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# DEVELOPMENT OF UPDATING PROCEDURES FOR AND ANALYSIS OF PAKISTAN INTERINDUSTRY RELATIONSHIPS

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# DEVELOPMENT OF UPDATING PROCEDURES FOR AND ANALYSIS OF PAKISTAN INTERINDUSTRY RELATIONSHIPS

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No. 13

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## PREFACE

This EAN Project Special Report is particularly important for its contribution to the history of input-output analysis in Pakistan. The report was originally submitted as a dissertation by Abdul Qayyum Khan at Colorado State University, where he collaborated with John McKean and Forrest Walters on updating the 1975/76 I-O Model developed by the Pakistan Institute of Development Economics [42].

With this report, the EAN Project has produced three major studies to support an improved understanding of the role of agriculture in Pakistan's economy. In 1988, John McKean described the basic input-output analytical techniques, with special reference to the PIDE Model (EAN Special Report No. 3, A Guide to Interindustry Analysis of the Pakistan Economy). In 1989, Mubarik Ali and Rao Shafique-ur-Rehman detailed the linkages between the food and fiber system and the overall economy (EAN Special Report No. 12, Contributions and Interlinkages of the Food and Fiber System in Pakistan's Economy). The present report demonstrates the superiority of the RAS Method of updating input-output models by creating and evaluating alternative Pakistan I-O models for 1984/85.

These studies will be useful in refining national income accounts, forecasting production and demand for inputs and assessing the interindustry bottlenecks and opportunities for business development. In 1988, the EAN Project trained a core group of analysts in the Federal Bureau of Statistics in basic Input-Output methods. During 1989/90, the EAN Project will use these studies to assist the Ministry of Food, Agriculture and Cooperatives in strengthening the economic and policy analysis capabilities of its newly formed Economic Wing.

**ABSTRACT**

The input-output table is one of the fundamental tools providing information on economic relationships between various sectors of the economy. The Pakistan Institute of Development Economics developed a comprehensive 118 sectors input-output table for the year 1975/76. The input-output model assumes the constancy of technical coefficients over time. But, empirically the technical coefficients may change due to a variety of reasons. This instability of technical coefficients necessitates that the input-output table be updated. The objective of this study is to develop alternative methods of updating the base 1975/76 input-output table to the year 1984/85 and select the one with best updating capabilities and then to use this updated table for marketing and structural analyses.

Accordingly the PIDE's 118 sector table was condensed to 20 sector with households as an endogenous sector. A subset of updating methods consisting of two naive methods namely Final Demand Method and the Transactions Proportional to the Value Added Method and third the RAS Method was tried. According to evaluation criteria of index of over and under-estimation and average percentage error, the RAS method was judged the best.

The condensed 1975/76 input-output table was updated to the year 1984/85 by using the RAS method. This updated input-output table was solved for total, direct and indirect input requirements matrices. This updated table was used for marketing and structural analyses. For marketing analysis, sales coefficients matrices for the base year table and the updated table were developed and compared to see whether or not there has occurred any change in the customers faced by each industry. According to the marketing analysis most of the sectors shifted their output between interindustry consumers and the final consumers. To examine the structural change in the economy, the two direct input requirements matrices for the period 1975/76 and 1984/85 were obtained and compared. The comparison showed that for each sector some input requirements have decreased while some other input requirements absorbed by the same sector have increased and this situation held globally true for all of the 20 sectors of Pakistan's economy.

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# CHAPTER I

## INTRODUCTION

Planning in both centralized and market economies has become an integral part of economic life. The planning process in Pakistan started in the early fifties when the first Five Year Plan (1955-60) was formulated with the help of the Harvard Advisory Group. The First Five Year Plan did not use Input-Output analysis because sufficient data were not available for this purpose. Thus far, Pakistan has completed six Five Year Plans. However, technical information for the Third Five Year Plan was provided by Tim's first interindustry model [100] and the Fourth Five Year Plan (1970-75) projections were based on a simple Leontief type input-output model. Neither the Second Five Year Plan nor the Fifth Five Year Plan nor the Sixth Five Year Plan has made use of any input-output model [75]. In these development plans, the targets for final demand and gross output were set on the basis of political goals and aspirations. These targets were so exaggerated that they were seldom achieved. This kind of planning can be termed planning in fantasy. It is devoid of any consideration of economic relationships between the various sectors of the economy.

The Input-Output table is one of the fundamental tools providing information on economic relationships between various sectors of the economy. The information provided by the input-output table enables the analyst (1) to measure the direct and indirect effects of changes in output of one or more industries, (2) to assess the market for individual industries and (3) to calculate the level of output of each industry that is consistent with a given level of the final demand components in the Gross National Product [104].

The first attempt in the area of Input-Output analysis was made by Fei [25] in 1962 by developing a preliminary input-output table for large scale industries in Pakistan. The table included 14 agricultural sectors, 3 mining sectors, 15 industrial sectors, 1 unallocated sector, a wage sector, a non-wage sector, a value added, total output sector and 1 foreign sector. This table ignored all other services sectors such as communications, transportation, banking, commerce, construction and government. The author used the data from the Census of Manufacturing Industries (CMI), 1955. This table was not comprehensive enough to be used for planning purposes.

The first comprehensive interindustry flow table was prepared by Rasul [74] for the calendar year, 1954. The table shows the transaction flows of 71 commodities corresponding to cost structures of 27 different production sectors. The information was collected from domestic as well as foreign sources. The domestic sources included the Census of Manufacturing Industries, the First

Five Year Plan, and Production and Trade Statistics of Pakistan. The foreign source was the Census of Indian Manufacturers, 1950. This table is at purchasers' prices and gives the overall view of the economy.

Later, Saeed Ahmad [2] formulated a basic 40 x 40 interindustry transaction flow table for the fiscal year 1959-60. Norbye's 30 x 30 [64] interindustry table was for the calendar year 1960, and Tim's 30 x 30 for 1960-61, and an 54 x 54 interindustry flow table by Tims and Sterns [69] was for the year 1963-64. Other studies include Rasul's [76] 70 sectors interindustry table for 1962-63, Khan and MacEwan's [44] 35 sector interindustry table for 1962-63 and Rasul and Jarret's [77] table for 21 sectors for the year 1968-69. After six years, the Pakistan Institute of Development Economics (PIDE) [82] formulated a comprehensive input-output table for the year 1975-76 for 118 sectors. In 1985, Syed [92] using PIDE's 1975-76 input-output table has analyzed the interdependent nature of the various sectors of the economy through Leontief type open Input-Output Model by estimating income and output multipliers and key industries have been identified by quantifying backward and forward linkages by using the total requirements matrix $(I-A)^{-1}$. The backward linkages are the sum of the elements in the jth column of the total requirements matrix and the forward linkages are the sum of elements in the ith row of the total requirements matrix.

In 1987, John McKean [58] modified the PIDE model by closing it with respect to households. The information needed for inclusion of a new row of household wages and salaries was obtained from the Census of Manufacturing Industries, 1975-76 Survey of Small and Household Manufacturing Industries, 1976-77, Census of Mining Industries, 1975-76 and the Survey of Wholesale and Retail Trade and Restaurants, 1975-76. The data in the new row of household wages and salaries were deducted from the value added row. The value added row was renamed as self employment income, profits, interest and savings. PIDE's input-output table was revised into two tables, one for 106 intermediate processing sectors and the other one into a condensed model with 13 intermediate processing sectors, both inclusive of household sector. Both of the models were solved for Leontief inverse, business multipliers.

## PROBLEM STATEMENT AND RESEARCH OBJECTIVES

The input-output model assumes the constancy of technical coefficients over time. But, empirically the technical coefficients may change due to:

- technological progress;
- substitutions induced by changes in demand and supply that are made among intermediate products, labor and capital;
- changes in the proportions in which the given products are produced;
- government regulations; and imports, i.e. as economy expands and import substitution is developed, the imports decrease which may result in changes in the technical coefficients. Also, government's restrictions on imports might have changed the technical coefficients.

In the light of the above-mentioned and any other types of changes in the technical coefficients, it becomes imperative that the input-output tables be updated. Most of the studies conducted thus far in the area of input-output analysis recommend that the input-output tables be updated every five years since the technology does not change so rapidly even in the developed countries. And in the underdeveloped countries where the technological progress is very slow as compared to the developed economies, the five year interval for updating the input-output table is adequate.

### OBJECTIVES

The specific objectives of the study are:

- to develop a condensed input-output table for 1975-76 from PIDE's 118 sectors input-output table according to the sector classifications consistent with the national income accounting systems as adopted by the Federal Bureau of Statistics;
- to solve the condensed input-output table for 1975-76 for total, direct and indirect requirements matrices;
- to develop the alternative methods of updating the base 1975-76 input-output table to the year 1984-85 and select the one with best updating capabilities; and
- to analyze and compare the updated 1984-85 input-output table in terms of the changing structure of Pakistan's economy.

The plan of study is as follows. Chapter I gives the introduction, including a statement of the problem and the objectives of the study. Chapter II discusses the basic theory of input-output analysis and shows its mathematical presentation as well as the relationship between the input-output and the national income accounts. Chapter III describes the construction of a condensed 20 x 20 sector input-output table from PIDE's 118 sector input-output table for 1975-76 and discusses sector definitions, classifications, and modifications made to PIDE's 1975-76 input-output table. Chapter IV discusses the various updating methods and criteria for their evaluation. Chapter V discusses the performance of each updating method and provides a detailed discussion of the marketing and structural implications of the updated model. Chapter VI presents the summary of the conclusions and the limitations of the study.

# CHAPTER II

## INPUT-OUTPUT THEORY

### BACKGROUND

The basic idea of input-output analysis goes back to Francois Quesnay who developed the first Tableau Economic in 1758. The Tableau was a diagram showing the flow of goods and services among the four sectors: land owners, farmers, manufacturers and traders. It also showed the interdependence among those four sectors in production and consumption [101]. This effort was further advanced by Leon Walras who developed a mathematical model of general equilibrium in the context of simultaneous linear equations. This is a model of production used by Walras in his first and second edition of the Elements d'economie Politique Pure [20]. Walras assumed the fixed coefficients model just for convenience and mentioned that technical substitution is possible and the coefficients depend on the prices of the factors of production. He called these technical coefficients "coefficients of fabrication" (input per unit of output) which are variable as factor proportions change but are fixed with respect to changes in the level of output and thus maintains the assumption of constant returns to scale. Walras assumed:

- constant returns to scale;
- fixed technical coefficients;
- commodity and factor markets are interdependent;
- substitution among factors of production is possible;
- competitive equilibrium, i.e., P = MC;
- both the demand functions for commodities and supply functions of factors of production or resources are homogenous of degree zero in commodity and factor prices.

In the light of the above assumptions, the Walrasian model of general equilibrium runs like this. Let there be n commodities produced by the economy and denoted by $X_1$, $X_2$, $X_3$, ..., Xn and m factors of production of these commodities denoted by $r_1, r_2, \ldots, r_m$. Let $P_j$ be the price of commodity for j=1,2,...,n, and vi be the price of factors of production or resources for i=1,2,...,m. The demand functions for commodities depend on commodity prices and prices of factors of production such as:

$$X_j = F_j\ (P_1, P_2, \ldots, P_n,\ v_1, v_2, \ldots, v_m).$$

Similarly, the supply of resources function is given by

$$r_i = G_i\ (P_1, P_2, \ldots, P_n,\ v_1, v_2, \ldots, v_m).$$

Let the coefficient of fabrication be defined as:

$$X_{ij}/X_j = a_{ij}.$$

Thus $a_{11}v_1$ is the cost of resource 1 ($r_1$) used in the production of commodity $X_1$ and $a_{21}v_2$ is the cost of second resource used in the production of commodity $X_1$ and so on. According to the assumption of competitive equilibrium, each commodity price must equal its unit cost. Since each commodity uses m resources in its production, therefore the first equation for commodity $X_1$ becomes

$$a_{11}v_1 + a_{21}v_2 + \ldots + a_{m1}v_m = P_1.$$

The left hand side of the above equation is the total resource cost to produce one unit of commodity $X_1$ and the right hand side is the price of the commodity $X_1$. And so the n equations for n commodities using m resources can be obtained. According to the constant returns to scale assumption, the equilibrium condition requires that the total value of output must be imputed to the factors of production, i.e.,

Total Revenue = Total Cost or

$$\sum_{i=1}^{n} P_j X_j \quad = \quad \sum_{i=1}^{n} v_i r_i$$

for all $j = 1, \ldots, n$ and for all $i = 1, \ldots, m$.

This identity in commodity and factor markets has been given the name of Walras Law. The detailed description of Walrasian equilibrium is given by Dorfman, Samuelson and Solow [20].

This is where Leontief picked up the Walrasian idea and simplified it by discarding (in his own mind, at least) its assumption of substitution and maintaining its assumption of fixed coefficients and adopted it in the development of first input-output table for the United States economy in the 1930s. Since then the input-output tables have been used by various developed countries as an analytical tool to analyze the structure, to demonstrate the interdependence among the various sectors of the economy, to analyze the interrelations among trade and production in two or more regions, to study individual enterprises, and to explain the level of trade among countries.

## ASSUMPTIONS

Because input-output theory is a theory of production, many assumptions of the input-output theory are related to production. Leontief's input-output theory makes the following assumptions:

- each commodity or group of commodities is supplied only by one producing sector or industry;

- the amounts of inputs purchased by each sector is a function only of the level of output of that sector; and

- the total effect of carrying on several types of production is the sum of separate effects. This is known as the assumption of additivity which rules out external economies and diseconomies.

These assumptions are discussed in detail by Chenery and Clark [17]. The first assumption implies that there is only one method of production which further implies that there is no possibility of substitution; it is possible to divide the economy into sectors; and that each sector has only one output. Also, it is possible to have a well established criterion for aggregation of plants, firms and activities into sectors. This criterion must be based on the knowledge of production relationships and availability of particular data. However, for most of the input-output analysis, the basis for aggregation of commodities is the similarity of inputs. The second assumption disallows substitutability. Chenery and Clark [17] give two reasons for this:

- the technology is such that no substitution is possible; or

- relative prices do not change so that it is not efficient to alter input proportions regardless the shape of production functions.

Leontief relied on the first assumption. He maintained that even if substitution is possible among inputs, this problem in the input-output analysis can be taken care off by a finer breakdown of the sectors. He further maintained that even a change in the relative prices of inputs would not affect the input proportions significantly because of the possibility of the existence of a high degree of complementarity among inputs. This assumption of complementarity is highly plausible in the short run because in the short run technology does not change. This assumption is not valid in the long run when all resources are variable. Samuelson [20] states that Leontief's theory is compatible with the general case of substitutability. He suggests that everything in the Leontief system is congealed labor. Therefore, when we increase wages, at the same time we are also increasing the cost of machinery and other inputs and therefore there will be no relative change in the prices of inputs. He further observes that the implications of the

Leontief system are that even if there are several processes available for each industry, only one of them would ever be observed based on the profit maximization or cost minimization behavior and thus no actual substitution would take place in spite of the possibility of substitutability. Thus, with the observance of one activity or technique of production and invariance of relative prices of inputs, especially in the short run, the Cobb-Douglas production function with constant returns to scale and diminishing returns which allows substitutability conforms to the Leontief system.

The third assumption rules out external economies and diseconomies. This implies a linear homogenous production function with constant returns to scale.

## TESTS OF CONSTANCY OF INPUT COEFFICIENTS ASSUMPTION

The stability of input-output coefficients is the main assumption of the Leontief system based on the three main assumptions discussed above. The major criticism directed against the Leontief system was that the input-output coefficients are not stable but they do change and causes of changes depend on the nature of economy. The changes in input-output coefficients, if observed, reflect the collapse of Leontief's three assumptions. The purpose of this section is to examine the stability of input-output coefficients with the help of various studies conducted from time to time for this purpose. In the literature, there are two types of tests that have been conducted thus far which are discussed below.

### FIRST TYPE OF TEST

The first type of test involves computing of gross output of a second period corresponding to the second period's final demands by applying first period's technical coefficients matrix and then compares the gross output with the actual one or the estimate of gross output derived from the naive methods other than the input-output analysis, such as:

- regression analysis, i.e., $X = a + bGNP + t$
- GNP blow up method, $X/GNP = a$ (constant ratio)
- final demand blow up method, $X_i/FD_i = b$ (constant ratio).

Thus the comparison of calculated values of total output of each industry derived from the above mentioned naive methods with the actual output of each industry can be regarded as a test of constancy. If all the coefficients are the same in the two periods then the predicted or calculated and actual output of each industry will be the same. Since no method of prediction is perfect, it is

impossible to expect the exact agreement between the predicted and actual values of output of each industry. Therefore, there will certainly be some degree of deviation between the predicted and the actual values of output. Then the immediate question that emanates is how to compare these deviations. One way to do this is to form an index of ratio of predicted to actual values of output. If the predicted or calculated value is equal to actual then the index will be equal to one. If the index is greater than one or less than one this would show the overestimation or underestimation of the predicted or calculated value of the output. The index showing the least deviation (i.e., it is close to one) would represent the best method through which it has been estimated.

Leontief [53] himself carried out one test of predictive power of the input-output coefficients. He used the 1939 coefficients with the final demands of 1919 and 1929 to calculate the output for 1919 and 1929 and then he calculated the deviations between the actual and the predicted values. He also calculated the output for the same period by using two other assumptions (1) that for each industry the ratio of output to total final demand is a constant over time, and (2) that for each industry the ratio of output to its own final demand is a constant over time. He then compared deviations between the actual and the predicted values of these two methods with the deviations of input-output method and found out that input-output method with constant coefficients was superior to these two methods. But the period of these three years is too small to make the test conclusive.

A major study for test of constancy assumption was undertaken by Barnett [8]. He estimated final demands on the basis of a set of assumptions concerning employment, labor productivity, wage rates, the distribution of income by function and size and the pattern of investment and consumption and then estimated the total demand from the final demamds by using 1939 input-output table. The author then used the above mentioned three methods of prediction; (i) regression of gross output on GNP and time; (ii) GNP blow up method; and (iii) final demand blow up method ($X/FD = a$), i.e., each industry's output will change in the same proportion as does the final demand for that industry. The author concluded that regression results were superior to all other methods of prediction of output. Later, Salma Arrow cited in [66] compared the actual industry's output with the predicted output using the same Barnett's method for the odd years from 1929 to 1937. The author again concluded that the regression analysis results were superior to the results of input-output analysis and of other methods. The inferiority of input-output results to the results of the regression analysis is due to the rigid assumption of constancy of input-output coefficients. Had the input-output coefficients been allowed to change, they would have improved the prediction capability of input-output method. Therefore, in the light of the results of the above studies, the assumption of long run constancy of input-output coefficients can not be maintained. However, the

criticism directed against the index of overestimation or underestimation as a test of the assumption of constancy is that it did not examine the changes in the input-output coefficients. The deviations between the actual and the predicted values of the gross output as exhibited by this index can be considered as a reflection of the changes in the input-output coefficients.

