	Crops, livestock & poultry; agric'l services	0.04	18.96	12.65	13.08	24.08	11.31
2	Fishery	0.04	1.41	3.46	5.07	5.78	2.65
3	Forestry	0	0.24	0.01	0.01	0.95	0.19
<b>I</b>	<b>AGRIC, FISHERY &amp; FORESTRY</b>	<b>0.07</b>	<b>20.61</b>	<b>16.12</b>	<b>18.16</b>	<b>30.81</b>	<b>14.16</b>
4	Mining and quarrying	0.03	2.65	1.14	0.85	1.11	0.94
5	Manufacture of food, beverage & tobacco	20.19	11.88	11.66	11.65	13.95	14.87
6	Manufacture of other consumer goods	10.88	6.11	10.05	4.61	3.88	7.99
7	Manufacture of industrial materials	5.07	5.44	17.25	5.68	6.14	8.12
8	Manufacture of capital goods	7.47	4.21	13.13	4.17	0.81	6.72
9	Electricity, gas & water	2.25	3.22	3.33	2.78	2.14	2.69
10	Construction	4.91	8.52	2.89	5.81	6.09	5.28
<b>II</b>	<b>INDUSTRY</b>	<b>50.8</b>	<b>42.04</b>	<b>59.43</b>	<b>35.55</b>	<b>34.11</b>	<b>46.61</b>
11	Wholesale and retail trade	10.81	10.46	9.24	15.48	13.36	11.49
12	Transport services	5.74	5.4	2.26	6.38	3.57	4.65
13	Post and telecommunication	1.81	0.93	0.49	1.06	0.47	1.06
14	Finance, real estate & business services	12.48	9.55	6.72	11.01	7.11	9.69
15	Other private services	9.82	6.04	3.32	7.42	5.88	6.84
16	Government services	8.47	4.97	2.42	4.93	4.69	5.5
<b>III</b>	<b>SERVICES</b>	<b>49.13</b>	<b>37.35</b>	<b>24.45</b>	<b>46.29</b>	<b>35.08</b>	<b>39.23</b>
<b>ALL SECTORS</b>		<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>
<b>TOTAL VALUE (U.S. \$ Million)</b>		<b>45,767</b>	<b>19,573</b>	<b>31,217</b>	<b>19,727</b>	<b>22,702</b>	<b>138,984</b>
<b>PERCENT SHARE</b>		<b>32.93</b>	<b>14.08</b>	<b>22.46</b>	<b>14.19</b>	<b>16.33</b>	<b>100</b>

In regions outside of NCR, it is the crops, livestock & poultry sector that dominates in the North-Central Luzon and Mindanao regions, while in South Luzon, the manufacture of industrial materials (07) and manufacture of capital goods (08) are the top producers because the CALABARZON industrial complex is located in this region. In the Visayas, wholesale and retail trade sector appears to be the major contributor.

### 3-3. Input Structures

#### (1) Intermediate Inputs

In 1994, intermediate inputs, whether domestically or foreign-sourced, ranged from a low 41.4% of total production cost in Mindanao to a high 52.1% in South Luzon where a significant 39.5% was sourced from outside the region. The relatively low ratio in Mindanao is attributed to low intermediate input ratio posted by the high-value-added crops, livestock & poultry sector (01) which is the dominant sector in the region. In South Luzon, high consumption ratios of imported inputs by the industrial materials (07) and capital goods (08) sectors caused the rise in the region's intermediate input ratio.

The import content ratios of production costs are relatively low in the Visayas and Mindanao, where the less import-dependent services and agriculture sectors dominate. On the other hand, the import-content ratio of production, as shown in Table 3-3, is relatively high in South Luzon, which could be attributed to the influx of highly import-dependent industries located in the CALABARZON complex.

**Table 3-3. Intermediate Input Structures by Source of Inputs**

Sector	R1: NCR			R2: NCL			R3: SOL			R4: VIS			R5: MIN		
	Source of Inputs			Source of Inputs			Source of Inputs			Source of Inputs			Source of Inputs		
	Total	Local	ROW	Total	Local	ROW	Total	Local	ROW	Total	Local	ROW	Total	Local	ROW
	Ratio	%	%	Ratio	%	%	Ratio	%	%	Ratio	%	%	Ratio	%	%
1.CLP	0.392	91.3	8.7	0.319	82.4	17.6	0.313	89.5	10.5	0.365	91.2	8.8	0.214	83.2	16.8
2.FSHY	0.266	95.5	4.5	0.266	95.1	4.9	0.244	95.9	4.1	0.259	98.1	1.9	0.329	97.0	3.0
3.FSTRY	0.000	0.0	100.0	0.244	95.5	4.5	0.087	98.9	1.1	0.136	97.8	2.2	0.200	97.0	3.0
AFF	0.327	93.0	7.0	0.315	83.2	16.8	0.298	90.6	9.4	0.336	92.3	7.7	0.235	87.2	12.8
4.MQ	0.419	76.1	23.9	0.457	69.8	30.2	0.481	78.2	21.8	0.440	80.9	19.1	0.325	83.4	16.6
5.FBT	0.666	94.0	6.0	0.653	89.3	10.7	0.671	94.9	5.1	0.649	95.8	4.2	0.711	93.5	6.5
6.OCG	0.578	58.0	42.0	0.696	67.7	32.3	0.655	57.7	42.3	0.603	75.3	24.7	0.673	77.3	22.7
7.IndM	0.696	59.9	40.1	0.722	49.2	50.8	0.713	33.8	66.2	0.697	73.9	26.1	0.693	73.7	26.3
8.CapG	0.740	40.8	59.2	0.752	34.4	65.6	0.764	31.9	68.1	0.698	50.4	49.6	0.642	67.8	32.2
9.EGW	0.533	62.7	37.3	0.495	49.9	50.1	0.453	63.1	36.9	0.540	75.7	24.3	0.438	60.5	39.5
10.CON	0.496	73.6	26.4	0.482	80.1	19.9	0.428	78.7	21.3	0.462	78.1	21.9	0.418	80.4	19.6
IND'Y	0.638	71.6	28.4	0.619	68.3	31.7	0.674	52.2	47.8	0.612	79.4	20.6	0.620	83.7	16.3
11.TRD	0.351	83.8	16.2	0.320	85.3	14.7	0.279	87.1	12.9	0.334	86.2	13.8	0.351	84.3	15.7
12.TRANS	0.529	82.0	18.0	0.606	76.6	23.4	0.532	74.1	25.9	0.642	86.1	13.9	0.587	84.3	15.7
13.COMM	0.255	84.3	15.7	0.317	62.1	37.9	0.310	78.7	21.3	0.354	82.5	17.5	0.295	77.3	22.7
14.FREBS	0.259	82.2	17.8	0.185	87.6	12.4	0.177	85.9	14.1	0.209	89.0	11.0	0.171	88.9	11.1
15.OPS	0.437	84.7	15.3	0.514	84.0	16.0	0.501	85.6	14.4	0.510	87.3	12.7	0.535	86.9	13.1
16.GOV	0.325	86.2	13.8	0.280	90.0	10.0	0.214	91.1	8.9	0.310	92.3	7.7	0.362	90.9	9.1
SVCS	0.358	83.8	16.2	0.353	83.3	16.7	0.299	84.6	15.4	0.373	87.4	12.6	0.370	86.2	13.8
Total	0.500	76.0	24.0	0.457	74.6	25.4	0.521	60.5	39.5	0.451	84.3	15.7	0.414	85.0	15.0

**(2) Primary Inputs**

Table 3-4 shows the regional distribution of sectoral total primary inputs or GVA by factor share. On the whole, the NCR economy accounted for 31.5% of the country's GDP of US \$72.6 billion in 1994, expressed in current producers' prices. Southern Luzon contributed 20.6%, followed closely by Mindanao (18.3%). North-Central Luzon and Visayas regions occupied the tail end with 14.7% and 14.9% shares, respectively.

One interesting observation in Table 3-4 is that, while South Luzon region ranked next to NCR in terms of labor income contribution as measured by compensation to employees, its compensation-GVA ratio, however, is the lowest at 28.5% compared with those in the other regions. On the other hand, its share of operating surplus ranked the highest at 56.6% of total GVA. This finding would tend to suggest that multi-national companies operating in the CALABARZON [South Luzon] appeared to be more profit-oriented than providing adequate income to workers.

**Table 3-4. Regional Distribution of Primary Inputs by Factor Share: 1994**

REGION	Total Primary Inputs		Compensation		Net Indirect Taxes		Depreciation		Operating Surplus	
	US\$M	%	US\$M	%	US\$M	%	US\$M	%	US\$M	%
R1: NCR	22,874	31.5	7,996	34.4	1,234	31	2,002	31.3	11,642	29.9
R2: NCL	10,634	14.7	3,252	14	551	13.8	966	15.1	5,865	15.1
R3: SOL	14,940	20.6	4,257	18.3	974	24.5	1,248	19.5	8,460	21.7
R4: VIS	10,825	14.9	3,591	15.5	706	17.7	1,054	16.5	5,474	14
R 5: MIN	13,311	18.3	4,135	17.8	519	13	1,131	17.7	7,526	19.3
PHILS	72,583	100	23,231	100	3,984	100	6,401	100	38,966	100
CONTRIBUTION RATIOS (%)										
R1: NCR	100		35		5.4		8.8		50.9	
R2: NCL	100		30.6		5.2		9.1		55.2	
R3: SOL	100		28.5		6.5		8.4		56.6	
R4: VIS	100		33.2		6.5		9.7		50.6	
R 5: MIN	100		31.1		3.9		8.5		56.5	
PHILS	100		32		5.5		8.8		53.7	

Table 3-5 shows the proportions of total primary inputs to total inputs consumed in production or what is known as gross value added ratios (GVARs). A sector's GVAR is the difference between its unit cost of production and its corresponding intermediate input ratio. The table thus enables one to confirm that high-value added sectors such as the primary and tertiary industries exhibit high GVARs, while the material-intensive secondary industries show low GVARs.

**Table 3-5. Primary Input (Value Added) Ratios by Sector  
(Per Unit Output)**

SECTOR	R1: NCR	R2: NCL	R3: SOL	R4: VIS	R5: MIN	PHILS
1.CLP	0.608	0.681	0.687	0.635	0.786	0.711
2.FSHY	0.734	0.734	0.756	0.741	0.671	0.720
3.FSTY	-	0.756	0.913	0.864	0.800	0.794
<b>AFF</b>	<b>0.673</b>	<b>0.685</b>	<b>0.702</b>	<b>0.664</b>	<b>0.765</b>	<b>0.714</b>
4.MQ	0.581	0.543	0.519	0.560	0.675	0.564
5.FBT	0.334	0.347	0.329	0.351	0.289	0.330
6.OCG	0.422	0.304	0.345	0.397	0.327	0.378
7.IndM	0.304	0.278	0.287	0.303	0.307	0.294
8.CapG	0.260	0.248	0.236	0.302	0.358	0.254
9.EGW	0.467	0.505	0.547	0.460	0.562	0.507
10.CON	0.504	0.518	0.572	0.538	0.582	0.535
<b>INDY</b>	<b>0.362</b>	<b>0.381</b>	<b>0.326</b>	<b>0.388</b>	<b>0.380</b>	<b>0.359</b>
11.TRD	0.649	0.680	0.721	0.666	0.649	0.670
12.TRANS	0.471	0.394	0.468	0.358	0.413	0.429
13.COMM	0.745	0.683	0.690	0.646	0.705	0.715
14.FREBS	0.741	0.815	0.823	0.791	0.829	0.783
15.OPS	0.563	0.486	0.499	0.490	0.465	0.521
16.GOV	0.675	0.720	0.786	0.690	0.638	0.688
<b>SVCS</b>	<b>0.642</b>	<b>0.647</b>	<b>0.701</b>	<b>0.627</b>	<b>0.630</b>	<b>0.647</b>
<b>SCIRS</b>	<b>0.500</b>	<b>0.543</b>	<b>0.479</b>	<b>0.549</b>	<b>0.586</b>	<b>0.522</b>

The Mindanao's economy recorded the highest GVAR of 0.586, meaning that, for every US \$1000 cost of production, US \$586 was derived as value added to the region's economy. In contrast, South Luzon's economy had the lowest GVAR of 0.479, since it is a heavy user of material inputs compared with the economies of the other 4 regions.