SECOND TYPE OF TEST

The second type of test directly compares the input-output coefficients observed at different times with the actual input-output coefficients available for the corresponding periods. This type of test can be applied to the whole input-output matrix if a time series of tables is available. Since a time series of tables is not available for many countries, the test of the constancy assumption has rarely been applied to the whole matrix. More often it has been applied to selected coefficients which are important in affecting the results of the input-output analysis. No study thus far has successfully been carried out for the second type of test applied to a whole matrix, and all of the studies conducted thus far stress the need for more work in the field of input-output analysis.

MATHEMATICAL PRESENTATION OF INPUT-OUTPUT MODEL

The basic elements of the open input-output model are as follows:

$X_i$ = total output of commodity i measured in million rupees

$Y_i$ = total final demand faced by industry i measured in million rupees

$Z_{ij}$ = amount of output of commodity i used by industry j as inputs measured in million rupees

$V_j$ = total final payments or primary inputs for sector j measured in million rupees.

From the above definitions, the two balance equations follow:

$$(1) \qquad X_i = \sum_{i=1}^{n} Z_{ij} + Y_i \qquad \text{(for all } i = 1,\ldots,n.)$$

$$(2) \qquad X_j = \sum_{i=1}^{n} Z_{ij} + V_j \qquad \text{(for all } j = 1,\ldots,n.).$$

Since $X_i = X_j$, these equations are equal to each other.

The implicit assumption behind these two balance equations is that the value of output of any industry is entirely consumed by all other industries and the final demanders, as is normally assumed in all general equilibrium models, i.e., demand equals supply. Now if we attempt to solve equation (1) for a particular $X_i$, we can not because there are $n^2$ unknowns (Z's) which are the dependent intermediate spending flows among industries and only n equations. In order to have solutions to this simultaneous equations input-output model we need to reduce the number of unknowns equal to the number of equations. To do so, we can use the definition of technical coefficients, i.e.,

$$(3) \quad Z_{ij}/X_j = a_{ij} \quad \text{or}$$

$$Z_{ij} = a_{ij}X_j \quad \text{and } X_j = X_i.$$

Equation (3) tells if the input coefficients are stable then the managers of any particular industry could tell how much inputs from other supplying industries would be needed if they expanded their own output level since the demand for inputs by industry j from industry i is a proportional function of the level of output of industry j.

Given these known parameters of technical coefficients, the number of unknowns is now reduced to n which exactly equal the number of equations and this makes the model theoretically solvable.

By substituting the $Z_{ij}$'s of equation (3) into equation (1), we get

$$X_i = \sum_{i=1}^{n} a_{ij}X_j + Y_i$$

or this can be written as

$$X_i - \sum_{i=1}^{n} a_{ij}X_j = Y_i \qquad \text{(for all } i = 1,\ldots,n.).$$

This system can be conveniently written in matrix and vector notations as

$$X - AX = Y \quad \text{or}$$

$$(I - A)X = Y \quad \text{or}$$

$$X = (I - A)^{-1}Y. \qquad (4)$$

Thus according to the equation (4), the input-output analysis is concerned with the determination of the level of output for a particular year based on the final demands of that particular year by using the previously determined or estimated Leontief inverse of some base year.

## RELATIONSHIPS BETWEEN INPUT-OUTPUT AND THE NATIONAL INCOME ACCOUNTS

The national income accounting system presents the accounts of any economy from both sides of the product and factor markets. The product side of the Gross Domestic Product (GDP) at market prices is shown in terms of final product spending flows and is arrived at by summing total private consumption, government consumption, investment (gross fixed capital formation) and net exports, i.e., exports minus imports. On the factor side of the market it sums the total charges against the Gross Domestic Product which include payments to various factors of production such as wages, proprietors' income, rental income, interests, corporate profits, capital consumption allowance, business transfers and the current surplus of government enterprises. All of these payments measure the value added by each sector which is the income generated in production. The value added is the GDP at factor cost. In addition it also includes the net indirect business taxes (taxes less subsidy). The sum of all value added and net indirect business taxes by each sector yields the estimate of GDP at market prices which exactly equals the GDP at market prices on product side of the market.

The input-output accounting system also follows the system of both product and factor markets. On the product side of the market the output is shown as sales by each industry to final demanders, i.e., private consumers, government, investors, sales for changes in stocks and the net foreign demanders (exports less imports). The value added is shown for each sector in which it is generated as an input of that sector. The sum of value added plus net indirect business taxes plus imports (M) is denoted in an input-output accounting system as final payments which exactly equal the final demand (C + I + G + EX). Final payments minus imports in an input-output analysis corresponds to GDP at market prices on product side of the national accounting system. This similarity of concepts between the Input-Output Analysis and the National Accounting System is further demonstrated below with the help of

actual data for the year 1984-85 taken from the Pakistan Economic Survey 1986-87.

NATIONAL INCOME ACCOUNTING
(Million rupees)

| Factor Market | | Product Market | |
|---|---|---|---|
| Sum of value added by all sectors (GDP at FC) | 430889 | Private Personal Consumption | 396345 |
| | | Government Consumption | 58080 |
| Indirect Business Taxes | | Investment | 80397 |
| less subsidy | 47093 | Net Exports (EX-M)[1] | 56840 |
| GDP at Market Prices | 477982 | GDP at Market Prices | 477982 |

1 Where M is subtracted from the input-output model's final payments and from final demand leaving them in balance but changing exports to "net" exports in final demand.

INPUT-OUTPUT TABLE

FINAL DEMANDS

| Interindustry Consumption | C | I | G | (EX-M) | TOTAL |
|---|---|---|---|---|---|
| Value Added | | | | 430889 | |
| Indirect Business Taxes less Subsidy | | | | 47093 | |
| Total Purchases | 396345 | 80397 | 58080 | -56840 | 477982 |

In spite of the similarity between the national income accounting and the input-output techniques, the latter gives much additional information regarding interindustry flows of goods and services used as inputs and the total output and the total outlay of each sector and the economy as a whole.

## CHAPTER III

## CONSTRUCTION OF 1976-76 INPUT-OUTPUT TABLE

The Pakistan Institute of Development Economics (PIDE) prepared a comprehensive input-output table of 118 sectors for the 1975-76 year. The purpose of this chapter is to condense the model to a desirable level of aggregation which could provide an easily understandable picture of Pakistan's economy. Doeksen and Little [22] examined the impact of aggregation and concluded that size of the model has little or no effect on the size of a sector multiplier. This means that within limits, a small model yields the impact estimate similar to that of a large model. Therefore, the present study condensed the PIDE's 118 sector model to 20 sectors for easy understanding of Pakistan's economy. The classifications with necessary modifications of Pakistan's interindustry relationships are discussed below.

### CLASSIFICATIONS/MODIFICATIONS AND DEFINITIONS OF SECTORS

Chenery and Clark [17] listed the following three types of aggregation to be applied to the development of the input-output table:

(i) similarity of input structures;

(ii) use of output of several processes in fixed proportions; and

(iii) substitutes.

The first type of aggregation, i.e., similarity of input structure, implies that all those producing units which use the same types and proportions of inputs should be lumped together. For example, all crops that use the same type of inputs such as fertilizers and pesticides, could be lumped together as the agriculture sector. Any change in the composition or the constituents of the agriculture sector will have no effect on the demand for fertilizers and pesticides from the input manufacturing sector if this criteria is satisfied. Thus, the aggregation based on this criteria did not lose any information. The second type of aggregation is associated with the vertical process of production, i.e., the aggregation of those industries which use the entire outputs of other industries as inputs in fixed proportions. For example, the manufacture of steel products such as stainless steel cutlery requires a fixed amount of steel ingot, and steel ingot itself requires a fixed amount of pig iron which is obtained from a fixed amount of iron ore. Therefore, all these sectors should be lumped together because they move up and down together. The



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change in the final demand for the steel product will affect the whole group in the same way and thus no information is lost in lumping all these sectors together. The third type of aggregation is associated with substitutes. If the two commodities are substitutable and they have a similar production function then they can be considered as the same product. For example, electricity and gas can be used for heating purposes, but if gas costs less than the electricity then the gas will be substituted for electricity. But since both the electricity and gas are constituents of one sector named electricity and gas distribution, the coefficients of this sector as a whole will remain stable in spite of the substitutions between these two components.

The accuracy of aggregation depends on the availability of data and the technical knowledge of the sectors. However, the main purpose of these three types of aggregation is to produce the minimum average error for all of the production totals of the solution. Keeping this purpose in view, and on the basis of sectoral knowledge, a complete sectoral classification was carried out. An effort was also made to bring the sectoral classification in line with the classification of national income accounting system adopted by the Federal Bureau of Statistics (FBS). This was done with a view to make the input-output table comparable with the national income accounting system and to present it as an empirical tool to measure the connections among the different sectors of the economy and to use it for further planning purposes. Also, the input-output table can be used to check the consistency of Census data. A complete list of sector classification is given in Table 1.

MANUFACTURING

While presenting macroeconomic data like GNP and value added, the national income accounting system also contains data on large scale manufacturing and small scale manufacturing industries only. These manufacturing industries include agricultural processing industries, industrial commodity manufacturing, machinery manufacturing and farm inputs manufacturing. In order to have some knowledge of these constituents of the manufacturing sector, an effort was made by this study to split the national income accounting system data on manufacturing into these separate manufacturing activities. And this is important because the agriculture sector plays a very important role in Pakistan's economy both in terms of contributions to GNP and employment of labor force. Therefore, in order to see the impact of the entire food and fiber system on the rest of the economy, all the agricultural related activities were split off from other manufacturing industries which include both large and small establishments. An establishment is defined as an economic unit which produces goods and services, for example, a farm, a mine, a factor, a store, and falls within the scope of manufacturing activity according to Pakistan Standard Industrial Classification, 1970. Since both the

large and small establishments differ considerably in cost structures, it would not be advisable to lump them together. Therefore, an effort has been made by this study to split off all of the agricultural processing industries, industrial commodity manufacturing industries, machinery manufacturing and farm input manufacturing into large and small scale activities.

DEFINITION OF LARGE AND SMALL SCALE INDUSTRIES

According to the Pakistan Economic Survey, 1986-87 (page 98) [32], the scale of an industry may be defined on the basis of employment or fixed assets. In the national accounts, firms employing less than 10 persons are classified as small and the firms employing 10 persons or greater are classified as large. The present study uses the national income accounting definition of large and small scale industries again for the sake of comparability.

TRANSPORT, STORAGE & COMMUNICATIONS AND TRADE (WHOLESALE & RETAIL)

With a view to have complete information on food and fiber sector in order to see its impact on the rest of economy in future, the Transport, Storage and Communication sector was disaggregated in this study into two distinct sectors; Transport, Storage and Communications (Food and Fiber) - serving the food and fiber sector - and Transport, Storage and Communication (others) - serving other than food and fiber sector. The transaction in each of the disaggregated sectors was allocated proportionately to the relative output share of each disaggregated sector in the food and fiber manufacturing sector (which includes large and small scale agricultural processors and in other manufacturing sectors which include large and small scale commodity manufacturing and the large and small scale machinery manufacturing sectors). For example, the total output of Transport, Storage and Communications sector during 1984-85 was allocated between its two disaggregated components serving the food and fiber sector and all other sectors at 59% and 41% of total output respectively. Similarly, the wholesale and retail trade sector was disaggregated into two distinct sectors; Trade (wholesale & retail) - food and fiber sector, and Trade (wholesale & retail) - others. The total output of this sector was equally distributed between its two components. The data on the distribution pattern of the total output of Transport, Storage and Communications and Trade (Wholesale and Retail) sectors between their two disaggregated components; Food and Fiber sector and other than Food and Fiber sector, were obtained from the Economic Analysis Network Project of the Government of Pakistan.

HOUSEHOLDS

The major modification to PIDE's 1975-76 model was made by John McKean [57] in 1987 when he closed the PIDE model with respect to

the households. The information needed for inclusion of the new households row has already been discussed in Chapter I in the introduction. The total of the households column represents the total personal income which is received by individuals, i.e., households and unincorporated business inclusive of transfer payments such as pensions, social security benefits, retirement benefits etc. Personal income is important if the model is closed with respect to households because it is the main determinant of household consumption and savings. The estimate of personal income was obtained by deducting from the national income or the Gross Domestic Product at factor cost, the corporate profits (pretax), interests, dividends and profits to government, surplus of autonomous bodies and by adding the interest on domestic credit to the GDP at factor cost. Since the entire personal income is not spent by the households, but a part of it is saved, a saving rate of 8.6% was used to calculate the households savings and the households column showing the total personal income was reduced proportionately by this amount. The households savings were then added to the investment column in the final demand sector which included investment and discrepency.

SPLIT OF INVESTMENT BETWEEN LARGE AND SMALL SCALE SECTORS

The State Bank of Pakistan's Annual Report and other government's publications report investment data for large and small scale manufacturing without detailed description of the manufacturing sectors. To split this investment data into large and small scale agricultural processing, industrial commodity manufacturing, machinery manufacturing and farm inputs manufacturing, one needs detailed investment information for these sectors. This information is neither available in any of the government's publications for the year 1984-85 nor for the previous years. Because of this limitation the GNP blow up method could not be used to allocate investment between the detailed large and small scale manufacturing sectors. Therefore, the only alternative left was to use the value of fixed assets reported at the end of the year 1980-81 by the Census of Manufacturing Industries 1981-82 to form the basis to allocate 1984-85 investment among the different large and small scale manufacturing sectors in proportion to their investment share of 1980-81 assuming that this initial investment will remain the same between the period 1980-81 to 1984-85.

Investment in government enterprises such as Railways, Post Office and Telephone and Telegraph Departments were added in this study, to the Transport, Storage and Communications sector. Investments in Indus Basin (construction of dams for irrigation purposes) and Rural Development were added to the Agriculture Sector.

INVESTMENT BY HOUSEHOLDS

The sum of employment costs, i.e., household wages and salaries and home remittances by Pakistanis working abroad were subtracted in this study, from the total personal income and the difference was allocated to investment by households which may be any type of exogenous investment spending or inventory building etc.

VALUE ADDED BY HOUSEHOLDS

Since no estimate of value added by the households was possible from any source, therefore it was determined as a residual being the difference between the final demand and final payments.

By endogenizing the households sector the final demand sector was reduced to two sectors; exports and investment and discrepency. The final payments sector included imports, taxes less subsidy, self employment income, interest and savings.

TRANSACTIONS AMONG SECTORS FOR 1975-76

In the light of above sector classifications, definitions and modifications made to PIDE's input-output table 1975-76, a condensed model of 20 sectors for 1975-76 was prepared from PIDE's 118 sectors table. The transactions among the sectors table for the condensed model is given in Table 2. The transactions table shows the economic structure and the interdependence among the sectors of the economy. It also shows who the major customers are for any particular industry and who the major suppliers of inputs are for each industry. For example, reading across the first row we can find the total sales or output of the agriculture sector which is Rs 68197 million. Reading the first column of first row we can find the transactions among the agriculture sector itself or the sales by agriculture sector to other farmers which is Rs 16877 million. Similarly, reading across the first row we can find the major customers of the agriculture sector which are large and small scale agricultural processors and households who altogether bought about 70% of total agriculture sector output. Of course, there are other domestic customers for the agriculture sector but their purchases are not very high as compared to these three sectors. There are foreign customers for the agriculture sector whose purchases from this sector were Rs 278 million as can be seen by reading across the first row under the export column. It can also be seen that the agriculture sector did not sell all of its output but retained some output worth of Rs 2101 million for the purposes of investment. Similarly, reading down the first column shows how the agriculture sector used its total sales revenue to buy inputs from other sectors that were used in the production of its output. For example, the agriculture sector bought inputs worth Rs 16877 million from other farmers. The other domestic major suppliers of inputs to the agriculture sector are farm inputs

manufacturers, transport, trade, industrial commodity manufacturing, government services and households which altogether accounted for 31.4% of total supply of inputs, of which the households alone accounted for 17%. Foreign suppliers of inputs sold Rs 726 million worth of inputs to the agriculture sector. Self-employment income, interest and savings are the highest categories in the agriculture sector, accounting for 31% of total self-employment income, interest and savings.

The same procedure applies to all other sectors. The interdependence among sectors means that the output of one sector is an input for other sectors. For example, the intersection of households row and agriculture sector column shows Rs 11246 million which is the output of the households sector in the form of wages and salaries received from the agriculture sector as payments for the purchase of labor inputs.

## DIRECT REQUIREMENTS OR TECHNICAL COEFFICIENTS MATRIX FOR 1975-76

The direct requirements or technical coefficients matrix for the year 1975-76 has been derived and is given in Table 3. The technical coefficients matrix shows the direct input requirements for each industry to expand output and it also shows the technology trade pattern.

The technical coefficients can be calculated by the following formula:

$$Z_{ij}/X_j = a_{ij}$$

where

$Z_{ij}$ = flow of inputs from industry i to industry j measured in million rupees

$X_j$ = total output of industry j measured in million rupees

Since the technical coefficients are assumed to be fixed, therefore if output of industry j is doubled, the inputs purchased by industry j from various industries will also be doubled. This assumption rules out the economies of scale and implies constant returns to scale. For example, the technical coefficient for the intersection of the first row and first column has been computed by dividing the farmers' purchases from other farmers by the total output of the agriculture sector as:

$$16877/68197 = 0.24747423$$

Now if the output of the agriculture sector doubles to 136394, the input requirements of the farmers from other farmers will also double to 33754, i.e., (0.24747423 * 136394 = 33754). Thus the

direct requirements of the industry can be found by reading down the column. This also means that for each rupee worth of output of the agriculture sector, farmers buy 0.24747423 worth of one rupee output from other farmers, 0.01567518 from farm input manufacturing, 0.03438568 from transport, storage and communications (other) and so on reading down the column.