### 3-4 Self-Sufficiency Rates

The self-sufficiency rate is defined as the ratio of total production to total regional demand, so that, in each region, we have

$$SSR_i^R = \frac{X_i^R}{TD_i^R} \quad (53)$$

where:  $SSR_i^R$  is the self-sufficiency rate of product  $i$  in region  $R$ ;

$X_i^R$  is the gross output of product  $i$  in region  $R$ ; and

$TD_i^R$  is the total local demand for product  $i$  in region  $R$ .

A sector with  $SSR \geq 1$  means that its output is sufficient to sustain its regional demand. On the other hand, a sector with  $SSR < 1$  suggests that imports are needed to meet that sector's total domestic demand.

Table 3-6 is a comparative presentation of regional self-sufficiency rates by product sector. The table shows that, on the whole, only the economies of South Luzon and Mindanao are viewed as self-sufficient with all-sector average SSR of 1.084 and 1.045, respectively. The Visayas region (0.948), NCR (0.934) and North-Central Luzon (0.839) had to resort to importations to meet their total domestic demands.

**Table 3-6. Regional Self-Sufficiency Rates, 1994**

Sector		R1	R2	R3	R4	R5
1	Crops, livestock & poultry; agric'l services	0.004	1.337	1.138	1.117	1.888
2	Fishery	0.025	0.614	2.148	1.779	1.882
3	Forestry	-	1.614	0.444	0.123	1.573
<b>I</b>	<b>AGRIC, FISHERY &amp; FORESTRY</b>	<b>0.007</b>	<b>1.240</b>	<b>1.265</b>	<b>1.241</b>	<b>1.876</b>
4	Mining and quarrying	0.073	1.529	0.195	0.405	3.872
5	Manufacture of food, beverage & tobacco	1.467	0.593	0.999	0.693	0.988
6	Manufacture of other consumer goods	1.249	0.592	1.182	0.653	0.607
7	Manufacture of industrial materials	0.493	0.490	1.635	0.673	0.628
8	Manufacture of capital goods	0.480	0.350	1.103	0.639	0.130
9	Electricity, gas & water	0.616	1.353	1.956	1.015	1.004
10	Construction	1.166	1.071	0.621	1.009	1.019
<b>II</b>	<b>INDUSTRY</b>	<b>0.898</b>	<b>0.641</b>	<b>1.085</b>	<b>0.719</b>	<b>0.760</b>
11	Wholesale and retail trade	1.171	1.137	1.347	1.201	1.223
12	Transport services	1.513	1.053	0.742	1.157	0.893
13	Post and telecommunication	1.166	1.449	1.282	1.173	0.661
14	Finance, real estate & business services	1.178	0.952	0.854	1.030	0.857
15	Other private services	1.479	0.858	0.812	1.154	1.010
16	Government services	1.000	1.000	1.000	1.000	1.000
<b>III</b>	<b>SERVICES</b>	<b>1.220</b>	<b>1.009</b>	<b>0.991</b>	<b>1.119</b>	<b>1.018</b>
<b>ALL SECTORS</b>		<b>0.934</b>	<b>0.839</b>	<b>1.084</b>	<b>0.948</b>	<b>1.045</b>

By product sector, all of the service sectors in Metro Manila exhibited SSRs equal to or greater than 1. For manufactured products, only South Luzon is shown to be self-sufficient. All regions are self-sufficient with respect to electricity, gas and water (09) except in the NCR, since NCR is dependent on electricity generated in its neighboring regions, NCL and SOL. In the agriculture, fishery and forestry sector, Mindanao registered the highest SSR of 1.876 while highly urbanized NCR recorded an almost nil SSR, hence it had no choice but to resort to heavy importation, whether domestic and/or foreign, to satisfy its demand for agriculture, fishery & forestry products.

### 3-5. Inter-regional Interdependencies

#### (1) Inter-Regional Trade

A salient feature of an IRIO table is inter-regional trade. In an IRIO table, inter-regional outflows/inflows of products are explicitly recorded as separate sub-matrices. Thus, our IRIO table can be used to determine the extent of a region's dependence on the other region's products and, vice versa. Moreover, with the availability of the IRIO Leontief inverse, the analysis can be extended to measure the indirect effects of inter-regional trade on a multi-region economy such as the 5-region PIRIO table, in terms of spillover and feedback effects.

Tables 3-7 and 3-8 present, in their summary forms, the structural characteristics of inter-regional trade in the country in 1994. At this 5-region spatial disaggregation, the tables show that the total volume of inter-regional domestic trade in 1994 amounted to US \$24.9 billion, representing a mere 17.9% of the country's total production value of US \$139.0 billion. The remaining 82.1% of total production is presumed to be what went to intra-regional intermediate and domestic final demand transactions as well as to exports to ROW.

Table 3-7 shows that NCR's total outflow totaled US \$8,625 million or 34.6% of the total volume traded, followed closely by Southern Luzon that traded US \$ 7,962 worth of mostly manufactured products or 31.9%. From the inflow side, Table 3-8 shows that NCR imported from other regions a total of US \$8,718 million worth of goods and services to sustain its intermediate and final demands, followed by North Central Luzon and the Visayas with estimated total inflows of US \$4,348 million and US \$4,302 million, respectively.