TOTAL REQUIREMENTS MATRIX FOR 1975-76

With the households as an endogenized sector, the total requirements matrix includes all direct, indirect, and the induced requirements which include the original output of rupee worth demanded by the final demanders that caused all these effects for each industry to expand its output. The total requirements matrix is shown by the Leontief inverse and is given in Table 4. Each coefficient in the inverse matrix bij is interdependent and includes direct, indirect and induced requirements of sector i per unit of final demand for the output of sector j. For example, consider the equation:

$$X = (I - A)^{-1}Y$$

Let the coefficients of the Leontief Inverse $(I - A)^{-1}$ be denoted by $b_{ij}$. Then the above equation becomes:

$$X = b_{ij}Y \quad \text{and}$$

$$\partial X_i/\partial Y_j = b_{ij}$$

If we compare the direct input requirements or technical coefficients of the first row and the first column of Table 3 with the total requirements coefficient of first row and first column of Table 4, we find, as expected, that the coefficient of total requirements matrix is greater than the coefficient of direct input matrix. Of course this should be so because the direct input coefficient is the estimate of first initial round while the coefficient of total requirements matrix included all direct, indirect and induced requirements and this estimate of the total requirements matrix is arrived at after meeting the successive rounds of demand and supply of all industries. It in fact shows cumulative effect on each industry back and forth. The interpretation of the Leontief inverse is as given below. First, we would observe that all of the diagonal elements of Leontief Inverse are usually greater than one and all other elements off the diagonal are usually less than one. For example, the element of the first row and the first column is 1.46790572. This element can be decomposed into parts 1 + 0.46790572. What this means is that if the final demand for the output of agriculture sector increases by one rupee, then the output of the agriculture sector must increase by 1.46790572, because the output worth of one rupee is needed to meet the final demand placed on the agriculture sector by the final

demanders and in addition 0.46790572 worth of one rupee output is needed directly and indirectly by the agriculture sector to supply inputs to all other industries to support the production of this additional agricultural output. Thus, if the output of agriculture sector increases by one rupee, then the sales within the agriculture sector must increase by 1.4679072 and after successive rounds of meeting the demand and supply requirements, the large scale agricultural processing sector would supply 0.05485 worth of inputs and farm inputs manufacturing sector will supply 0.02319652 worth of inputs and so on down the column of the inverse. Similarly, to meet the one rupee worth of final demand imposed on it, after the successive rounds the sales of the agriculture sector to the other farmers would increase directly and indirectly by 1.46790572, 0.565089 to the large scale agricultural processing sector, 0.92080570 to the small scale agricultural processing sector and so forth across the first row of inverse.

The Leontief Inverse also shows the business multipliers. For example, if the final demand for the agriculture sector, say exports, increases by one rupee, then the total spending in the economy would increase by 2.3526 which is the sum of the first column of Leontief Inverse. This is the total impact on the economy of one rupee increase in the final demand for the output of the agriculture sector. The sectoral impacts can be read down the column. For example, the agriculture sector itself would expand by more than the amount of increase in final demand, i.e., 1.46790572. Similarly, the trade other than the food and fiber sector and the households would receive 0.13 and 0.31 directly and indirectly for each one rupee increase in the final demand for the agriculture sector.

# CHAPTER IV

## PROCEDURES FOR UPDATING THE INPUT-OUTPUT TABLE

Because of the effort and cost involved, constructing a new input-output table for each year is possible, but not economical. Moreover, many countries like Pakistan possess just one input-output table. Therefore, there is a need to update the basic input-output table for later years by some inexpensive method. Many methods can be used for updating an input-output table ranging from simple to very complex. The most important of them are naive proportional methods, the RAS method and Linear Programming Methods. Since each method requires different kinds of information, the use of any specific method depends on the information available and the efficacy of the method to predict economic variables. Keeping the data and cost limitations in mind, this study has developed and used two naive methods and the RAS method for updating the input-output model of Pakistan's economy. These methods are discussed below.

### NAIVE METHODS

The naive methods assume that the future values of the input-output table bear some sort of relationship with the present values of table. And this relationship may conform to the basic assumption of constancy of input-output coefficients of the input-output table. Accordingly, the following two naive methods have been developed and tested.

#### FINAL DEMAND METHOD

This method involves predicting the gross output in some future year corresponding to the future year's final demand using the base year's interindustry relationships. Thus the equation suggested by this method becomes:

$$X^{84/85} = \left| (I - A)^{-1} \right|^{75/76} Y^{84/85}$$

where

$X^{84/85}$ = gross output for the year 1984/85

$(I-A)^{-1}$ = total requirements matrix for the year 1975/76

$Y^{84/85}$ = sum of final demands for the year 1984/85

TRANSACTIONS PROPORTIONAL TO VALUE ADDED

According to this method, all the transactions were made proportional to the value added for the year 1975/76 by using the formula:

$$X_{ij}/V_j \qquad \text{for all } i = 1,\ldots,n$$

where

$X_{ij}$ = amount of output of industry i used by industry j as inputs measured in million rupees

$V_j$ = value added by sector j

Then the matrix of these proportions was multiplied by the diagonal matrix of value added for the year 1984/85 to arrive at the transaction matrix for the year 1984/85 as under:

$$\left| X_{ij} \right|^{84/85} = \left| \frac{X_{ij}}{V_j} \right|^{75/76} \left| \begin{matrix} V_1 & & & \\ & V_2 & & \\ & & \ddots & \\ & & & V_n \end{matrix} \right|^{84/85}$$

and the gross output was calculated by adding the final demand or final payments to the transaction matrix as under:

$$X^{84/85} = \left| \begin{matrix} X_{ij}^{84/85} + Y^{84/85} \\ X_{ij}^{84/85} + P^{84/85} \end{matrix} \right|$$

where:

$X_{ij}^{84/85}$ = Transactions matrix for 1984/85

$Y^{84/85}$ = Sum of final demand for 1984/85

$P^{84/85}$ = Sum of final payments for 1984/85 and sum of $P^{84/85}$ = sum of $Y^{84/85}$

$X^{84/85}$ = Gross output for 1984/85

Another possible naive method is multiplying the final demand matrix for the year 1984/85 with the bridge table for 1975/76 and then derive the gross output by using the inverse matrix of 1975/76. The bridge table is the percentage distribution of final demand for the year 1975/76. This study could not use this method because the vectors of final demand for the year 1975/76 had a few negative entries. These negative entries related to investment and discrepancy column.

## RAS METHOD

The RAS method or iterative proportional method also sometimes called the biproportional method was originally developed by Richard Stone in the 1960s [3]. It is well recognized and widely used not only in updating input-output tables but also in other fields such as international trade [47].

The advantage of the RAS method is that it requires the minimal marginal information for updating the input-output table. A big advantage of the RAS method is that it changes the direct input coefficients and achieves a balanced model with a unique solution while the other methods usually do not change the technical input coefficient matrix. Specifically, the RAS requires:

- the technical coefficient matrix of base period;
- the gross output for the second period; and
- the total final demands and the total final payments for the second period to arrive at the total interindustry sales and purchases by subtracting the total final demands and total final payments from the gross output.

The RAS operates as under:

$$U' = A^0 X 1$$

where

$U'$ = Predicted interindustry sales

$A^0$ = Technical coefficients matrix for the base period

$X$ = Gross output for later year

$1$ = column vector of unity used for deriving the totals for the matrix

Then compare the predicted row sum (U') with the actual row sum (U) of interindustry sales. In case of a difference between the predicted and actual interindustry sales, the RAS gets the ratio U/U' and applies this ratio to $A^0$ to make sure that the predicted row sum equals actual row sum, i.e.,

$$R = U/U'$$

$$A' = RA^0 \text{ and}$$

$$A'Xi = U''$$

This implies that U" = U.

Similarly, to see that the predicted column sum (V') is equal to actual column sum (V) of interindustry purchases, the RAS repeats the same procedure as under:

$$1'A'X = V'$$

where

$V'$ = predicted interindustry purchases

$1'$ = transpose of column vector of unity used for summation purposes.

Then the RAS compares it with the actual column sum (V) and in case of difference, gets the ratio of actual to predicted column sums and repeats the same procedure as under:

$$S = V/V'.$$

The new estimate will be

$$A^2 = A'S$$

where

$$A' = RA^0.$$

This implies that

$$A^2 = R\ A^0\ S.$$

This makes sure that the predicted column exactly equals the actual column sum. Now check the row sum of interindustry sales, it might have been disturbed by bringing the column sum in balance. And repeat the same process time and again until the RAS converges after a certain number of iterations and solves for unique values of R and S and a unique solution of technical coefficient matrix for the later year. The new updated technical coefficients matrix is different from the base year technical coefficients matrix. The detailed description of the RAS method is given in Miller and Blair [61]. The RAS updates the matrix by adjusting each technical coefficient aij of the base matrix. The adjustment takes into account the changes which occurred between the base period and the period for which the base table is updated. These changes include:

- changes in the relative prices;
- changes in the degree to which a commodity has been substituted for or replaced by other outputs used as intermediate inputs. This has been interpreted by Stone as a Substitution Effect, i.e., if Ri > 1, this implies expanding product (substitution in) and if Ri < 1, this implies declining product (substitution out);
- changes in the degree to which the intermediate inputs have increased or decreased per unit of gross output in the

fabrication of commodity j produced by industry j (Sj). This has been interpreted by Stone as the Fabrication Effect (Sj). If Sj > 1, this implies that the degree of fabrication has decreased and if Sj < 1, this implies that the degree of fabrication has increased.

Thus, while using RAS, there is no need of assuming constant coefficients because it accounts for the changes that have occurred between the two time periods. However, the only conditions that Stone requires of the updated matrix are:

(i) preservation of zeros in cells of the transactions table where they exist for the base year;

(ii) preservation of non-negativity, i.e., $A' = RA^0S > 0$;

(iii) $Ri > 0$ and $Sj > 0$

In (ii) and (iii), $A^0$ is always positive and rules out any negative entry because negative outputs will never be required from any sector to satisfy positive final demand. Since $A^0$ is positive, this implies that Substitution Effect $R_i$ and Fabrication Effect $S_j$ will also be positive.

Thus the RAS method has economic appeal as it emerges as a solution to a constrained optimization problem, i.e., to generate a new technical coefficient matrix in the second period which is different from the base period matrix subject to interindustry row and column totals of the second period. The properties of the RAS method are discussed by Bacharach [5] and in numerous other papers. Bernard and Waelbroeck reported in [5], Grandville, Fontela and Gabus [35] made use of RAS in international studies. Bernard tests RAS estimates against the observed trade matrices and concludes that the RAS estimates may be useful over period of up to fifteen years. Waelbroeck interprets the row multipliers ($R_i$'s) as an index of one country's market share in the trading partners represented in the matrix, and the constancy of column multipliers ($S_j$'s) indicates the stability of other countries' market share in a given country in response to changes in its total imports. Grandvill et al. used the RAS method to calculate future trade flows between different countries with known marginal data on imports and exports of each country by assuming on the one hand that an increase in the exports of country i, increases exports from country i to country j which is proportional to the share of country i's exports to each country in the total exports of i at base period and on the other hand increase in the imports of country j from country i are proportional to the share of imports of j from i in the total imports of j at base period. A test of this method was carried out by CEPREL (Centre d'Etude de la Prospection Economique a' Moyen et Long Termes) and the results appeared to be satisfactory as long as the period was not longer than fifteen years and there was no world conflict or great depression.

For interindustry analysis, the RAS method has been used in many countries. For example, the UK tables for 1963 [3] and for 1968 [3] were estimated using the RAS method. Paelinck and Waelbroeck, reporting in [3] and [5], applied the RAS method to update the Belgian table of 1953 to the year 1959 using 1959 control totals. The estimated table for 1959 was of considerable improvement over the naive method of applying 1953 coefficients to 1959 update without adjustment. However, several estimated figures were considerably different from the actual figures. Bates and Bacharach as reported in [59] gave three reasons for this divergence which are:

(i) the high level of aggregation used in Belgian table which is not a direct fault of RAS;

(ii) the assumption of uniform substitution effects over using industries, e.g., coal is being used as a raw material in the production of coke but as fuel in other industries. Now suppose coal is being replaced as a fuel across the economy, there should be no effect on the production of coke where it is being used as a raw material, yet the RAS method applies the replacement of coal by other fuels across all industries; and

(iii) the ripple effect, whereby an erroneous RAS estimate of one element generated errors throughout the rest of the table.

Paelinck and Waelbroeck as reported in [3] have demonstrated that the RAS estimates could be improved by insertion of exogenous information into the cells which are seen in advance to be troublesome.

## EVALUATION CRITERION

In order to evaluate the performance of various updating procedures one needs some sort of criteria. The criteria may include the evaluation of methods in terms of:

(i) minimum information required by each method, i.e., inexpensive method; and

(ii) the prediction accuracy of each method.

As explained elsewhere, the input-output tables can not be produced each year because they involve high costs which developing countries like Pakistan cannot afford. Therefore some sort of least cost method is required which can update the base input-output table with the help of marginal information which may become available for the later years and at the same time performs well in terms of prediction accuracy.

So far as the accuracy of prediction is concerned, several methods have been used for this purpose such as, a measure of under- or overestimation of the forecasting model, the average percentage error in the predicted values and root mean square error, etc. The ideal situation would have been to use a time series of actually published input-output tables so that a time series of predicted input-output tables could be generated and statistically compared. But, unfortunately, in our case there is only one actual table, and that is the base table for 1975/76. Keeping this limitation in mind, the only criteria we can use to evaluate the performance of each updating method is either to use the measure of under or overestimation of the forecasting model or to use the average percentage of error in the predicted values.

# CHAPTER V

## COMPARISONS AND ANALYSES

### COMPARISONS OF THE PERFORMANCE OF THREE UPDATING METHODS

The input-output table for the year 1984/85 has been updated by using two naive methods: Final Demand Method and Transactions Proportional to the Value Added Method, and thirdly by the RAS method. Actually, it is only the Final Demand Method that predicts the gross output and the whole transaction matrix directly for future year based on future year's final demand. None of the other two methods -- the transactions proportional to the value added method or the RAS method --directly predict the gross output. Transactions proportional to the value added method predicts the interindustry transaction matrix only by making the transactions proportionately to the value added of future year. Then the final demands for the future year were added to the transactions table to calculate the gross output. Thus the transactions proportional to the value added method requires both final demand and final payments whereas the final demand method requires only the final demands for the future year and predicts the whole transaction table as well as the gross output for the future year. On the other hand, the RAS method requires actual gross output, final demands and final payments for the future period and then updates the technical coefficients matrix only for the future period. It is obvious that all of the three updating methods are not comparable among each other. Each method will be tested by its individual performance by using the following criteria:

(i) under or overestimation index by taking the ratio of predicted gross output to actual gross output ($X^p/X^a$) or ratio of calculated to actual gross output ($X^c/X^a$);

(ii) average percentage of error criteria by using the formula:

$$(X^p/X^a - 1) * 100 \quad \text{and/or}$$

$$(X^c/X^a - 1) * 100$$

where

$X^a$ = actual gross output for 1984/85

$X^p$ = predicted gross output for 1984/85

$X^c$ = calculated gross output for 1984/85

(iii) goodness of fit criteria by regressing the predicted or calculated gross output on the actual gross output.

To save the space, the results of all the three updating methods under the first and second criteria are combined and given in Table 5 and Table 6 respectively. The results of the third criteria would follow the discussion of each method separately under the first and second criteria.

FINAL DEMAND METHOD

According to Table 5, the final demand method of projecting gross output overestimates the gross output for agriculture, large scale agricultural processing, small scale agricultural processing, energy and gas distribution, ownership of dwelling, public administration and defense, and services. This method underestimates the gross output for farm inputs manufacturing, transport, storage and communications for food and fiber sector, large scale and small scale commodity manufacturing, large and small scale machinery manufacturing, mining and quarrying, construction, banking and insurance and the households. The biggest underestimation of gross output reported by this method is .015, .077, .109, .126, .255 and .343 times of the actual gross output for small scale machinery manufacturing, construction, farm inputs manufacturing, large scale machinery manufacturing, small scale commodity manufacturing and mining and quarrying respectively. Thus the major underestimation was for machinery manufacturing sectors. One interpretation of this phenomenon is that even if the technology is assumed to be constant, the prices of machinery and other related manufactured goods have increased faster than the general price level. Similar interpretation for overestimation can be attributed to agriculture, large scale agricultural processing, small scale agricultural processing, electricity and gas distribution, that the prices of goods and services produced by these sectors lagged considerably behind the general price level. This makes sense because these are the sectors which are subsidized by the government. Also, the wages and salaries paid to the employees of public administration and defense and other services sectors and the rental income from the ownership of dwelling lagged behind the general price level. On the average, the final demand method underestimates the economy by 19.1%. This implies that this method has failed to capture the effect of changes in technology and prices. The assumption of constant technology over the period 1975/76 through 1984/85 is not realistic. Therefore, the above phenomenon as indicated by the naive updating method of final demand in fact reflects the combination of both the changes in technology and the changes in prices or any other factor that may cause changes in the technical coefficients, such as government regulations. Other important information that this naive method gives us is that it provides us with a test of the assumption of constancy of input coefficients. The results derived through this method disprove this assumption by showing the large difference in the actual and the predicted values of gross output, thus reflecting the changes in the technology and prices. Had there been no change in technology and prices, the actual and predicted values

of the gross outputs would have been closely the same and in that case the assumption of constancy of the technical coefficients would have held.

An alternative way to describe the same situation is the Average Percentage of Error (APE) method. According to this method, average percentage of error was calculated for each sector for each updating method as shown in Table 6. The average percentage of error shows the underestimation or overestimation in terms of percentages. The positive figure of APE shows the overestimation in terms of percentages and the negative figure shows the underestimation in terms of percentages. The average percentage of error reported by the final demand method ranges from 15% to 118% for all sectors with the exception of households and services sectors where the absolute average percentage error is 3% and 6% respectively.

According to the third criteria, the gross output predicted by the final demand method was regressed on the actual gross output. The estimated equation is as under:

$$FDP = -12452.038 + 1.0060357\ ACT$$
$$(-1.4269) \quad (12.9941)$$
$$R^2 = 0.9036 \quad DW = 1.20$$

(Figures in parentheses are t-statistics.)

where

FDP = gross output predicted by the final demand method for 1984/85

ACT = actual gross output for the year 1984/85.

The hypothesis we want to test here is that whether the predicted gross output is related with the actual gross output. As the coefficient of actual gross output is highly significant (as is reflected by the t-value in parentheses), this implies that there exists a significant relationship between the predicted and the actual gross output. The explanatory power of the model is very high, i.e., $R^2 = 0.90$, which means that 90% of the variations in the predicted gross output are explained by this model. The residuals are plotted in Figure A which shows the problem of industries with large errors such as agriculture, large scale agricultural processing, small scale agricultural processing, farm input manufacturing, large scale machinery manufacturing, small scale machinery manufacturing, construction and public administration and defense.

## TRANSACTIONS PROPORTIONAL TO THE VALUE ADDED METHOD

The transactions proportional to the value added method overestimates the gross output of agriculture, large scale

agricultural processing, small scale agricultural processing, large scale commodity manufacturing, electricity and gas distribution, ownership of dwelling, public administration and defense and services and underestimates the gross output of farm inputs manufacturing sector, transport, storage and communications, trade, small scale commodity manufacturing, large scale machinery manufacturing, small scale machinery manufacturing, mining and quarrying, construction, banking and insurance and the households. The biggest underestimation of gross output as reported by this method is .097, .0664, .1019, .2553, and .448 times of the actual gross output of small scale machinery manufacturing, construction, farm inputs, large scale machinery manufacturing, and small scale commodity manufacturing respectively. This also implies that the prices of machinery manufacturing and other nonagricultural manufactured goods increased faster than the general price level and the prices of agricultural and agricultural processed goods, large scale commodity manufacturing, electricity and gas distribution and the compensation (wages and salaries) paid to government employees and the rental income from the ownership of dwelling lagged behind the general price level. On the average this method overestimates the economy by 16.3%.

The average percentage error reported by this method for all sectors ranges from 11% to 518% with the exception of large scale commodity manufacturing, transport, storage and communications (other) and the agriculture sectors where the average percentage error in absolute terms is 3%, 3% and 4% respectively.

According to the third criteria, the gross output calculated by transactions proportional to the value added method was regressed on the actual gross output and the estimated equation is obtained as under:

$$PMP = \underset{(0.5459)}{13940.886} + \underset{(3.902)}{0.8840528}\ ACT$$

$$R^2 = 0.45 \qquad DW = 1.88$$

(Figures in parentheses are t-statistics.)

where

PMP = gross output for 1984/85 calculated via transactions proportional to the value added method

ACT = actual gross output for 1984/85.

The highly significant coefficient of the actual gross output shows that there exists a significant relationship between the predicted gross output and the actual gross output. The explanatory power of the model is very low, i.e., $R^2 = 0.45$, which means that only 45% of the total variations in the predicted gross output are explained by this model. The residuals are plotted in Figure-2, which shows that the only industry showing a big error is the construction industry.

THE RAS METHOD

According to Table 5, the RAS method, on the average, overestimates the economy by .096% and the average percentage error (Table 6) reported by the RAS method is between zero and 1.63% for all sectors with the exception of construction, where it is underestimated to the extent of 21%. This large error in the construction sector is not due to the fault of the RAS method but due to the minimal data pertaining to the construction sector as most of the cells in the PIDE's input-output table pertaining to the output of the construction sector going to other sectors as inputs were empty with the exception of transport, storage and communications (both for food and fiber and other than food and fiber sectors), banking and insurance and the ownership of dwelling. It is strange that no other sector is buying from the construction sector in the PIDE's 1975/76 input-output table. However, if the construction data are corrected, the RAS method can reduce this error and improve its updating performance.

The results of the regression equation for this method are as under:

$$RASP = -362.36907 + 1.0054\ ACT$$
$$(-.4005) \qquad (125.23)$$
$$R^2 = 0.9988 \qquad DW = 2.02$$

(Figures in parentheses are t-statistics.)

where

RASP = the gross output calculated for 1984/85 via RAS method

ACT = actual gross output for 1984/85.

The coefficient of the actual gross output is highly statistically significant which shows the existence of signifcant relationship between the predicted gross output and the actual gross output. The explanatory power of the equation is very high, i.e., $R^2 = 0.9988$, which implies that 99.88% of the total variations in the calculated gross output are explained by this model. The residuals are plotted in Table 3, which shows that construction is the only sector which suffers from big error.

In the light of the above three criteria, the RAS method has successfully proved itself as the best method for updating the input-output table which takes into account all kinds of changes that might have occurred between the two time periods; 1975/76 through 1984/85. The only drawback of the RAS method is that it can not predict the gross output for the future years.

INFORMATION NEEDED BY EACH METHOD

Each one of the three updating methods requires different information. A brief summary of the information needed by each method for updating the input-output table is given below.

I. Final Demand Method
   i) base year input-output matrix
   ii) final demands for the later year
II. Transactions Proportional to the Value Added Method
   i) base year input-output matrix
   ii) value added for all sectors for the later years
   iii) final demands for the later year
III. RAS Method
   i) base year input-output table
   ii) gross output for the later year
   iii) final demand for the later year
   iv) final payments for the later year

In the light of results discussed above for each method, the final demand method is the most inexpensive method which requires only the information on final demand which can either be obtained from the government publications or can be estimated. The advantage of this method is that it can predict the gross output as well as the whole transaction matrix for the future years which none of the other two methods can do. The disadvantage of this method is that it cannot take into account the changes that might have taken place between the base and the updated period as is reflected in the big differences between the actual and predicted values of the gross output. This is so because the final demand method is based on the assumption of constancy of the technical coefficients.

Similarly, the transactions proportional to the value added method, which requires more information than needed by the final demand method, at the same time reflects large average percentage errors between the calculated and actual gross outputs. This method can not help any way.

On the other hand, the RAS method requires more rim information than needed by any of the other two methods but at the same time it has proved itself, as reflected in the results above, as the best method to update the input-output table. The RAS updated table takes into account all the changes that have taken place between the two time periods, i.e., 1975/76 through 1984/85. A big advantage of the RAS method is that it changes the direct input coefficients matrix and achieves a balanced model with a unique solution while the other methods usually don't change the coefficients matrix. The disadvantage of the RAS method is that it can not predict the gross output for the future years. However, the prediction performance of the final demand method can be improved if this method is used complementary with the RAS method, i.e.,

applying the final demand method to the RAS updated table for projection of the gross output as well as the whole transaction table for the future year as no single method alone can do the entire job.

## UPDATED INPUT-OUTPUT TABLE FOR THE YEAR 1984/85

The input-output table for the year 1984/85 has been updated by applying the RAS technique to PIDE's 1975/76 input-output table. The transactions among sectors of the updated table for the year 1984/85 is given in Table 7.

## ANALYSES

### MARKETING ANALYSIS

Interindustry analysis is very important in appraising the marketing possibilities of industries, especially those whose major customers are the other industries. However, this interindustry analysis will be of little help to those industries who only sell to the final consumers in analyzing the marketing possibilities for their products. The basic idea behind the input-output analysis is that, due to change in the final demand of output of any industry, there will be a change in the pattern of sales distribution to other interindustry customers from year to year. But there will be no change in the input structure of any industry due to fixity of plants, equipment, labor and management skills in the short run. With this stability of inputs the input-output analysis can do a great job in marketing research area. It tells who the customers are for any industry by looking at the market distribution analysis of that sector. Other important information provided by the interindustry analysis is related to the analysis of final demanders. To illustrate this point, suppose the agriculture sector sells its output in addition to other industries to the final demanders who may be domestic investors or the foreign consumers. Also, that the output of the agriculture sector, say food products, is consumed by the final demanders as the final product without the possibility of further processing. Thus, to satisfy the increased demand by the final demanders the agriculture sector buys more of inputs such as fertilizers, pesticides and agricultural machinery, etc. needed to produce this additional output. Although the final consumers do not buy these inputs directly but indirectly they provide incentives for expansion of production and supply of fertilizers and agricultural machinery, etc. These indirect demand driven incentives are translated into increased interindustry sales which are well explained by the input-output analysis. In order to know the patterns of marketing or distribution of output of each industry to other industries as well as to the final demanders, two tables of sales coefficients have been prepared. Sales coefficients for the 1975/76 input-

output table are given in Table 8 and the sales coefficients for the 1984/85 input-output table are given in Table 9. The marketing patterns of each sector are discussed below in the light of these two tables.

AGRICULTURE

The major customers for the agriculture sector are the other farmers, the large scale agricultural processing sector, the small scale agricultural processing sector, households and the final demanders predominated by foreign consumers. In 1975/76 PIDE's input-output table, 94.5% of total output of the agriculture sector was sold to these four major customers, 3.5% was sold to the final demanders including foreign consumers and the domestic investors and only 2% was sold to other interindustry customers. In the 1984/85 updated table, the share of four major customers decreased from 94.5% to 89% thus showing a total decline of 5.07%. However, individually, the sales of agriculture sector output to other farmers and the small scale agricultural processing sector over the period 1975/76 through 1984/85 decreased by 45% and 52% from their 1975/76 consumption level respectively. Sales to the large agricultural processing sector and households over the same period increased by 5.7% and 3.5% respectively. The share of other interindustry customers in the agriculture sector's output increased from 2% of total output in 1975/76 to 2.6% of the total output in 1984/85 thus showing an overall increase of 30%. This increase in the consumption of the agriculture sector's output includes both increases by construction, public administration and defense, large scale commodity manufacturing and small scale commodity manufacturing of 53%, 65%, 295%, 258% respectively and decreases by transportation, storage and communications both for food and fiber and other sectors. The total interindustry sales declined from 96.5% of total output in 1975/76 to 92.3% of total output in 1984/85 and this decline was exactly offset by increase in final demand. The agricultural sales to the final demanders which include foreign consumers and the domestic investors who are either making direct investment in the agriculture sector or building up inventories for future production and sales increased from 3.5% of total output in 1975/76 to 4.2% of total output in 1984/85. The major increase came from the foreign consumers who increased their purchases by almost 600% while the domestic investors increased their inventories and investment by 57% over the period of 10 years (1975/76 - 1984/85). The transport, storage and communications sector which consumed about .7% of total output of agriculture sector in 1975/76 was no longer a customer for this sector in 1984/85. With the exception of this sector none of the customers previously served by the agriculture sector terminated purchases.

## LARGE AND SMALL SCALE AGRICULTURAL PROCESSING SECTOR

The major customers for the large scale agricultural processing sector are the other large scale agricultural processors, small scale agricultural processing sector, public administration and defense and the households consuming 21%, 9%, 3% and 45% of total output of large scale agricultural processing sector in 1975/76 respectively. Only 1% of total output of this sector was consumed by other interindustry sectors. Thus the interindustry consumers consumed 79% of total output of the large scale agricultural processing sectors in 1975/76 and the remaining 21% of total output was sold to the foreign consumers. The sales by this sector to the interindustry consumers were reduced from 79% to 62% of the total output in 1984/85. This decline was exactly compensated by an increase in the demand for the output of large scale agricultural processing sector by foreign consumers which increased from 21% in 1975/76 to 38% in 1984/85. The major customers for the small scale agricultural processing sectors are domestic consumers such as the households which alone consumed 86% of the total output of this sector in 1975/76. Of the remaining 14% of output, 10% was taken up by the domestic investors, and 4% was consumed by other small scale agricultural processors. Thus, the interindustry sales by the small scale agricultural processing sector increased from 90% of total output in 1975/76 to 97% of total output in 1984/85. This increase in interindustry sales was exactly offset by a decrease in the domestic investment in the small agricultural processing sector.

## FARM INPUTS MANUFACTURING SECTOR

The major customers for the farm inputs manufacturing sector are agriculture, household, foreign consumers and the domestic investors which consumed 76%, 6%, 1% and 17% of total output of this sector during 1975/76 respectively. The share of the same customers, namely, agriculture, household, foreign consumers and domestic investors changed in 984/85 to 80%, 15%, 2% and 3% respectively. Thus the purchases by the interindustry customers increased from 82% in 1975/76 to 95% of total output of this sector in 1984/85 accounting for 4% increase in agriculture and 9% increase in household patronage. This also included a decline in the final demand from 18% to 5% in 1984/85 including the fact that the demand by foreign consumers increased by 1% and depletion of domestic stock or investment by 14%.

## TRANSPORT, STORAGE AND COMMUNICATIONS (FOOD AND FIBER)

In 1975/76 the transport, storage and communications (food and fiber) sector served its major customers which are large scale agricultural processing sector, small scale agricultural processing sector, trade other than food and fiber, households and other industrial sectors by supplying its services at 7%, 13%, 4%, 73% and 3% of the total value of its services respectively. The supply

of services by this sector to the final demanders was almost zero. However, in 1984/85 the supply of services to the final demanders increased to 11% of total value of services. This was the result of combination of reduction in services to large and small scale agricultural processing and households altogether by 16% and an increase in supply of services to large and small scale commodity and machinery manufacturing.

TRANSPORT, STORAGE AND COMMUNICATIONS (OTHER THAN FOOD AND FIBER)

The supply of services by the transport, storage and communications other than the food and fiber sector to interindustry customers was 52% of the total value of the services in 1975/76. The remaining 48% of the total value of services was spent on investment or stock building. In 1984/85 the consumption of services of this sector by the interindustry sectors increased to 88% and the final demand, which in this case is just the domestic investment, decreased to 12% of the total value of the output. This can be interpreted as either a decline in investment rate or depletion of the stock. The major switch took place between these two periods of time (1975/76 - 1984/85) by showing a decline in the consumption of this sector's services by agriculture, households and investment from 20%, 11% and 48% of total value of output in 1975/76 to 7%, 10% and 12% of the total value of output in 1984/85 respectively. The consumption of this sector's services by farm inputs manufacturing, large scale commodity manufacturing, small scale commodity manufacturing, large scale machinery manufacturing and small scale machinery manufacturing increased from 2%, 5%, 3%, 2% and zero percent of the total value of output in 1975/76 to 26%, 12%, 8%, 15% and 5% of total value of output in 1984/85 respectively. The share of public administration and defense and services did not change during this period. The small scale machinery manufacturing was a new customer served by this sector in 1984/85.

TRADE (WHOLESALE AND RETAIL)

The wholesale and retail trade for food and fiber sector served its major customers such as large scale agricultural processing, small scale agricultural processing sector, households and investment to the tune of 16%, 8%, 58% and 17% respectively in 1975/76. In 1984/85 the entire output by this sector was provided to the interindustry sectors with zero amount of sales going to the final demand sector.

The major customers for wholesale and retail trade other than the food and fiber sectors are agriculture, farm inputs, large and small scale commodity manufacturing sectors and households which altogether account for about 90% of the total value of output in 1984/85. This is slightly lower than the share of output consumed by the same sectors in 1975/76. The share of agriculture sector in the output of trade sector declined from 71% of total output in

1975/76 to 26% of total output in 1984/85. Farm inputs manufacturing, large scale commodity manufacturing, small scale commodity manufacturing, large scale machinery manufacturing and small scale machinery manufacturing increased their consumption from 1%, 9%, 2%, 0% and zero percent of total output of trade sector respectively in 1975/76 to 16%, 24%, 6%, 2% and 2% of the total value of output of trade sector in 1984/85 respectively.

LARGE SCALE COMMODITY MANUFACTURING

The large scale commodity manufacturing lost important customers in 1984/85 such as transport, storage and communications - food and fiber and other than food and fiber sectors which altogether purchased 29% of the total output of this sector in 1975/76 and bought nothing from this sector in 1984/85. In addition the share of agriculture sector and the agricultural processing sectors in the output of this sector declined from 15% of total output in 1975/76 to 3% of total output in 1984/85. This may be due to expansion of nonagricultural sectors. However, the share of the farm input manufacturing sector in the output of large scale commodity manufacturing increased from 1% of total output in 1975/76 to 4% in 1984/85. The share of the large and small scale machinery manufacturing sectors increased from 5% to 21% in 1984/85. The exports of large scale commodity manufacturing sector declined from 10% of the total output in 1975/76 to 7% of total output in 1984/85. The share of the other large scale commodity manufacturers and the small scale commodity manufacturing sectors in the output of this sector did not change over this period.

SMALL SCALE COMMODITY MANUFACTURING

The sales by the small scale commodity manufacturing sectors to other small scale commodity manufacturers increased from 21% of the total output in 1975/76 to 37% of the total output in 1984/85. This sector also found new customers for their products in 1984/85, namely, the farm inputs manufacturers and the small scale machinery manufacturers who bought about 7% and 6% of total output respectively. The sales of output by the small scale commodity manufacturing sector to the construction and the households sectors declined from 23% and 49% of total output in 1975/76 to 17% and 33% of total output in 1984/85.

LARGE SCALE MACHINERY MANUFACTURING

The large scale machinery manufacturing sector lost both domestic and foreign customers. Domestically, the transport, storage and communications sector which bought about 3% of the total output of this sector in 1975/76 was no longer a customer for this sector in 1984/85. Similarly the foreign customers which bought 7% of total output of this sector in 1975/76 terminated their purchases from this sector in 1984/85. Moreover, the purchases from this sector by large scale agricultural processing

sector, construction, public administration and defense, households and the domestic investors declined from 6%, 7%, 2%, 38% and 16% of the total output in 1975/76 respectively to 2%, 4%, 1%, 18% and 1% of total output in 1984/85. This decrease in sales was offset by increase in the purchases of output of this sector by other large scale machinery manufacturers, farm inputs manufacturers and the large scale commodity manufacturing sector.

SMALL SCALE MACHINERY MANUFACTURING

The small scale machinery manufacturing sector sold most of its output to the other small scale machinery manufacturers and households. Both of these sectors accounted for 99% of total output in 1984/85 as compared to 82% of total output in 1975/76. The increase in the sales of output of this sector in 1984/85 was a combination of 47% increase in sales to other small scale machinery manufacturers and a 30% decline in households and 17% decline in purchases both by the small scale agricultural processor and the domestic investors.

MINING AND QUARRYING

About 92% of the total value of output of mining and quarrying sector is sold to the interindustry sectors. Its major customers are agriculture, farm input manufacturing sector, transport, storage and communications, large scale commodity manufacturing, small scale commodity manufacturin, large scale machinery manufacturing, construction, electricity and gas distribution, households, foreign customers and the domestic investors. In 1975/76, 4% of the total output of this sector was sold to transport, storage and communications (other than the food and fiber sector), but in 1984/85, this sector ceased to be a demander for the output of mining and quarrying sector. The sales of output of this sector to most of its customers decreased in 1984/85 as compared to the sales level of 1975/76 with the exception of farm inputs manufacturing sector, large and small scale commodity manufacturing sectors and the large scale machinery manufacturing sector who required larger deliveries from this sector.