**Table 3-7. Inter-Regional Structure on Domestic Outflows**

		TO	R 1	R 2	R 3	R 4	R 5	Total OUTFLOW	
		FROM	%	%	%	%	%	%	\$ M
R 1	NCR (Metro Manila)			29.40	27.80	23.30	19.60	100.00	8,625
R 2	North-Central Luzon		59.60		16.60	13.30	10.50	100.00	2,359
R 3	South Luzon		48.10	15.40		19.10	17.40	100.00	7,962
R 4	Visayas		50.40	16.30	19.40		14.00	100.00	2,526
R 5	Mindanao		63.70	5.10	17.90	13.20		100.00	3,474
TOTALS (%)			34.90	17.40	15.60	17.20	14.70	100.00	24,946

**Table 3-8. Inter-Regional Structure on Domestic Inflows**

		FROM	R 1	R 2	R 3	R 4	R 5	TOTALS	
		TO	%	%	%	%	%	%	
R 1	NCR (Metro Manila)			58.2	61.4	46.6	46	34.6	
R 2	North-Central Luzon		16.1		10.1	7.3	6.7	9.5	
R 3	South Luzon		43.9	28.2		35.4	37.6	31.9	
R 4	Visayas		14.6	9.5	12.5		9.6	10.1	
R 5	Mindanao		25.4	4.1	16	10.7		14.0	
Total INFLOW (%)			100.0	100.0	100.0	100.0	100.0	100.0	
(US \$ M)			8,718	4,348	3,900	4,302	3,678	24,946	

By region of destination, a bigger chunk of NCR's outflows were delivered to its neighboring Luzon regions than to the South. Deliveries by the 4 partner regions to NCR are observed to be quite heavy. From the inflow side, NCR's domestic requirements are mostly sourced from South Luzon (43.9%) and from Mindanao (25.4%).

Table 3-9 summarizes the regional "terms of trade" on domestic outflows and inflows as well as with the Rest of the World (ROW). It can be observed that only South Luzon had a favorable "terms of trade" with the 4 partner regions as its domestic exports exceeded its inflows by an estimated US \$4.1 billion in 1994. On the other hand, the region (South Luzon) recorded a "negative terms of trade" with the ROW, as its imports exceeded its exports by US\$1.6 billion. The NCR registered "negative terms of trade" with the partner regions as well as with the ROW. The same finding is true with North-Central Luzon and Mindanao.

**Table 3-9. Summary Table on Regional Terms of Trade**

REGION		DOMESTIC			ROW		
		Outflow	Inflow	DO - DI	Exports	Imports	E - M
R 1	NCR (Metro Manila)	8,625	8,718	-93	6,682	9,846	-3,164
R 2	North-Central Luzon	2,359	4,348	-1,989	2,340	4,106	-1,766
R 3	South Luzon	7,962	3,900	4,061	6,128	7,757	-1,629
R 4	Visayas	2,526	4,302	-1,776	3,033	2,330	703
R 5	Mindanao	3,474	3,678	-204	3,621	2,450	1,171
TOTAL		24,946	24,946	0	21,804	26,489	-4,685

Shown in Table 3-10 are indicators analogous to the "terms of trade" concept that also measures imbalance in trade relationships. This is called trade intensity index, which is calculated as the ratio of one region's outflow to partner region relative to partner region's total exports to the proportion of partner region's total inflows to total inflows for all regions. A ratio of 1 shows an average degree of trade intensity, and a figure greater than 1 shows a relatively stronger degree of trade intensity.

**Table 3-10. Inter-Regional Domestic Trade Intensity Index**

From		To	NCR	NCL	SOL	VIS	MIN
R 1	NCR (Metro Manila)			5.873	1.527	4.385	2.177
R 2	North-Central Luzon		0.499		0.209	0.778	0.395
R 3	South Luzon		1.584	4.243		4.330	2.992
R 4	Visayas		0.500	1.083	0.297		0.493
R 5	Mindanao		1.032	0.556	0.596	1.255	

It can be observed from the above table that the NCR economy exhibited strong degrees of trade intensities with its 4 partner regions. Its trade with North Central Luzon (NCL) and the Visayas appeared to be more intense than its trade with Southern Luzon and Mindanao. Similar pattern of trade relationships could be inferred for Southern Luzon's domestic trade. On the contrary, the table suggests that NCL's domestic trade with its partner regions is relatively weak with its trade intensities falling below one. Mindanao's trade with NCR and the Visayas is strong but weak with NCL and SOL. Visayas exhibited an average degree of trade intensity with NCL but is observed to be relatively weak in its trade with NCR, Southern Luzon and Mindanao.

**(2) Key Sector Analysis: Inter-Regional & Inter-Sectoral Linkage Effects**

Linkages reflect the dependence of industries on one another in an economy and measure the potential stimulus that will be induced in other industries arising from an increase in activity in a particular industry. In essence, there are two types of linkages, namely, backward linkages and forward linkages.

Backward linkage is a measure of the relative importance of an industry as a user of inputs from the entire production system. It measures the output increases 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 is described by Rasmussen (1957) as the index of the power of dispersion,  $\mu_j$ , and is defined mathematically as

$$\mu_j = \frac{\sum_{i=1}^n r_{ij}}{\frac{1}{n} \sum_{i=1}^n \sum_{j=1}^n r_{ij}} \quad (55)$$

where the  $r_{ij}$  is the element of the Leontief inverse. The higher the value of  $\mu_j$ , the stronger is the influence of industry  $j$  as a user of intermediate inputs.