CONSTRUCTION

The PIDE data on construction were not adequate. Most of the cells were empty in 1975/76 input-output table with the exception of ownership of dwelling which bought only 3% of the total output of this sector. The remaining 97% of the output was allocated to investment and discrepancy. In 1984/85 new customers appeared for the output of the construction sector. These included transport, storage and communications both for food and fiber and other sectors and banking and insurance. These new customers along with the old interindustry customers of dwelling owners consumed 94% of the total output of this sector thus leaving 6% of the output for

domestic investors or additions to stock. The new customers consumed 86% of the total output of this sector.

ELECTRICITY AND GAS DISTRIBUTION

About 35% of the total output of electricity and gas distribution sector in 1975/76 was distributed to interindustry customers while the remaining 65% was attributed to investment. In 1984/85 the interindustry sales were reduced to 30% thus increasing the domestic investment to 70% of the total output. The sales of electricity and gas distribution consumed by agriculture, large and small scale agricultural processors, household, banking and insurance and within the electricity and gas distribution sector itself declined altogether from 25% in 1975/76 to 7% in 1984/85. However, its deliveries to other sectors such as farm inputs manufacturing, large scale commodity manufacturing, large scale machinery manufacturing, services and investment increased altogether from 10% of total output in 1975/76 to 28% of total output in 1984/85. Also, in 1984/85, this sector lost its customer banking and insurance served by this sector in 1975/76 which seems very unlikely.

BANKING AND INSURANCE

The services of banking and insurance to agriculture, large and small scale agricultural processing sectors, household, domestic investors and the transactions within the banking and insurance sector declined altogether from 82% of the total output of this sector in 1975/76 to 56% of total output in 1984/85. The level of services to the wholesale and retail trade both for food and fiber and other sectors, construction, public administration and defense, services, mining and quarrying sectors in 1984/85 remained at the same level of about 14% in 1975/76. However, the services of banking and insurance sector increased to manufacturing sectors such as farm inputs manufacturing, large and small scale commodity manufacturing , large and small scale machinery manufacturing from 6% of total output in 1975/76 to 32% of total output in 1984/85.

OWNERSHIP OF DWELLING

The customers for the output of ownership of dwellings are households and domestic investors. There was no change in the customers between the period 1975/76 through 1984/85. However, there was a big change in the composition of output of dwelling going to these two customers over this period. For example, in 1975/76, 91% of the total output of this sector was sold to households and the remaining 9% was retained for investment purposes. In 1984/85 sales to households decreased from 91% to 51%. This decrease of 40% was offset by an increase of the same size in the investment in the dwelling sector by the domestic investors.

PUBLIC ADMINISTRATION AND DEFENSE

The services of public administration and defense to the agriculture, construction, other government departments and households decreased altogether from 85% of the total output of this sector in 1975/76 to 47% in 1984/85. This sector also lost two important customers: the transport, storage and communications and banking and insurance. These sectors which consumed altogether 7% of total output of the government sector in 1975/76 ceased to be the customer for the services of the government sector in 1984/85. Moreover the magnitude of the government pledge or commitments made to foreign governments or international financial institutions, i.e., the amount of foreign aid and borrowing decreased from 58% of the total government expenditure in 1975/76 to 28% in 1984/85.

SERVICES

Like government services, the other services which are not elsewhere cited also lost the same two customers as did the government sector, i.e., transport, storage and communications and banking and insurance. These sectors which consumed altogether 16% of the total value of the services of the services sector in 1975/76 did not buy any amount of service from the services sector in 1984/85. This seems to be unlikely. However, the services sector also discovered a new customer, i.e., farm inputs manufacturing sector which bought 5% of the total value of output of the services sector in 1984/85. Moreover, the supply of services to the agriculture sector, large scale agricultural processing sector, wholesale and retail trade (other than food and fiber) and households decreased from 34.5% in 1975/76 to 29% of the total services in 1984/85. The supply of services by this sector increased for large and small scale commodity and machinery manufacturing, public administration and defense, mining and quarrying and the domestic investment from 41.5% in 1975/76 to 59% in 1984/85. The construction sector is the only exception where the utilization of level of service remained constant at 7% of the total use of services over the two time periods, i.e., 1975/76 through 1984/85.

HOUSEHOLD

The employment income from agriculture, small scale agricultural processing, transport, storage and communications both for food and fiber and other sectors, electricity and gas distribution and ownership of dwelling and overseas employment decreased altogether from 25% in 1975/76 to 13% in 1984/85 with the complete elimination of transport, storage and communications sector as a buyer of labor services which seems impossible. This decline of 12% in employment income was exactly offset by an equivalent increase in the employment income in farm inputs manufacturing, large scale commodity manufacturing, small scale commodity

manufacturing, large scale machinery manufacturing, small scale scale machinery manufacturing, mining and quarrying, construction and public administration and defense which increased from 8% in 1975/76 to 20% in 1984/85. The employment income from large scale agricultural processing, total wholesale and retail trade and the services sectors remained constant at 5% of total employment income over the period 1975/76 through 1984/85. Also, the home remittances by Pakistanis working abroad Similarly andeclined from 12% of the total households income in 1975/76 to 9% in 1984/85. The sales to investment by the households sector remained constant at 62% of the total household income over the period of ten years between 1975/76 through 1984/85. This big share of investment by households is in fact a residual derived by subtracting the household wages and salaries and home remittances from the total personal income. This may be any exogenous investment spending or inventory building.

## TOTAL DEPENDENCE OF EACH INDUSTRY ON FINAL DEMAND

Direct dependence of any industry's output on final demand does not reveal the full effect of final demand. Therefore the indirect effect of final demand on output of any industry may become crucial for policy purposes. To see the total effect on an industry of a change in final demand, the total requirement matrix of Table 12 will be applied to the components of final demand given in Table 13. For example, the exports of the agricultural products by the agriculture during 1984/85 were Rs 5406 million. In order to satisfy the export component of final demand the total output of the agriculture sector required directly and indirectly would be Rs 6857.12 million (Table 14). This has been obtained by multiplying the first row and first column interaction of Table 12, with the export figure of agriculture sector in Table 13, i.e., 1.26842826 * 5406 = 6857.12. Similarly, an investment of Rs 8377.4 million in the agriculture sector would stimulate the output of agriculture sector directly and indirectly worth of Rs 10626.13 million. This has been obtained in the same way by multiplying 1.26842826 with the investment figure, i.e., 1.26842826 * 8377.4 = 10626.13. The foreign aid and loans of Rs 19045 million received during 1984/85 would stimulate the total expenditure of public administration and defense directly and indirectly to the extent of Rs 21702.02 million, i.e., 1.1391288 * 19045 = 21702.02. The home remittances of Rs 38311 million in 1984/85 by Pakistanis working abroad, especially in the middle eastern countries, would stimulate the total income of households directly and indirectly to the extent of Rs 48252.09 million. Similar types of analyses can be conducted for other sectors based on the final demand for their products.

INDIRECT INPUT REQUIREMENTS

Indirect input requirements are most important in assessing the total effect on each industry of a change in exogenous variables. The total input requirements matrix denoted by $(I-A)^{-1}$ for a unit change in the final demand of any industry has three main components:

1 = one unit change in the exogenous variable, i.e., final demand;

A = direct input requirements matrix;

$A^2(I-A)^{-1}$ = indirect input requirements matrix.

The indirect input requirements matrix can be derived by subtracting 1+ direct input coefficients from the main diagonal elements and subtracting just direct input coefficients from off the diagonal elements of the total requirements matrix or Leontief Inverse $(I-A)^{-1}$. However, for the large matrix where this procedure may prove cumbersome, the above equation $A^2(I-A)^{-1}$ can be used to get the indirect input requirements matrix. This equation was used by Stone [89]. The indirect input requirements matrix has been derived for the year 1984/85 by using the above equation and is given in Table 11.

The total requirements matrix includes direct, indirect, and the induced effect for a unit change in the output of exogenous variables, i.e., final demand. The decomposition of the total input requirements into direct and indirect has been made and is given in Table 15. For example, at row 12, small scale machinery manufacturing requires 80% of total requirements in the form of direct and indirect inputs to produce one unit of output to satisfy the final demand which itself accounts for 20% of the total input requirements by this industry. Alternatively, this can be stated as: in addition to the production of one rupee's worth of output to satisfy final demand, the small scale machinery manufacturing industries require 3.811896 rupees' worth of inputs directly and indirectly. This consists of .95099646 in the form of direct inputs and 2.8609000 in the form of indirect inputs. The direct inputs used by all industries account for 10% to 25% while the indirect inputs range between 20% to 60% of total inputs requirements. The direct inputs are smaller than the indirect inputs because the former just involves the first round of spending while the latter involves cumulative effects of various successive rounds of spending back and forth on various industries. The direct and indirect input requirements as percentage of total input requirements for agriculture, large and small scale agricultural processing and farm input manufacturing sectors range from 65% to 73%. For large scale commodity manufacturing, small scale commodity manufacturing, large scale machinery manufacturing, small scale machinery manufacturing, household, mining and quarrying, construc-

tion, public administration and defense, banking and insurance and transport, storage and communications other than food and fiber these are 68%, 77%, 76%, 80%, 71%, 67%, 72%, 66%, 58% and 57% respectively.

The large magnitude of the total input requirements of the sectors also implies big business multipliers for these sectors. For example, the business multipliers for the small scale machinery manufacturing is 4.81 which shows the total spending in the economy as a result of an increase of one unit in investment purchases from small scale machinery manufacturing (Table 12). The numbers down the column of small scale machinery manufacturing (Table 12) show the share of other sectors received directly and indirectly as a result of one rupee change in sales to final demand by small scale machinery manufacturing. For example, the agriculture sector will receive 0.28 directly and indirectly for one rupee of sales to investment by the small scale machinery manufacturing sector. Similarly, households, small scale agricultural processing, transport, storage and communications other than food and fiber sector, wholesale and retail trade other than food and fiber, large scale commodity manufacturing, small scale commodity manufacturing and construction will receive directly and indirectly 0.48, 0.13, 0.16, 0.15, 0.51, 0.26, 0.14, 0.12 respectively for each one rupee of investment in the small scale machinery manufacturing. The largest direct and indirect input requirements imply the highest degree of interdependence among industries. This also means that in order to have the biggest impact on the economy, the priorities should be given to promoting final demand sales by large and small scale commodity and machinery manufacturing, food and fiber sector, mining and quarrying, construction, banking and insurance, public administration and defense and employment generating activities.

## COMPARISON OF BUSINESS MULTIPLIERS

The business multipliers for any sector are obtained by summing the column sum of that sector of the total requirements matrix. The magnitude of the multiplier shows the amount of product demand for that particular sector that would be stimulated as a result of one rupee worth of change in the final demand for that sector. Thus the size of the business multipliers shows the total impact on the output of that particular sector. The large business multiplier for a sector also implies the large dependence of that sector on other sectors for purchase of inputs rather than importing these inputs. The business multipliers for all the sectors have been obtained from the total requirements matrix of 1975/76 and 1984/85 and are given in Table 16. In 1975/76 there were only two sectors; small scale agricultural processing and small scale commodity manufacturing whose business multipliers were greater than 3. In 1984/85 the number of such sectors whose multipliers were greater than 3 increased to ten. Moreover, the multipliers of all sectors increased in 1984/85 over the level of

1975/76 with the exception of trade (wholesale and retail) other than the food and fiber sector, and electricity and gas distribution whose multipliers slightly decreased, thus reflecting a contraction in these two sectors. Since the multipliers of all other sectors have increased considerably over the period 1975/76 through 1984/85, this implies that the capacity of the economy has increased, and because of this development of economy, the future impact on the economy of change in final demand will be greater.

## PRIMARY INPUTS EMBODIED IN THE FINAL DEMAND

Primary inputs embodied in one unit of final demand placed on the agriculture sector by final consumers have been derived and are given in Table 18. These are obtained by multiplying the coefficients of the first column (agriculture) of the total requirements matrix in Table 12 with the components of primary inputs as well as total primary inputs of Table 17. For example, the imported input coefficient for the agriculture sector is 0.01114487 derived by dividing 2113 by 189594 (2113/189594). The total requirement coefficient for the agriculture sector is 1.26842826. The imported input embodied in one unit of final demand for the agriculture sector is 1.26842826 * 0.01114487 = 0.01413646. Similarly, the amount of self-employment income, interest, profit and savings embodied in one unit of final demand for the agriculture sector is 1.26842826 * 0.41024563 = 0.52036717 and total primary inputs of agriculture embodied in one unit of final demand for the agriculture sector is 1.26842826 * 0.42139050 = 0.53450363. Similarly, for the large scale agricultural processing sector at second row first column of Table 18, the primary input embodied indirectly in one unit of final demand for the agriculture sector is 0.03190450 * 0.11584419 = 0.00369595 for imports, 0.0319045 * 0.05112212 = 0.00163103 for taxes less subsidy, 0.03190450 * 0.11362113 = 0.00362503 for self employment income etc. and 0.0319045 * 0.28058743 = 0.008952 for total primary inputs. Similarly these coefficients can be calculated for all other sectors. So the total direct and indirect amount of primary inputs embodied in one rupee of final demand for agriculture sector is 0.53450363 + 0.008952 + ... + ... = 1. The direct primary input per unit of output for the agriculture sector is 0.42139050. The total primary inputs required to satisfy one unit of final demand placed on the agriculture sector is 0.53450363 which almost belongs to self-employment income, interest and savings in the agriculture sector. This leaves 0.11311312 as an indirect amount of primary inputs embodied in one unit of final demand. Thus when the agriculture sector increased its output to meet one unit of additional final demand, it also increased its purchases of inputs directly and indirectly from other sectors. Those inputs coming from other sectors are their outputs embodying some amounts of primary inputs in them. The direct and indirect outputs of others sectors going to the agriculture sector multiplied by their respective primary input coefficients would give total primary

inputs embodied in one unit of final demand for the agriculture sector. These total primary inputs must add to one.

## STRUCTURAL ANALYSIS OF THE PAKISTAN ECONOMY

### THE CONCEPT OF STRUCTURAL CHANGE

In the words of Koopman in [73], "a model can be defined as a set of structures." The structure of the model includes specific numerical values of the parameters involved [73]. Suppose a consumption function has been formulated as follows:

$$C_t = a + b Y_t$$

where $C_t$ is the consumption in period t and $Y_t$ is the income in period t and a and b are the structural parameters which explain the behavior of the consumers towards their spending. Thus the numerical value of a and b in fact shows the structure of the consumption model. Therefore, any change in the value of a and b is considered a change in the structure of the consumption model.

In an input-output set up, the structural parameters are the inputs per unit of output, i.e., the technical coefficients, and any change in the value of these technical coefficients observed in a different period of time would be considered as a structural change. Thus, in an input-output analysis the structural change involves a comparison of technical coefficients of two different matrices belonging to two different periods of time, after the due allowance has been made for changes in the prices of output. This type of analysis has been carried out by Leontief and Per Sevaldson cited in Rasmussen [73].

In our case, both the input-output tables for 1975/76 and 1984/85 are in current prices. The ideal situation for the input-output analysis would have been that the input-output tables be presented in constant prices since the tables are expressed in monetary units instead of physical units. To do so, we need to know the price index for each commodity. But unfortunately, due to nonavailability of price indexes for each commodity, we could not deflate 1984/85 input-output table into 1975/76 prices. If both matrices are in constant prices, any change in the matrix for 1984/85 over 1975/76 matrix would have been considered a change in the technology or a change in the structure of the economy. If both matrices are in current prices any change in the 1984/85 matrix over the 1975/76 matrix would be attributed either to:

- change in prices;
- change in technology; or
- combination of both.

To see the structural change, if any, that has taken place in the economy over the period 1975/76 through 1984/85, the two direct input requirements matrices for the respective periods shown in Table 3 and Table 19 will be compared. The comparison shows that for all of the 20 sectors, some input requirements for the year 1984/85 have decreased while some other input requirements absorbed by the same sector have increased at the same time. This gives us a signal that some sort of substitution between the inputs has taken place in the economy over the period 1975/76 through 1984/85. There has not been a single sector whose entire input requirements have decreased or increased over this period. According to Leontief, the adoption of new technology implies a simultaneous change in all inputs absorbed by the same industry.

As an illustration of the structural change we will consider the example of the agriculture sector. The only major increase in inputs used by the agriculture sector was for farm inputs manufacturing whose coefficient increased from 0.01567518 in 1975/76 to 0.27132270 in 1984/85 with a slight increase of .2% in imported inputs. This increase in farm inputs manufacturing coefficient was exactly offset by a decrease in the coefficients of: the agriculture sector itself, transport, storage and communications other than food and fiber, wholesale and retail trade other than food and fiber sector, large scale commodity manufacturing, mining and quarrying, electricity and gas distribution, banking and insurance, public administration and defense, services and households. This increase or decrease in the technical coefficients needs explanation. A reduction in one or more technical coefficients with the rest of the coefficients remaining the same implies more efficient utilization of resources. What this means is that to produce one fixed unit of output to satisfy the final demand this sector now requires a smaller amount of inputs. Similarly, an increase in one or more input coefficients while rest of the coefficients remaining the same might be due to change in external circumstances viz. bad weather, exhaustion of natural resources, limitation of capacity utilization, etc. The increase in the technical coefficients of farm inputs implies more use of fertilizer and large and small scale agricultural machinery. This farm mechanization may be due to a substitution effect between the factors of production caused by changes in their relative prices. Because the increase in the technical coefficients of farm inputs has, inter-alia, been offset by a decrease in the coefficients of households, which means the farm mechanization has resulted in the displacement of farm labor. Thus, this in fact is a case of factor substitution, i.e., substitution of capital for labor. The term technology implies a change in quality of a good or service, e.g. development of new high yielding varieties which make differences in yield or development of such agricultural machinery, which saves gasoline, etc. However, about 39% of the displacement of farm labor caused by farm mechanization in the agriculture sector has been absorbed by farm input manufacturing sector alone to make possible the increased output to be sold as farm input to the agriculture

sector. The remaining farm displaced labor was absorbed by other manufacturing sectors such as small and large agricultural processing sector, wholesale and retail trade for food and fiber sector, large and small scale commodity manufacturing, large scale machinery manufacturing, construction, government and other services sectors. The reduction in the technical coefficient of agriculture sector on itself implies that the other farmers who were previously buying from the agriculture sector have become more self-sufficient and now produce their own improved seeds, hay and livestock feed in enough quantity to satisfy their input requirements. The increased farm mechanization also led to the reduction of technical coefficient of transport, storage and communications other than food and fiber sector and wholesale and retail trade other than the food and fiber sector. This implies that the farmers are now using their tractors for hauling purposes and are also selling their produce directly to government procurement centers thus eliminating the middlemen in the marketing system. The reduction in the technical coefficient of banking and insurance, public administration and defense and other services imply a declining level of agricultural credit service received by the farmers from the commercial banks, reduction in government expenditures on agricultural research and extension and other services involved in one unit of output of the agriculture sector. The similar kind of analysis can be carried out for other sectors of the economy.

An overall view of the whole economy shows that the increase in some of the intermediate processing technical coefficients of any sector is associated with the decrease in some other intermediate processing technical coefficients of the same sector and this is globally true for all other sectors of the economy. Thus the overall picture of the Pakistan's economy shows that change in the structure of the economy that took place between the period 1975/76 through 1984/85 may be due to the substitution effect between factors caused by changes in their relative prices.

# CHAPTER VI

## SUMMARY, CONCLUSIONS AND LIMITATIONS

Many methods are available for updating input-output tables. Consistent with the declared objectives of the study of developing the least cost method of updating input-output table, a subset of updating methods consisting of two naive methods, namely, Final Demand Method and the Transactions Proportional to the Value Added Method and the third RAS Method was tried. According to the criteria of the index of over and underestimation; the final demand method underestimates the economy on the average by 19.1%, while the transactions proportional to the value added method and the RAS method overestimate the economy on the average by 16.3% and 0.096% respectively. Alternatively, according to the Average Percentage Error method, the average percentage error reported by the final demand method ranges from 15% to 118% for all sectors of the economy as a whole with the exception of the households and the services sectors where the average percentage errors reported by this method are 3% and 6% respectively. The average percentage error reported by the transactions proportion to the value added method ranges from 11% to 518%. However, unlike these two methods, the average percentage error reported by the RAS method ranges between zero and 1.63 for all of the sectors with the exception of construction where the APE reported by this method is about 21%.

All of these three updating methods require different information and produce different output. For example, the final demand method can successfully predict the whole transactions matrix as well as gross output for the future period based on future period's final demand. Transactions proportional to the value added method require more information than the final demand method requires and produces a transactions matrix only for the future period and does not predict gross output directly. The RAS method produces a new technical coefficient matrix that is different from the base period matrix and achieves a balanced model with a unique solution which the other two methods can not do. But the problem with the RAS method is that it cannot predict the gross output for a future year. Therefore all of these three updating methods are not comparable. To do a good job of forecasting of economy, it is suggested that both the final demand method and the RAS method be used as complementary tools as no one method alone can do this job.

The input-output analysis in fact is a descriptive one. The u[illegible]ed input-output table for 1984/85 has been used for marketing and structural analyses. According to the marketing analysis, in order to see whether or not there has occurred any change in the customers faced by each industry, the sales coefficients matrices for 1975/76 and 1984/85 were obtained and compared. The transport,



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storage and communications sector, which was a customer for almost all the sectors of Pakistan's economy in 1975/76, ceased to be a customer for the outputs of: agriculture, large scale commodity manufacturing, large scale machinery manufacturing, public administration and defense, services and the households in 1984/85. However, it appeared as a new customer for construction. The sectors who lost some of the final consumers are wholesale and retail trade and the small scale machinery manufacturing and the one who found a new final customer is the transport, storage and communications (for food and fiber) sector. Most of the sectors shifted their output between interindustry consumers and final consumers. The sectors which increased their sales to interindustry customers at the cost of final consumers are: small scale agricultural processing sector, farm inputs manufacturing sector, transport, storage and communications (other than food and fiber) sector, wholesale and retail trade, small scale commodity manufacturing, large scale machinery manufacturing, small scale machinery manufacturing, construction, banking and insurance and households. The sectors which increased sales of their output to the final consumers at the cost of interindustry consumers are: agriculture, large scale agricultural processing, transport, storage and communications (food and fiber), large scale commodity manufacturing, mining and quarrying, electricity and gas distribution, ownership of dwelling, public administration and defense and services. Also, business multipliers for all sectors were obtained from inverse matrices of 1975/76 and 1984/85 and were compared. The business multipliers of all sectors in 1984/85 increased over the level of 1975/76 with the exception of wholesale and retail trade (other) and electricity and gas distribution whose multipliers slightly decreased during this period.

To examine the structural change in the economy the two direct input requirements matrices for the period 1975/76 and 1984/85 were obtained and compared. The comparison showed that for each sector some input requirements have decreased while some other input requirements absorbed by the same sector have increased and this situation held globally true for all of the 20 sectors of Pakistan's economy. This gave a signal that some sort of substitution between inputs was taking place in the economy over this period (1975/76 - 1984/85). The adaptation of new improved technology by any industry implies that all of the intermediate processing and import input coefficients faced by that industry should fall simultaneously and this did not happen in the case of Pakistan's economy. Therefore, the structural change that has taken place in Pakistan's economy is solely due to the factor substitution caused by changes in their relative prices and cannot be attributed by definition to the change in technology.

## LIMITATIONS

An input-output analysis is a descriptive one. It describes the relationships among the different sectors of the economy over

a specific period in time, but this description of interdependency may hold for a short period in the future and can not be projected for a long term economic planning because of a change in technology or prices. The implication of input-output analysis is that there is no degree of freedom since one observation for each parameter of the 1975/76 table is used to predict each parameter of the 1984/85 input-output table. Moreover, we have only one updated table for 1984/85 and there is no actual input-output table for 1984/85 available that can be used for statistical comparisons.

The other problems with the 1984/85 updated table are associated with the data and the classifications of sectors. That the petroleum and petroleum products which are used as an input by all other sectors were not included in the electricity and gas distribution sector according to the national income accounting classification adopted by the Federal Bureau of Statistics is a concern. In this study, the petroleum and petroleum products were included in the large scale commodity manufacturing sectors. The implication of this "bad" classification is that when farm mechanization took place in the agriculture sector, the intuitive insight that one would like to get from this is how this increase in the use of agricultural machinery is associated with the consumption of gasoline. If both are positively related this would mean the substitution of farm machinery for labor. However, if the farm machinery is negatively related with the consumption of gasoline, this would have meant that types of machinery have been developed which saved the consumption of gasoline. Thus, the development of farm machinery which has resulted in a resource saving can be interpreted as the adaptation of new technology. But, unfortunately, because of this classification problem this effect can not be detected.

Other problems are associated with the data. The data for gross output, value added and investment for the electricity and gas distribution sectors need to be rechecked, because it appeared somehow that the data on investment in electricity and gas distribution is either equal to or greater than the gross output generated by this sector. Similarly, the output of the construction sector was poorly distributed to other sectors in PIDE's 1975/76 input-output table where most of the cells pertaining to the output of the construction sector were empty. Therefore, the results of the 1984/85 updated table can be further improved via RAS technique with the availability of new information concerning these two sectors and by modifying the necessary classifications until an actual input-output table for 1984/85 becomes available. This updated input-output table for 1984/85 can act as a guide for the policy maker in allocation of resources between the different sectors of Pakistan's economy while preparing annual development plans and five year development plans.

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Appendix Table 1 --Classification of Sectors

1. AGRICULTURE

Wheat on small farms (001), Wheat on large farms (002), Rice on small farms (003), Rice on large farms (004), Cotton on small farms (005), Cotton on large farms (006), Sugarcane on small farms (007), Sugarcane on large farms (008), Tobacco (009), Oilseeds and other cottonseeds (010), Pulses (011), Other Crops (012), Livestock (013), Fishing (014), Forestry (015).

2. LARGE SCALE AGRICULTURAL PROCESSING

Grain Milling (017), Rice Milling (018), Sugar Refining (019), Edible Oils (020), Tea Blending (021), Fish and Fish Preparations (022), Confectionery and Bakery (023), Other Food Industries (024), Beverages (025), Cigarettes and other Tobacco Products (026), Cotton Yarn (027), Cotton Fabrics (028), Silk and Synthetic Textiles (029), Woolen Textiles (030), Hosiery (031), Thread Ball Making (032), Carpets and Rugs (033), Other Textiles (034), Footwear Other than Rubber Footwear (035), Wearing Apparel (036), Wood, Cork and Furniture (037), Paper, Paper Board and Paper Products (038), Leather and Leather Products (040), Soaps and Detergents (047), Matches (048), Cotton Ginning (063).

3. SMALL SCALE AGRICULTURAL PROCESSING

Grain Milling (068), Rice Husking (069), Gur and Khandsari (070), Edible Oils (071), Other Food Industries (072), Beverages (073), Tobacco (074), Cotton Textiles (075), Silk and Artsilk Textiles (076), Carpets (077), Other Textiles (078), Shoe Making (079), Wood (080), Wooden Furniture (081), Leather Goods (084).

4. FARM INPUT MANUFACTUREING

Fertilizer (044), Large Scale Machinery (057), Small Scale Agricultural Machinery (091).

5. TRANSPORT, STORAGE AND COMMUNICATIONS (FOOD AND FIBER)

Road Transportation (109), Rail Transportaion (110), Air Transportation (111), Water Transportation (112), Television (113), Radio (114), Telephone, Telegrap and Post (115).



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6. WHOLESALE AND RETAIL TRADE (FOOD AND FIBER)

Wholesale and retail trade (108).

7. TRANSPORT, STORAGE AND COMMUNICATIONS OTHER THAN FOOD AND FIBER

Road Transportation (109), Rail Transportation (110), Air Transportation (111), Water Transportation (112), Television (113), Radio (114), Telephone, Telegraph and Post (115).

8. WHOLESALE AND RETAIL TRADE OTHER THAN FOOD AND FIBER

Wholesale and retail trade (108)

9. LARGE SCALE COMMODITY MANUFACTURING

Printing and Publishing (039), Rubber Footwear (041), Other Rubber Products (042), Pharmaceutical and Medicinal Preparations (043), Perfumes and Cosmetics (045), Paints and Varnishes (046), Other Chemicals (049), Plastic Products (050), Petroleum Products (051), Cement (052), Glass and Glass Products (053), Other Non-Metallic Mineral Products (054), Basic Metals (055), Metal Products (056), Office Equipments (064) Sports Goods (065), Other Large-Scale Manufacturing Industries (067).

10. SMALL SCALE COMMODITY MANUFACTURING

Steel Furniture (082), Printing and Publishing (083), Rubber Products (085), Chemicals (086), Plastic Products (087), Non-Metallic Mineral Products (088), Iron and Steel Remolding (089), Metal Products (090), Sports Goods (095), Other Small-Scale Manufacturing Industries (097).

11. LARGE SCALE MACHINERY MANUFACTURING

Other Non-electrical Machinery (058), Electrical Machinery (059), Bicycles (060), Auto-Assembly and Parts (061), Ship Building (062), Surgical Instruments (066).

12. SMALL SCALE MACHINERY MANUFACTURING

Non-electrical Machinery (092), Electrical Machinery (093), Transport Equipment (094), Surgical Instruments (096).

13. MINING AND QUARRYING

Mining and Quarrying (016)

14. CONSTRUCTION

Low-Cost Residential Buildings (098), Luxurious Residential Buildings (099), Rural Buildings (100), Factory Buildings (101), Public Buildings (102), Roads (103), Infrastructures (104).

15. ELECTRICITY AND GAS DISTRIBUTION

Electricity (106), Gas (107).

16. BANKING AND INSURANCE

Banking and Insurance (116).

17. OWNERSHIP OF DWELLINGS

Ownership of dwellings (105)

18. PUBLIC ADMINISTRATION AND DEFENCE

Public Administration and Defence (117)

19. SERVICES (NOT ELSEWHERE CITED)

Services not elsewhere cited (118)

20. HOUSEHOLD

Household (Endogenized into interindustry transactions by removing it from the final demand components).

Appendix Table 2 --Transactions-Among-Sectors Table, 1976 (Million Rupees)

| | AGRICULTURE | LS AG PR | SS AG PR | FARM INPUTS | TS&C (F&F) | T-WR (F&F) | TS&C (OTH) | T-WR (OTH) |
|---|---|---|---|---|---|---|---|---|
| AGRICULTURE | 16877.0 | 8350.0 | 11831.0 | 0.0 | 491.0 | 0.0 | 4.0 | 0.0 |
| LS AG PR | 0.0 | 6406.0 | 2729.0 | 0.0 | 0.0 | 5.0 | 0.0 | 0.0 |
| SS AG PR | 0.0 | 38.0 | 886.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| FARM INPUTS | 1069.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| TS&C (F&F) | 0.0 | 637.0 | 1183.0 | 0.0 | 0.0 | 0.0 | 0.0 | 403.0 |
| T-WR (F&F) | 0.0 | 1749.0 | 901.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| TS&C (OTH) | 2345.0 | 48.0 | 101.0 | 206.0 | 0.0 | 0.0 | 53.0 | 0.0 |
| T-WR (OTH) | 5595.0 | 206.0 | 95.0 | 85.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| LS CM | 629.0 | 624.0 | 90.0 | 52.0 | 347.0 | 0.0 | 2115.0 | 5.0 |
| SS CM | 0.0 | 0.0 | 35.0 | 36.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| LS MM | 0.0 | 232.0 | 0.0 | 102.0 | 17.0 | 0.0 | 102.0 | 0.0 |
| SS MM | 0.0 | 0.0 | 6.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| M&Q | 100.0 | 8.0 | 0.0 | 65.0 | 2.0 | 0.0 | 74.0 | 0.0 |
| CONSTRUCTION | 0.0 | 0.0 | 0.0 | 0.0 | 8.0 | 0.0 | 5.0 | 0.0 |
| E&G DIST | 224.0 | 379.0 | 260.0 | 150.0 | 6.0 | 26.0 | 4.0 | 20.0 |
| B&I | 241.0 | 581.0 | 168.0 | 24.0 | 14.0 | 258.0 | 4.0 | 92.0 |
| OWNS.OF DW. | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| PA&D | 530.0 | 44.0 | 4.0 | 3.0 | 0.0 | 0.0 | 1031.0 | 52.0 |
| SERVICES | 133.0 | 362.0 | 6.0 | 34.0 | 0.0 | 0.0 | 1547.0 | 174.0 |
| HOUSEHOLDS | 11246.0 | 2294.0 | 1218.0 | 107.0 | 1626.0 | 972.0 | 1137.0 | 680.0 |
| IMPORTS | 726.0 | 3446.0 | 1502.0 | 270.0 | 3157.0 | 0.0 | 3767.0 | 0.0 |
| TAX-SUBSIDY | 0.0 | 2830.0 | 0.0 | 7.0 | 297.0 | 0.0 | 62.0 | 0.0 |
| SELF-EMP.&S. | 28482.0 | 3018.0 | 1514.0 | 272.0 | 3106.0 | 9625.0 | 2092.0 | 6487.0 |
| TOTAL PURCHA | 68197.0 | 31252.0 | 22529.0 | 1413.0 | 9071.0 | 10886.0 | 11997.0 | 7913.0 |

| | LS CM | SS CM | LS MM | SS MM | M&Q | CONSTRUCTION | E&G DIST | B&I |
|---|---|---|---|---|---|---|---|---|
| AGRICULTURE | 24.0 | 115.0 | 4.0 | 1.0 | 0.0 | 535.0 | 0.0 | 0.0 |
| LS AG PR | 353.0 | 71.0 | 17.0 | 0.0 | 0.0 | 13.0 | 0.0 | 0.0 |
| SS AG PR | 0.0 | 48.0 | 0.0 | 27.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| FARM INPUTS | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| TS&C (F&F) | 80.0 | 54.0 | 42.0 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| T-WR (F&F) | 134.0 | 34.0 | 6.0 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| TS&C (OTH) | 545.0 | 372.0 | 285.0 | 10.0 | 41.0 | 0.0 | 185.0 | 175.0 |
| T-WR (OTH) | 721.0 | 185.0 | 31.0 | 3.0 | 138.0 | 0.0 | 407.0 | 0.0 |
| LS CM | 1635.0 | 1436.0 | 420.0 | 34.0 | 79.0 | 2407.0 | 339.0 | 304.0 |
| SS CM | 0.0 | 1245.0 | 0.0 | 8.0 | 0.0 | 1310.0 | 0.0 | 0.0 |
| LS MM | 149.0 | 0.0 | 491.0 | 0.0 | 0.0 | 244.0 | 1.0 | 17.0 |
| SS MM | 0.0 | 0.0 | 0.0 | 2.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| M&Q | 153.0 | 154.0 | 7.0 | 0.0 | 0.0 | 811.0 | 225.0 | 0.0 |
| CONSTRUCTION | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 28.0 |
| E&G DIST | 431.0 | 12.0 | 25.0 | 0.0 | 0.0 | 0.0 | 76.0 | 140.0 |
| B&I | 145.0 | 20.0 | 80.0 | 4.0 | 17.0 | 24.0 | 16.0 | 96.0 |
| OWNS.OF DW. | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| PA&D | 15.0 | 9.0 | 4.0 | 0.0 | 120.0 | 416.0 | 28.0 | 152.0 |
| SERVICES | 170.0 | 14.0 | 61.0 | 1.0 | 128.0 | 695.0 | 43.0 | 187.0 |
| HOUSEHOLDS | 937.0 | 779.0 | 479.0 | 20.0 | 631.0 | 4089.0 | 1314.0 | 519.0 |
| IMPORTS | 1727.0 | 140.0 | 1088.0 | 11.0 | 102.0 | 2071.0 | 2628.0 | 74.0 |
| TAX-SUBSIDY | 504.0 | 0.0 | 129.0 | 0.0 | 19.0 | 0.0 | -106.0 | 0.0 |
| SELF-EMP.&S. | 880.0 | 1166.0 | 480.0 | 46.0 | 504.0 | 2430.0 | 1000.0 | 2631.0 |
| TOTAL PURCHA | 8603.0 | 5844.0 | 3649.0 | 169.0 | 1779.0 | 15045.0 | 6156.0 | 4323.0 |