A forward linkage indicates the relative importance of an industry as a supplier of inputs to the entire production system. It measures the output increases which will occur in industries which use the inputs supplied by the industry concerned. A forward linkage can be expressed as the ratio of the sum of the elements along a row of the Leontief inverse to the average of the entire system. This ratio is described by Rasmussen (1957) as the index of sensitivity,  $\mu_i$ , and is defined mathematically as

$$\mu_i = \frac{\sum_{j=1}^n r_{ij}}{\frac{1}{n} \sum_{i=1}^n \sum_{j=1}^n r_{ij}} \quad (56)$$

The higher the value of  $\mu_i$ , the greater is the influence of industry  $i$  as a supplier of intermediate inputs to the entire production system.

Shown in Table 3-11 are the calculated linkage effects, based on 16-sector matrix of inter-regional inverse coefficients. It can be gleaned from the table that a total of 35 region-sector pairings exhibit indices of dispersion greater than unity, indicating their high backward linkage effects on the entire productive system. The remaining 45 region-sector pairings exhibited less-than-unity indices, signifying their weak linkages with the productive sectors as users of intermediate inputs.

It can be noted that Region 5 (Mindanao) had the most number of sectors with relatively high backward linkage effects with 6 sectors, followed by the Visayas with 4 sectors. The food, beverage & tobacco sector (05) in all regions appeared to be the heaviest user of intermediate inputs. In Metro Manila (Region 1), only its food, beverage & tobacco manufacturing registered a significantly higher backward linkage effect.

As a supplier of inputs to the entire productive system, 7 sectors in Metro Manila appeared to be among the top region-pairings with significantly high forward linkage effects, followed by Regions 3 and 4 with 4 each. The agriculture, livestock & poultry & forestry sector (01) in all regions except Metro Manila is pinpointed to be the main provider of inputs used in production.

**Table 3-11. INTER-REGIONAL TOTAL BACKWARD-FORWARD LINKAGES, 1994**

16- SECTOR DESCRIPTION		R 1: NCR		R 2: NCL		R 3: SOL		R 4: VIS		R 5: MIN	
		TBL	TFL	TBL	TFL	TBL	TFL	TBL	TFL	TBL	TFL
1	Crops, livestock & poultry	1.04	0.67	0.93	1.34	0.96	1.41	1.02	1.23	0.84	1.67
2	Fishery	0.92	0.67	0.93	0.73	0.90	0.82	0.93	0.83	0.99	0.83
3	Forestry	0.67	0.67	0.90	0.72	0.76	0.67	0.80	0.67	0.86	0.90
4	Mining and quarrying	0.98	0.68	0.98	0.86	1.02	0.78	1.03	0.77	0.93	0.78
5	Food, beverage & tobacco	1.28	1.41	1.25	0.86	1.30	0.99	1.31	0.94	1.29	0.86
6	Other consumer goods	1.00	1.34	1.16	1.03	1.05	1.08	1.14	0.82	1.18	0.98
7	Industrial materials	1.08	1.37	1.01	1.41	0.90	3.86	1.18	0.97	1.22	1.37
8	Capital goods	0.97	1.23	0.91	0.77	0.90	1.08	1.03	0.82	1.12	0.76
9	Electricity, gas & water	0.97	0.93	0.90	1.01	0.93	1.11	1.07	1.05	0.91	0.97
10	Construction	1.03	0.72	1.06	0.82	1.00	0.73	1.05	0.78	1.03	0.79
11	Wholesale and retail trade	0.94	1.24	0.94	1.18	0.91	1.24	0.97	1.33	0.97	1.25
12	Transport services	1.07	1.28	1.12	0.98	1.04	0.90	1.22	1.20	1.16	1.02
13	Post and telecommunication	0.86	0.87	0.86	0.72	0.90	0.72	0.96	0.75	0.89	0.72
14	business services	0.87	2.05	0.83	0.92	0.82	0.91	0.86	1.13	0.82	0.97
15	Other private services	1.05	1.09	1.14	0.86	1.14	0.86	1.16	0.98	1.18	0.92
16	Government services	0.94	0.67	0.93	0.67	0.87	0.67	0.98	0.67	1.01	0.67

TBL: Total Backward Linkage    TFL: Total Forward Linkage

For a better appreciation of Table 3-11, it is possible to split the sectors in each region according to their calculated degrees of interdependencies. Industries with linkages greater than or equal to unity are defined as industries with high interdependencies, while those with linkages below unity are considered as industries with low interdependencies. Based on these definitions, Chenery and Clark (1959) classified industries into the following four groups:

GROUP I: HIGH  $\mu_j$ , HIGH  $\mu_i$

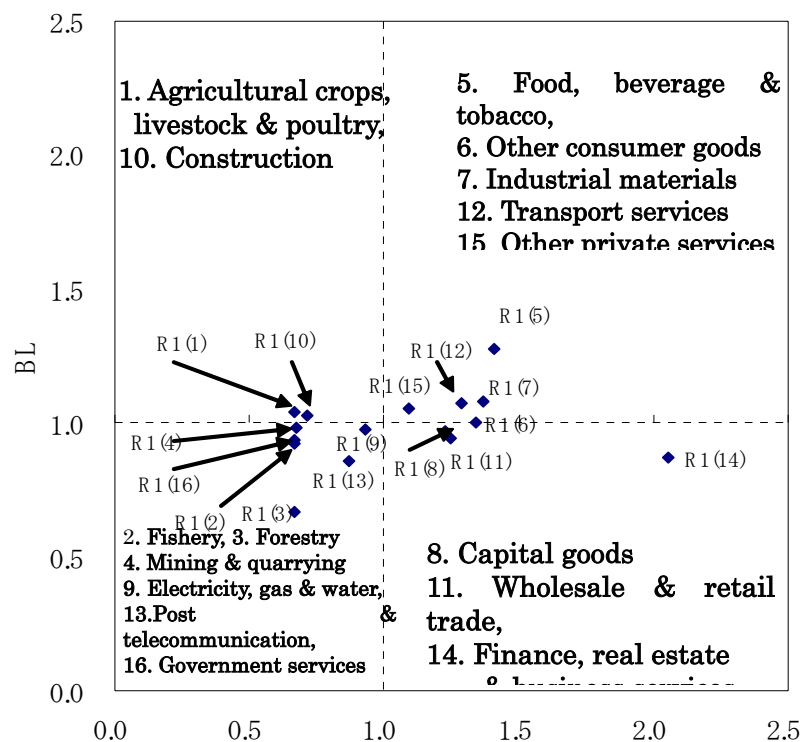
GROUP IV: HIGH  $\mu_j$ , LOW  $\mu_i$

GROUP II: LOW  $\mu_j$ , HIGH  $\mu_i$

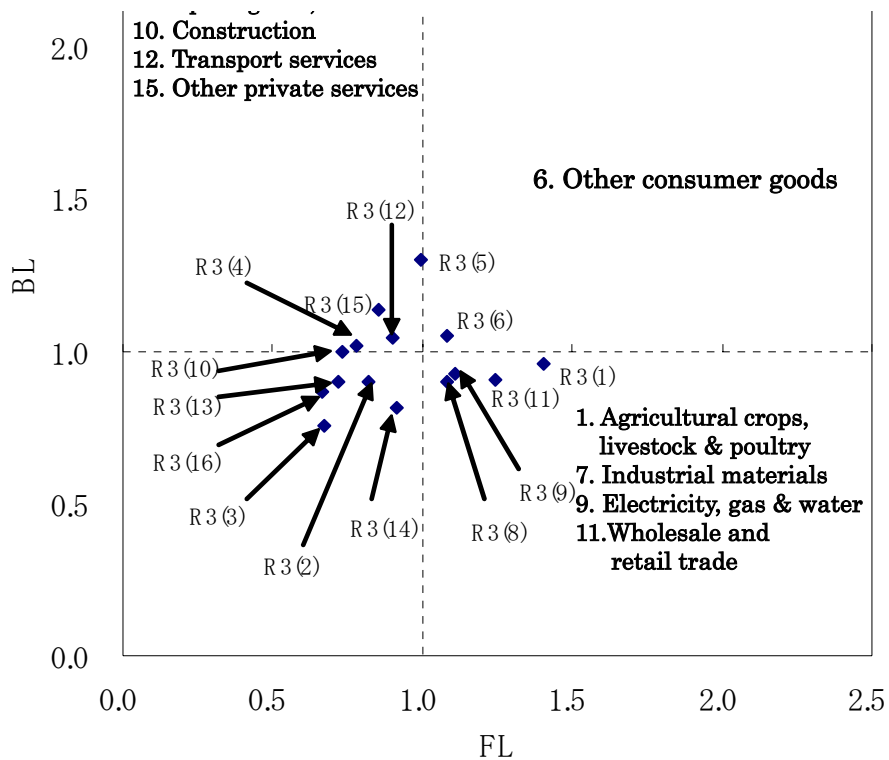
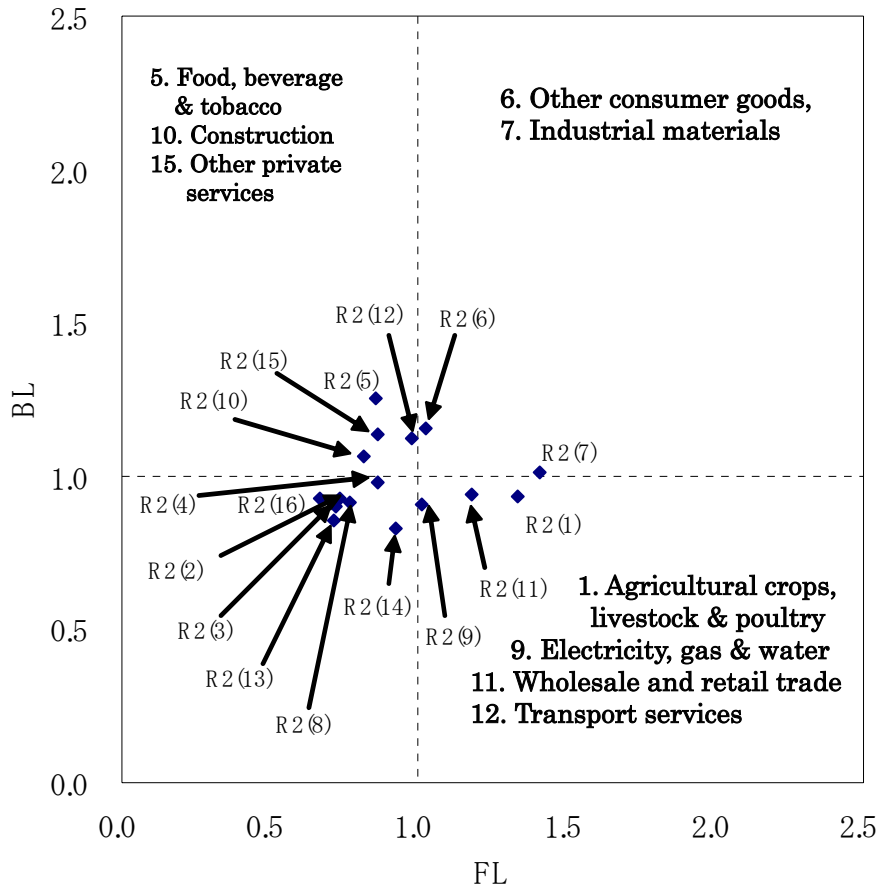
GROUP III: LOW  $\mu_j$ , LOW  $\mu_i$

Industries which belong to Groups I and II are those whose production processes are characterized by relatively high usage of intermediate inputs. An expansion in these industries would have a considerable impact on the whole economic system. This is particularly so for industries in Group I since, in addition to having high values of  $\mu_i$ , they are also characterized by large values of  $\mu_j$ , which means that a major portion of their outputs is