| | OWNS.OF DW. | PA&D | SERVICES | HOUSEHOLDS | EXPORTS | INV./DISC. | TOTAL SALES |
|---|---|---|---|---|---|---|---|
| AGRICULTURE | 0.0 | 180.0 | 0.0 | 27407.0 | 278.0 | 2101.0 | 68197.0 |
| LS AG PR | 0.0 | 1020.0 | 19.0 | 14119.0 | 7302.0 | -802.0 | 31252.0 |
| SS AG PR | 0.0 | 0.0 | 0.0 | 19268.0 | 0.0 | 2262.0 | 22529.0 |
| FARM INPUTS | 0.0 | 0.0 | 0.0 | 81.0 | 18.0 | 245.0 | 1413.0 |
| TS&C (F&F) | 0.0 | 0.0 | 0.0 | 6648.0 | 0.0 | 24.0 | 9071.0 |
| T-WR (F&F) | 0.0 | 0.0 | 0.0 | 6264.0 | 0.0 | 1798.0 | 10886.0 |
| TS&C (OTH) | 0.0 | 306.0 | 230.0 | 1343.0 | 0.0 | 5752.0 | 11997.0 |
| T-WR (OTH) | 0.0 | 0.0 | 0.0 | 1437.0 | 0.0 | -990.0 | 7913.0 |
| LS CM | 143.0 | 328.0 | 36.0 | 2907.0 | 830.0 | -6147.0 | 8603.0 |
| SS CM | 0.0 | 0.0 | 0.0 | 2859.0 | 0.0 | 351.0 | 5844.0 |
| LS MM | 0.0 | 69.0 | 7.0 | 1395.0 | 242.0 | 582.0 | 3649.0 |
| SS MM | 0.0 | 0.0 | 0.0 | 136.0 | 0.0 | 25.0 | 169.0 |
| M&Q | 0.0 | 0.0 | 0.0 | 86.0 | 86.0 | 8.0 | 1779.0 |
| CONSTRUCTION | 434.0 | 0.0 | 0.0 | 0.0 | 0.0 | 14570.0 | 15045.0 |
| E&G DIST | 0.0 | 21.0 | 24.0 | 341.0 | 0.0 | 4017.0 | 6156.0 |
| B&I | 8.0 | 122.0 | 42.0 | 2149.0 | 0.0 | 218.0 | 4323.0 |
| OWNS.OF DW. | 0.0 | 0.0 | 0.0 | 5297.0 | 0.0 | 537.0 | 5834.0 |
| PA&D | 0.0 | 2561.0 | 52.0 | 11897.0 | 10534.0 | -9329.0 | 18123.0 |
| SERVICES | 0.0 | 3668.0 | 14.0 | 3002.0 | 0.0 | 303.0 | 10541.0 |
| HOUSEHOLDS | 938.0 | 4143.0 | 1581.0 | 0.0 | 16440.0 | 82862.0 | 134012.0 |
| IMPORTS | 0.0 | 167.0 | 17.0 | 15909.0 | 167.0 | 0.0 | 36969.0 |
| TAX-SUBSIDY | 0.0 | 0.0 | 0.0 | 3.0 | 0.0 | 0.0 | 3745.0 |
| SELF-EMP.&S. | 4311.0 | 5538.0 | 8519.0 | 11464.0 | 0.0 | 0.0 | 93570.0 |
| TOTAL PURCHA | 5834.0 | 18123.0 | 10541.0 | 134012.0 | 35897.0 | 98387.0 | |

Appendix Table 3 --Direct Input Coefficients Matrix, 1976

| | AGRICULTURE | LS AG PR | SS AG PR | FARM INPUTS | TS&C (F&F) | T-WR (F&F) | TS&C (OTH) | T-WR (OTH) |
|---|---|---|---|---|---|---|---|---|
| AGRICULTURE | 0.24747423 | 0.26718290 | 0.52514537 | 0.00000000 | 0.05412855 | 0.00000000 | 0.00033342 | 0.00000000 |
| LS AG PR | 0.00000000 | 0.20497888 | 0.12113276 | 0.00000000 | 0.00000000 | 0.00045931 | 0.00000000 | 0.00000000 |
| SS AG PR | 0.00000000 | 0.00121592 | 0.03932709 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 |
| FARM INPUTS | 0.01567518 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 |
| TS&C (F&F) | 0.00000000 | 0.02038270 | 0.05251010 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.05092885 |
| T-WR (F&F) | 0.00000000 | 0.05596442 | 0.03999290 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 |
| TS&C (OTH) | 0.03438568 | 0.00153590 | 0.00448311 | 0.14578910 | 0.00000000 | 0.00000000 | 0.00441777 | 0.00000000 |
| T-WR (OTH) | 0.08204173 | 0.00659158 | 0.00421679 | 0.06015570 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 |
| LS CM | 0.00922328 | 0.01996672 | 0.00399485 | 0.03680113 | 0.03825378 | 0.00000000 | 0.17620407 | 0.00063187 |
| SS CM | 0.00000000 | 0.00000000 | 0.00155355 | 0.02547771 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 |
| LS MM | 0.00000000 | 0.00742352 | 0.00000000 | 0.07218684 | 0.00187410 | 0.00000000 | 0.00850213 | 0.00000000 |
| SS MM | 0.00000000 | 0.00000000 | 0.00026632 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 |
| M&Q | 0.00146634 | 0.00025598 | 0.00000000 | 0.04600142 | 0.00022048 | 0.00000000 | 0.00616821 | 0.00000000 |
| CONSTRUCTION | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00088193 | 0.00000000 | 0.00041677 | 0.00000000 |
| E&G DIST | 0.00528460 | 0.01212722 | 0.01154068 | 0.10615711 | 0.00066145 | 0.00238839 | 0.00033342 | 0.00252749 |
| B&I | 0.00353339 | 0.01859081 | 0.00745706 | 0.01698514 | 0.00154338 | 0.02370017 | 0.00033342 | 0.01162644 |
| OWNS.OF DW. | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 |
| PA&D | 0.00777160 | 0.00140791 | 0.00017755 | 0.00212314 | 0.00000000 | 0.00000000 | 0.08593815 | 0.00657146 |
| SERVICES | 0.00195023 | 0.01158326 | 0.00026632 | 0.02406228 | 0.00000000 | 0.00000000 | 0.12894890 | 0.02198913 |
| HOUSEHOLDS | 0.16490461 | 0.07340330 | 0.05406365 | 0.07572541 | 0.17925256 | 0.08928900 | 0.09477369 | 0.08593454 |

| | LS CM | SS CM | LS MM | SS MM | M&Q | CONSTRUCTION | E&G DIST | B&I |
|---|---|---|---|---|---|---|---|---|
| AGRICULTURE | 0.00278972 | 0.01967830 | 0.00109619 | 0.00578035 | 0.00000000 | 0.03555999 | 0.00000000 | 0.00000000 |
| LS AG PR | 0.04103220 | 0.01214921 | 0.00465881 | 0.00000000 | 0.00000000 | 0.00086407 | 0.00000000 | 0.00000000 |
| SS AG PR | 0.00000000 | 0.00821355 | 0.00000000 | 0.15606936 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 |
| FARM INPUTS | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 |
| TS&C (F&F) | 0.00929908 | 0.00924025 | 0.01151000 | 0.00578035 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 |
| T-WR (F&F) | 0.01557596 | 0.00581793 | 0.00164429 | 0.00578035 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 |
| TS&C (OTH) | 0.06334999 | 0.06365503 | 0.07810359 | 0.05780347 | 0.02304666 | 0.00000000 | 0.03004710 | 0.04048115 |
| T-WR (OTH) | 0.08380797 | 0.03165640 | 0.00849548 | 0.01734104 | 0.07757167 | 0.00000000 | 0.06610362 | 0.00000000 |
| LS CM | 0.19004998 | 0.24401095 | 0.11510003 | 0.19653179 | 0.04440697 | 0.15998671 | 0.05505928 | 0.07032154 |
| SS CM | 0.00000000 | 0.21307901 | 0.00000000 | 0.04624277 | 0.00000000 | 0.08707212 | 0.00000000 | 0.00000000 |
| LS MM | 0.01731954 | 0.00000000 | 0.13455741 | 0.00000000 | 0.00000000 | 0.01621801 | 0.00016242 | 0.00393245 |
| SS MM | 0.00000000 | 0.00000000 | 0.00000000 | 0.01156069 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 |
| M&Q | 0.01778449 | 0.02635181 | 0.00191833 | 0.00000000 | 0.00000000 | 0.05390495 | 0.03654377 | 0.00000000 |
| CONSTRUCTION | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00647698 |
| E&G DIST | 0.05009880 | 0.00205339 | 0.00685119 | 0.00000000 | 0.00000000 | 0.00000000 | 0.01234357 | 0.03238492 |
| B&I | 0.01685459 | 0.00342231 | 0.02192381 | 0.02312139 | 0.00955593 | 0.00159521 | 0.00259867 | 0.02220680 |
| OWNS.OF DW. | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 |
| PA&D | 0.00174358 | 0.00154004 | 0.00109619 | 0.00000000 | 0.06745363 | 0.02765038 | 0.00454767 | 0.03516077 |
| SERVICES | 0.01976055 | 0.00239562 | 0.01671691 | 0.00578035 | 0.07195053 | 0.04619475 | 0.00698392 | 0.04325700 |
| HOUSEHOLDS | 0.10891549 | 0.13329911 | 0.13126884 | 0.11560694 | 0.35469365 | 0.27178465 | 0.21341562 | 0.12005552 |

| | OWNS.OF DW. | PA&D | SERVICES | HOUSEHOLDS |
|---|---|---|---|---|
| AGRICULTURE | 0.00000000 | 0.00993213 | 0.00000000 | 0.20451154 |
| LS AG PR | 0.00000000 | 0.05628207 | 0.00180249 | 0.10535624 |
| SS AG PR | 0.00000000 | 0.00000000 | 0.00000000 | 0.14377817 |
| FARM INPUTS | 0.00000000 | 0.00000000 | 0.00000000 | 0.00060442 |
| TS&C (F&F) | 0.00000000 | 0.00000000 | 0.00000000 | 0.04960750 |
| T-WR (F&F) | 0.00000000 | 0.00000000 | 0.00000000 | 0.04674208 |
| TS&C (OTH) | 0.00000000 | 0.01688462 | 0.02181956 | 0.01002149 |
| T-WR (OTH) | 0.00000000 | 0.00000000 | 0.00000000 | 0.01072292 |
| LS CM | 0.02451148 | 0.01809855 | 0.00341524 | 0.02169209 |
| SS CM | 0.00000000 | 0.00000000 | 0.00000000 | 0.02133391 |
| LS MM | 0.00000000 | 0.00380732 | 0.00066407 | 0.01040952 |
| SS MM | 0.00000000 | 0.00000000 | 0.00000000 | 0.00101483 |
| M&Q | 0.00000000 | 0.00000000 | 0.00000000 | 0.00064173 |
| CONSTRUCTION | 0.07439150 | 0.00000000 | 0.00000000 | 0.00000000 |
| E&G DIST | 0.00000000 | 0.00115875 | 0.00227682 | 0.00254455 |
| B&I | 0.00137121 | 0.00673178 | 0.00398444 | 0.01603588 |
| OWNS.OF DW. | 0.00000000 | 0.00000000 | 0.00000000 | 0.03952631 |
| PA&D | 0.00000000 | 0.14131214 | 0.00493312 | 0.08877563 |
| SERVICES | 0.00000000 | 0.20239475 | 0.00132815 | 0.02240098 |
| HOUSEHOLDS | 0.16078162 | 0.22860454 | 0.14998577 | 0.00000000 |

Appendix Table 4 --Total Requirements or Leontief Inverse Matrix, 1976

| | AGRICULTURE | LS AG PR | SS AG PR | FARM INPUTS | TS&C (F&F) | T-WR (F&F) | TS&C (OTH) | T-WR (OTH) |
|---|---|---|---|---|---|---|---|---|
| AGRICULTURE | 1.46790572 | 0.56508941 | 0.92080570 | 0.11114583 | 0.18322422 | 0.05151090 | 0.11165177 | 0.06106420 |
| LS AG PR | 0.05485259 | 1.30455771 | 0.21142428 | 0.04908660 | 0.04437332 | 0.02016514 | 0.05830761 | 0.02246471 |
| SS AG PR | 0.04646686 | 0.04008011 | 1.08592582 | 0.03596493 | 0.03725832 | 0.01734282 | 0.03442524 | 0.01928553 |
| FARM INPUTS | 0.02319652 | 0.00901264 | 0.01461364 | 1.00188571 | 0.00302190 | 0.00087719 | 0.00188851 | 0.00103475 |
| TS&C (F&F) | 0.02626408 | 0.04567871 | 0.08152951 | 0.02233466 | 1.01721653 | 0.00756272 | 0.01873886 | 0.05938687 |
| T-WR (F&F) | 0.02025234 | 0.08770464 | 0.07011031 | 0.01777293 | 0.01667333 | 1.00740445 | 0.01926387 | 0.00827164 |
| TS&C (OTH) | 0.06493960 | 0.03566605 | 0.05050764 | 0.18025592 | 0.01646926 | 0.00595071 | 1.03618994 | 0.00692678 |
| T-WR (OTH) | 0.13170596 | 0.06647540 | 0.09267290 | 0.09796240 | 0.02499629 | 0.00712186 | 0.03539628 | 1.00840298 |
| LS CM | 0.05171590 | 0.06751368 | 0.05521761 | 0.13559046 | 0.06794609 | 0.01063757 | 0.24744823 | 0.01409356 |
| SS CM | 0.00935967 | 0.00744386 | 0.01084349 | 0.03906672 | 0.00709451 | 0.00325624 | 0.00648209 | 0.00361731 |
| LS MM | 0.00821542 | 0.01722082 | 0.00876444 | 0.09185414 | 0.00756303 | 0.00212736 | 0.01938334 | 0.00251107 |
| SS MM | 0.00032989 | 0.00027368 | 0.00059807 | 0.00025341 | 0.00026454 | 0.00012314 | 0.00024427 | 0.00013694 |
| M&Q | 0.00555958 | 0.00438309 | 0.00485681 | 0.05554859 | 0.00267059 | 0.00072272 | 0.01208391 | 0.00084887 |
| CONSTRUCTION | 0.00106305 | 0.00104546 | 0.00113303 | 0.00099166 | 0.00169718 | 0.00052676 | 0.00120791 | 0.00053516 |
| E&G DIST | 0.01318536 | 0.02532066 | 0.02501431 | 0.11890439 | 0.00725943 | 0.00497458 | 0.01647582 | 0.00514961 |
| B&I | 0.01603975 | 0.03665690 | 0.02550192 | 0.03069831 | 0.00993332 | 0.02753197 | 0.01335515 | 0.01584077 |
| OWNS.OF DW. | 0.01221829 | 0.01012054 | 0.01176073 | 0.00938285 | 0.00979773 | 0.00456087 | 0.00904711 | 0.00507176 |
| PA&D | 0.05444284 | 0.04024992 | 0.04739186 | 0.05409102 | 0.03018355 | 0.01439005 | 0.13191726 | 0.02325556 |
| SERVICES | 0.03574826 | 0.04020447 | 0.03268351 | 0.07717914 | 0.01755086 | 0.00834838 | 0.17424844 | 0.03223733 |
| HOUSEHOLDS | 0.30911783 | 0.25604571 | 0.29754193 | 0.23738249 | 0.24787868 | 0.11538811 | 0.22888826 | 0.12831357 |
| BUS. MULT. | 2.35257951 | 2.66074346 | 3.04889753 | 2.36735217 | 1.75307267 | 1.31052353 | 2.17664386 | 1.41844898 |

| | LS CM | SS CM | LS MM | SS MM | M&Q | CONSTRUCTION | E&G DIST | B&I |
|---|---|---|---|---|---|---|---|---|
| AGRICULTURE | 0.14621297 | 0.21562937 | 0.12615246 | 0.26853342 | 0.22904807 | 0.26738517 | 0.14347067 | 0.10088778 |
| LS AG PR | 0.11085374 | 0.10310190 | 0.06182742 | 0.09005771 | 0.09426921 | 0.09769902 | 0.05843615 | 0.04555846 |
| SS AG PR | 0.03937427 | 0.06364919 | 0.03927246 | 0.20767640 | 0.07586863 | 0.07138070 | 0.04770243 | 0.03255909 |
| FARM INPUTS | 0.00245003 | 0.00359208 | 0.00213531 | 0.00438122 | 0.00389544 | 0.00447448 | 0.00244075 | 0.00171230 |
| TS&C (F&F) | 0.03637555 | 0.04436972 | 0.03397372 | 0.04021770 | 0.03789641 | 0.03628760 | 0.02543404 | 0.01598683 |
| T-WR (F&F) | 0.04015098 | 0.03908082 | 0.02250700 | 0.03779096 | 0.03357819 | 0.03537622 | 0.02168071 | 0.01594310 |
| TS&C (OTH) | 0.09958011 | 0.12849942 | 0.11746064 | 0.10233956 | 0.05212245 | 0.05025689 | 0.05062028 | 0.06158994 |
| T-WR (OTH) | 0.13102245 | 0.10582591 | 0.04396165 | 0.07522555 | 0.11302565 | 0.06229642 | 0.09553889 | 0.02494689 |
| LS CM | 1.28766062 | 0.44215747 | 0.21242479 | 0.31368150 | 0.10097122 | 0.28111878 | 0.10286165 | 0.12267545 |
| SS CM | 0.00737787 | 1.28062849 | 0.00736372 | 0.06786198 | 0.01418029 | 0.12383345 | 0.00891496 | 0.00681739 |
| LS MM | 0.03156524 | 0.01606403 | 1.16524624 | 0.01238507 | 0.01069720 | 0.03241722 | 0.00766004 | 0.01145047 |
| SS MM | 0.00027901 | 0.00037736 | 0.00027871 | 1.01204387 | 0.00053865 | 0.00050024 | 0.00033868 | 0.00023108 |
| M&Q | 0.02693790 | 0.04436714 | 0.00830799 | 0.00975925 | 1.00389608 | 0.06431308 | 0.04032814 | 0.00509642 |
| CONSTRUCTION | 0.00106163 | 0.00128636 | 0.00109257 | 0.00118296 | 0.00171536 | 1.00157448 | 0.00107111 | 0.00736009 |
| E&G DIST | 0.07059492 | 0.03068102 | 0.02307416 | 0.02363673 | 0.01151344 | 0.02070714 | 1.02157827 | 0.04256814 |
| B&I | 0.03386697 | 0.02501951 | 0.03793986 | 0.04145952 | 0.02718579 | 0.02222595 | 0.01457604 | 1.03190975 |
| OWNS.OF DW. | 0.01033307 | 0.01386745 | 0.01032262 | 0.01124201 | 0.01995029 | 0.01851793 | 0.01254403 | 0.00855833 |
| PA&D | 0.04645422 | 0.06034304 | 0.04497903 | 0.04652964 | 0.14157852 | 0.09626942 | 0.04969047 | 0.07357585 |
| SERVICES | 0.06263897 | 0.05738766 | 0.05831504 | 0.04756351 | 0.12676634 | 0.09813718 | 0.03977565 | 0.07738383 |
| HOUSEHOLDS | 0.26142262 | 0.35084107 | 0.26115808 | 0.28441844 | 0.50473435 | 0.46849622 | 0.31735900 | 0.21652234 |
| BUS. MULT. | 2.44622016 | 3.02676902 | 2.27779345 | 2.69798701 | 2.60343159 | 2.85326759 | 2.06202195 | 1.90333352 |