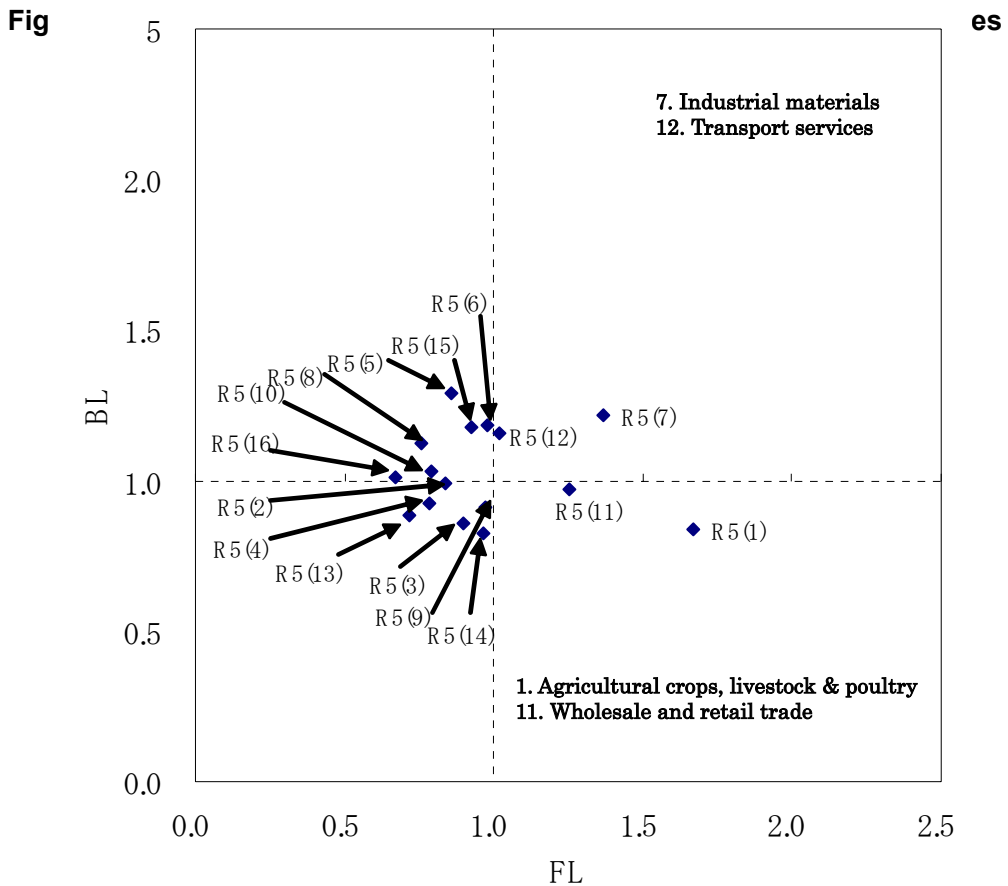
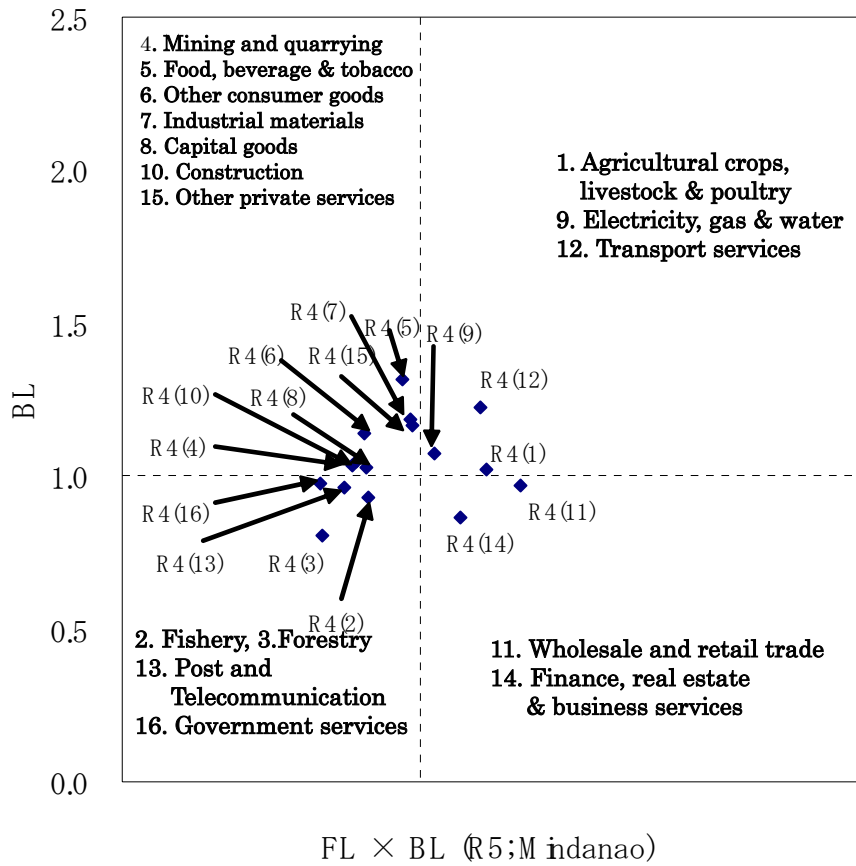
also absorbed by the system. Industries classified under Groups III and IV are both characterized by low values of  $\mu_j$  as they tend to maintain a cost structure which is biased towards the use of primary inputs rather than intermediate inputs. In addition, industries which belong to Group IV do not depend extensively on the system of productive sectors for their intermediate input requirements, while their products are not utilized much by other industries as they are mainly channeled directly to final consumption. The classification of industries in this manner is particularly useful to economic planners and policy makers in the assessment and setting of industrial priorities in regional development. For example, industries under Group I could be considered the top priority industries in development policy due to their high linkages with the productive system as users and providers of domestically-produced inputs. The results are shown below in the form of scatter diagrams (Fig.4-1, 4-2, 4-3, 4-4, 4-5).



**Fig.4-1 Grouping of Sectors Based on their Degrees of Interdependencies (Region 1 : Metro Manila)**



**Fig.4-3 Grouping of Sectors Based on their Degrees of Interdependencies (Region 3: South Luzon)**



**Fig. 4-5 Grouping of Sectors Based on their Degrees of Interdependencies (Region 5: Mindanao)**

## (2) Spillover and Feedback Effects

This sub-section is aimed at quantifying the inter-regional spillover and feedback effects by using equation (49). Spillover and feedback effects arise due to inter-regional trade in products to sustain regional final demands. Spillover effect is the direct or the first round effect of inter-regional product flows, while feedback effect is the indirect or the second round impact arising from the inter-regional spillovers.

Table.3-12 shows that, in terms of spillover effects, Region 3 (South Luzon) and Region 1 (Metro Manila) registered fairly significant impacts due to their trade transactions with the rest of the regions. The average spillover effects in South Luzon and Metro Manila are estimated to be \$62 and \$55 for every \$1000 increase in final demand. Because of weak inter-regional linkages among and between sectors, calculated spillover effects in Regions 2, 4 and 5 appear to be insignificant. Feedback effects in all regions are found to be negligible.

**Table. 3-12 INTER-REGIONAL SPILLOVER and FEEDBACK EFFECTS by SECTOR**  
(Total Effect per Unit of Final Demand)

Sector		SPILLOVERS					FEEDBACKS				
		S <sup>R1</sup>	S <sup>R2</sup>	S <sup>R3</sup>	S <sup>R4</sup>	S <sup>R5</sup>	F <sup>R1</sup>	F <sup>R2</sup>	F <sup>R3</sup>	F <sup>R4</sup>	F <sup>R5</sup>
1	Crops, livestock & poultry	0	0.042	0.047	0.022	0.104	0	0.011	0.01	0.008	0.025
2	Fishery	0	0	0.023	0.017	0.005	0	0	0.003	0.002	0.001
3	Forestry	0	0.004	0	0	0.024	0	0.001	0	0	0.002
4	Mining and quarrying	0	0.038	0.021	0.012	0.018	0	0.006	0.002	0.005	0.003
5	Food, beverage & tobacco	0.121	0.005	0.023	0.009	0.006	0.015	0.001	0.001	0.001	0.001
6	Other consumer goods	0.109	0.014	0.048	0.002	0.039	0.008	0.001	0.003	0	0.003
7	Industrial materials	0.106	0.031	0.627	0.024	0.035	0.011	0.004	0.071	0.006	0.01
8	Capital goods	0.104	0.001	0.06	0.002	0.001	0.009	0	0.004	0	0
9	Electricity, gas & water	0.015	0.016	0.05	0.003	0.006	0.001	0.003	0.009	0.001	0.001
10	Construction	0.003	0.014	0.001	0.005	0.001	0	0.002	0	0.001	0
11	Trade	0.032	0.009	0.059	0.009	0.01	0.003	0.001	0.007	0.003	0.002
12	Transport services	0.094	0.027	0.014	0.037	0.012	0.009	0.002	0.001	0.013	0.004
13	Communication	0.018	0	0.003	0.005	0	0.001	0	0	0	0
14	Finance, real estate & b.s.	0.209	0.011	0.012	0.022	0.005	0.018	0.002	0.001	0.004	0.001
15	Other private services	0.06	0.007	0.007	0.009	0.01	0.003	0.001	0.001	0.002	0.001
16	Government services	0	0	0	0	0	0	0	0	0	0
<b>TOTAL</b>		<b>0.873</b>	<b>0.219</b>	<b>0.994</b>	<b>0.178</b>	<b>0.277</b>	<b>0.077</b>	<b>0.036</b>	<b>0.114</b>	<b>0.047</b>	<b>0.055</b>
<b>AVERAGE</b>		<b>0.055</b>	<b>0.014</b>	<b>0.062</b>	<b>0.011</b>	<b>0.017</b>	<b>0.005</b>	<b>0.002</b>	<b>0.007</b>	<b>0.003</b>	<b>0.003</b>

#### 4. CONCLUSION

This paper has presented a pioneering research undertaking in the Philippines by constructing a multi-region IRIO table. The main objective of this study is to measure and analyze observed intra- and inter-regional differentials and interdependencies among and between sectors and regions. The hybrid approach was developed and adopted in compiling the 5-region PIRIO table of the Isard type. The method made use of available, albeit limited, statistics at the regional level, complemented by sound indirect estimation techniques to fill-in observed data gaps and deficiencies.

Basically, we made some measure of success in identifying and assessing the configurations of the regional economies by focusing extensively on the macro- and micro-economic structures and inter-relationships. Specifically, it highlighted such important topics as: (a) comparative analysis of the intra- and inter-regional economic structures; (b) inter-regional trade differentials; and (c) inter-industry dependencies by measuring the direct and indirect linkages, spillover and feedback effects due to inter-regional trade, intra-regionally and inter-regionally alike.

The results may not be as comprehensive as what regional planners and policy makers would wish for, but the general framework used could provide the foundation in extending and expanding the scope and coverage of this study.

Finally, the following broad areas of concerns are presented for consideration, given the observed limitations/constraints of the methods and sources in compiling the Philippine Inter-regional IO (PIRIO) table:

1. Improvement of data adequacy and quality at the sub-national level to enhance the accuracy of the hybrid technique of regional IO compilation;
2. Development and maintenance of a doable framework for the generation of product flow statistics suitable for inter-regional IO compilation; and
3. Conduct of IO updating exercises to help improve the reliability of IO-based research studies.

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