| | OWNS.OF DW. | PA&D | SERVICES | HOUSEHOLDS |
|---|---|---|---|---|
| AGRICULTURE | 0.11097869 | 0.22612245 | 0.08749712 | 0.54337740 |
| LS AG PR | 0.04308420 | 0.15351735 | 0.03598131 | 0.20547471 |
| SS AG PR | 0.03592107 | 0.06105608 | 0.02917581 | 0.18410801 |
| FARM INPUTS | 0.00188378 | 0.00378962 | 0.00148885 | 0.00925797 |
| TS&C (F&F) | 0.01640171 | 0.02894760 | 0.01284944 | 0.07954065 |
| T-WR (F&F) | 0.01612463 | 0.03112247 | 0.01266219 | 0.07766382 |
| TS&C (OTH) | 0.01410372 | 0.04693151 | 0.03103830 | 0.04876007 |
| T-WR (OTH) | 0.01917382 | 0.03147089 | 0.01239290 | 0.07024269 |
| LS CM | 0.06606489 | 0.06687239 | 0.02366411 | 0.08347566 |
| SS CM | 0.01493037 | 0.01141591 | 0.00545280 | 0.03438221 |
| LS MM | 0.00649584 | 0.01406445 | 0.00454769 | 0.02049275 |
| SS MM | 0.00025456 | 0.00043281 | 0.00020714 | 0.00130733 |
| M&Q | 0.00635846 | 0.00310659 | 0.00134427 | 0.00564018 |
| CONSTRUCTION | 0.07517370 | 0.00138767 | 0.00065881 | 0.00391190 |
| E&G DIST | 0.00605570 | 0.01131182 | 0.00576401 | 0.01695784 |
| B&I | 0.00934364 | 0.02317997 | 0.00984999 | 0.03386621 |
| OWNS.OF DW. | 1.00942773 | 0.01602927 | 0.00767211 | 0.04842057 |
| PA&D | 0.03092621 | 1.21676194 | 0.03060138 | 0.14009703 |
| SERVICES | 0.02046808 | 0.26773253 | 1.01795088 | 0.07168743 |
| HOUSEHOLDS | 0.23851779 | 0.40553407 | 0.19410139 | 1.22502119 |
| BUS. MULT. | 1.74168859 | 2.62079537 | 1.52490051 | 2.90368562 |

Appendix Table 5 --Under or Overestimation Index

| | Final Demand Method | Transactions Proportional to Value Added Method | RAS Method |
|---|---|---|---|
| AGRICULTURE | 1.15285433 | 1.04567805 | 1.01287927 |
| LS AG PR | 1.37650189 | 1.30179479 | 1.01214393 |
| SS AG PR | 2.18221365 | 2.32289941 | 1.01355739 |
| FARM INPUTS | 0.10903888 | 0.10194807 | 1.01325271 |
| TS&C (F&F) | 0.62534615 | 0.63392469 | 1.01234141 |
| T-WR (F&F) | 0.74183039 | 0.71490191 | 1.01396828 |
| TS&C (OTH) | 0.67158281 | 0.96777289 | 1.01234145 |
| T-WR (OTH) | 0.76113687 | 0.85143954 | 1.01396819 |
| LS CM | 0.61268020 | 1.03123268 | 1.01248686 |
| SS CM | 0.25524677 | 0.44812601 | 1.01380747 |
| LS MM | 0.12582160 | 0.25528418 | 1.01371206 |
| SS MM | 0.01498631 | 0.01972693 | 1.01389115 |
| M&Q | 0.34309854 | 0.82335861 | 1.01267788 |
| CONSTRUCTION | 0.07651646 | 0.06642127 | 0.78763978 |
| E&G DIST | 1.42134211 | 1.85555031 | 1.01631379 |
| B&I | 0.75217908 | 0.88191725 | 1.01347929 |
| OWNS.OF DW. | 1.63777936 | 1.67665078 | 1.00724020 |
| PA&D | 1.29168480 | 6.18067838 | 1.00686518 |
| SERVICES | 1.06165384 | 1.20446108 | 1.01258277 |
| HOUSEHOLDS | 0.96704151 | 0.86901509 | 1.00403262 |
| Average Percentage Error | -19.1% | 16.3% | 0.097% |

Appendix Table 6 --Average Percentage of Error

| | Final Demand Method | Transactions Proportional to Value Added Method | RAS Method |
|---|---|---|---|
| AGRICULTURE | 15.28 | 4.57 | 1.28 |
| LS AG PR | 37.65 | 30.18 | 1.21 |
| SS AG PR | 118.22 | 132.23 | 1.36 |
| FARM INPUTS | -89.09 | -89.81 | 1.33 |
| TS&C (F&F) | -37.46 | -36.61 | 1.23 |
| T-WR (F&F) | -25.81 | -28.51 | 1.40 |
| TS&C (OTH) | -32.84 | -3.22 | 1.23 |
| T-WR (OTH) | -23.88 | -14.86 | 1.40 |
| LS CM | -38.73 | 3.12 | 1.25 |
| SS CM | -74.48 | -55.19 | 1.38 |
| LS MM | -87.42 | -74.47 | 1.37 |
| SS MM | -98.50 | -98.03 | 1.39 |
| M&Q | -65.69 | -17.66 | 1.27 |
| CONSTRUCTION | -92.34 | -93.36 | -21.24 |
| E&G DIST | 42.13 | 85.55 | 1.63 |
| B&I | -24.78 | -11.81 | 1.35 |
| OWNS.OF DW. | 63.78 | 67.67 | 0.72 |
| PA&D | 29.17 | 518.01 | 0.68 |
| SERVICES | 6.17 | 20.44 | 1.26 |
| HOUSEHOLDS | -3.30 | -13.10 | 0.40 |

Appendix Table 7 --Transactions-Among-Sectors Table, 1984/85 (Million Rupees)

| | AGRICULTURE | LS AG PR | SS AG PR | FARM INPUTS | TS&C (F&F) | T-WR (F&F) | TS&C (OTH) | T-WR (OTH) |
|---|---|---|---|---|---|---|---|---|
| AGRICULTURE | 26119.81 | 24842.62 | 16036.53 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| LS AG PR | 0.00 | 11122.80 | 2158.78 | 0.00 | 0.00 | 13.36 | 0.00 | 0.00 |
| SS AG PR | 0.00 | 38.55 | 409.55 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| FARM INPUTS | 51441.10 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| TS&C (F&F) | 0.00 | 2804.06 | 2372.53 | 0.00 | 0.00 | 0.00 | 0.00 | 2149.10 |
| T-WR (F&F) | 0.00 | 6232.71 | 1462.82 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| TS&C (OTH) | 2777.99 | 109.31 | 104.79 | 9882.48 | 0.00 | 0.00 | 0.00 | 0.00 |
| T-WR (OTH) | 10177.05 | 720.32 | 151.34 | 6261.11 | 0.00 | 0.00 | 0.00 | 0.00 |
| LS CM | 792.87 | 1512.07 | 99.36 | 2654.40 | 0.00 | 0.00 | 0.00 | 14.68 |
| SS CM | 0.00 | 0.00 | 70.74 | 3364.14 | 0.00 | 0.00 | 0.00 | 0.00 |
| LS MM | 0.00 | 1895.97 | 0.00 | 17559.72 | 0.00 | 0.00 | 0.00 | 0.00 |
| SS MM | 0.00 | 0.00 | 372.24 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| M&Q | 149.14 | 22.94 | 0.00 | 3925.74 | 0.00 | 0.00 | 0.00 | 0.00 |
| CONSTRUCTION | 0.00 | 0.00 | 0.00 | 0.00 | 20600.14 | 0.00 | 14314.51 | 0.00 |
| E&G DIST | 60.90 | 198.08 | 61.91 | 1651.50 | 0.00 | 20.91 | 0.00 | 12.66 |
| B&I | 347.08 | 1608.53 | 211.90 | 1399.71 | 0.00 | 1099.21 | 0.00 | 308.56 |
| OWNS.OF DW. | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| PA&D | 456.74 | 72.89 | 3.02 | 104.69 | 0.00 | 0.00 | 0.00 | 104.36 |
| SERVICES | 170.94 | 894.39 | 6.75 | 1769.59 | 0.00 | 0.00 | 0.00 | 520.80 |
| HOUSEHOLDS | 17207.27 | 6747.51 | 1632.21 | 6629.92 | 0.00 | 4399.74 | 0.00 | 2423.05 |
| IMPORTS | 2113.00 | 9472.00 | 0.00 | 1743.00 | 20550.00 | 0.00 | 14280.00 | 0.00 |
| TAX-SUBSIDY | 0.00 | 4180.00 | 242.00 | 21.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| SELF-EMP.&S. | 77780.11 | 9290.23 | 3203.53 | 6587.98 | 13826.86 | 33186.78 | 9609.49 | 33186.78 |
| TOTAL PURCHA | 189594.00 | 81765.00 | 28600.00 | 63555.00 | 54977.00 | 38720.00 | 38204.00 | 38720.00 |

| | LS CM | SS CM | LS MM | SS MM | M&Q | CONSTRUCTION | E&G DIST | B&I |
|---|---|---|---|---|---|---|---|---|
| AGRICULTURE | 267.40 | 1162.68 | 107.30 | 246.02 | 0.00 | 1794.48 | 0.00 | 0.00 |
| LS AG PR | 2295.31 | 418.93 | 266.13 | 0.00 | 0.00 | 25.45 | 0.00 | 0.00 |
| SS AG PR | 0.00 | 165.50 | 0.00 | 2265.26 | 0.00 | 0.00 | 0.00 | 0.00 |
| FARM INPUTS | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| TS&C (F&F) | 1318.80 | 807.78 | 1666.94 | 364.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| T-WR (F&F) | 1788.27 | 411.73 | 192.78 | 294.68 | 0.00 | 0.00 | 0.00 | 0.00 |
| TS&C (OTH) | 4647.94 | 2878.85 | 5851.84 | 1883.14 | 257.47 | 0.00 | 179.91 | 0.00 |
| T-WR (OTH) | 9441.34 | 2198.27 | 977.33 | 867.44 | 1330.62 | 0.00 | 607.72 | 0.00 |
| LS CM | 14837.00 | 11742.46 | 9176.16 | 6812.79 | 527.88 | 6575.65 | 350.79 | 0.00 |
| SS CM | 0.00 | 18768.01 | 0.00 | 2934.58 | 0.00 | 6551.53 | 0.00 | 0.00 |
| LS MM | 4560.05 | 0.00 | 36178.27 | 0.00 | 0.00 | 2248.05 | 3.49 | 0.00 |
| SS MM | 0.00 | 0.00 | 0.00 | 22520.78 | 0.00 | 0.00 | 0.00 | 0.00 |
| M&Q | 1642.72 | 1500.39 | 180.95 | 0.00 | 0.00 | 2621.37 | 275.47 | 0.00 |
| CONSTRUCTION | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 7257.53 |
| E&G DIST | 843.59 | 21.31 | 117.81 | 0.00 | 0.00 | 0.00 | 16.96 | 0.00 |
| B&I | 1503.35 | 188.16 | 1996.94 | 915.73 | 129.78 | 74.91 | 18.92 | 0.00 |
| OWNS.OF DW. | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| PA&D | 93.06 | 50.67 | 59.75 | 0.00 | 548.18 | 776.95 | 19.81 | 0.00 |
| SERVICES | 1572.93 | 117.54 | 1358.85 | 204.30 | 872.06 | 1935.88 | 45.37 | 0.00 |
| HOUSEHOLDS | 10321.19 | 7786.44 | 12703.08 | 4864.50 | 5117.97 | 13559.42 | 1650.44 | 0.00 |
| IMPORTS | 5263.00 | 0.00 | 3728.00 | 0.00 | 715.00 | 5352.00 | 871.00 | 0.00 |
| TAX-SUBSIDY | 8113.00 | 0.00 | 216.00 | 0.00 | 0.00 | 0.00 | 779.00 | 10.00 |
| SELF-EMP.&S. | 5824.05 | 1635.29 | 4384.85 | 2275.79 | 2868.03 | 6623.31 | 6494.13 | 11319.47 |
| TOTAL PURCHA | 74333.00 | 49854.00 | 79163.00 | 46449.00 | 12367.00 | 48139.00 | 11313.00 | 18587.00 |

| | OWNS.OF DW. | PA&D | SERVICES | HOUSEHOLDS | EXPORTS | INV./DISC. | TOTAL SALES |
|---|---|---|---|---|---|---|---|
| AGRICULTURE | 0.00 | 831.80 | 0.00 | 104401.96 | 5406.00 | 8377.40 | 189594.00 |
| LS AG PR | 0.00 | 2750.83 | 40.48 | 31388.27 | 25535.00 | 5749.66 | 81765.00 |
| SS AG PR | 0.00 | 0.00 | 0.00 | 25030.45 | 0.00 | 690.69 | 28600.00 |
| FARM INPUTS | 0.00 | 0.00 | 0.00 | 9593.79 | 1426.00 | 1094.12 | 63555.00 |
| TS&C (F&F) | 0.00 | 0.00 | 0.00 | 37469.28 | 0.00 | 6024.50 | 54977.00 |
| T-WR (F&F) | 0.00 | 0.00 | 0.00 | 28580.86 | 0.00 | -243.85 | 38720.00 |
| TS&C (OTH) | 0.00 | 1082.38 | 642.67 | 3915.94 | 0.00 | 3989.27 | 38204.00 |
| T-WR (OTH) | 0.00 | 0.00 | 0.00 | 6433.55 | 0.00 | -446.10 | 38720.00 |
| LS CM | 0.00 | 1234.52 | 107.04 | 9019.23 | 5025.00 | 3851.11 | 74333.00 |
| SS CM | 0.00 | 0.00 | 0.00 | 16238.57 | 0.00 | 1926.43 | 49854.00 |
| LS MM | 0.00 | 875.85 | 70.19 | 14596.65 | 491.00 | 683.76 | 79163.00 |
| SS MM | 0.00 | 0.00 | 0.00 | 23712.14 | 0.00 | -156.16 | 46449.00 |
| M&Q | 0.00 | 0.00 | 0.00 | 315.69 | 96.00 | 1636.59 | 12367.00 |
| CONSTRUCTION | 3671.39 | 0.00 | 0.00 | 0.00 | 0.00 | 2295.44 | 48139.00 |
| E&G DIST | 0.00 | 17.05 | 15.39 | 228.19 | 0.00 | 8046.73 | 11313.00 |
| B&I | 0.00 | 524.62 | 142.67 | 7617.71 | 0.00 | 499.21 | 18587.00 |
| OWNS.OF DW. | 0.00 | 0.00 | 0.00 | 7155.92 | 0.00 | 6920.08 | 14076.00 |
| PA&D | 0.00 | 6589.80 | 105.70 | 25234.85 | 19045.00 | 15959.53 | 69225.00 |
| SERVICES | 0.00 | 14076.18 | 42.44 | 9496.57 | 0.00 | 3914.40 | 36999.00 |
| HOUSEHOLDS | 0.00 | 18927.82 | 5705.82 | 0.00 | 38311.00 | 260687.63 | 418675.00 |
| IMPORTS | 0.00 | 1165.00 | 96.00 | 24431.00 | | | 89779.00 |
| TAX-SUBSIDY | 0.00 | 0.00 | 133.00 | 7001.00 | | | 20695.00 |
| SELF-EMP.&S. | 10404.61 | 21149.14 | 29897.60 | 26813.36 | | | 316361.42 |
| TOTAL PURCHA | 14076.00 | 69225.00 | 36999.00 | 418675.00 | 95335.00 | 331500.42 | 1840150.42 |

Appendix Table 8 --Sales Coefficients Matrix, 1975/76

| | AGRICULTURE | LS AG PR | SS AG PR | FARM INPUTS | TS&C (F&F) | T-WR (F&F) | TS&C (OTH) | T-WR (OTH) |
|---|---|---|---|---|---|---|---|---|
| AGRICULTURE | 0.24747423 | 0.12243940 | 0.17348270 | 0.00000000 | 0.00719973 | 0.00000000 | 0.00005865 | 0.00000000 |
| LS AG PR | 0.00000000 | 0.20497888 | 0.08732241 | 0.00000000 | 0.00000000 | 0.00015999 | 0.00000000 | 0.00000000 |
| SS AG PR | 0.00000000 | 0.00168671 | 0.03932709 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 |
| FARM INPUTS | 0.75654636 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 |
| TS&C (F&F) | 0.00000000 | 0.07022379 | 0.13041561 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.04442730 |
| T-WR (F&F) | 0.00000000 | 0.16066507 | 0.08276686 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 |
| TS&C (OTH) | 0.19546553 | 0.00400100 | 0.00841877 | 0.01717096 | 0.00000000 | 0.00000000 | 0.00441777 | 0.00000000 |
| T-WR (OTH) | 0.70706432 | 0.02603311 | 0.01200556 | 0.01074182 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 |
| LS CM | 0.07311403 | 0.07253284 | 0.01046147 | 0.00604440 | 0.04033477 | 0.00000000 | 0.24584447 | 0.00058119 |
| SS CM | 0.00000000 | 0.00000000 | 0.00598905 | 0.00616016 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 |
| LS MM | 0.00000000 | 0.06357906 | 0.00000000 | 0.02795286 | 0.00465881 | 0.00000000 | 0.02795286 | 0.00000000 |
| SS MM | 0.00000000 | 0.00000000 | 0.03550296 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 |
| M&Q | 0.05621135 | 0.00449691 | 0.00000000 | 0.03653738 | 0.00112423 | 0.00000000 | 0.04159640 | 0.00000000 |
| CONSTRUCTION | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00053174 | 0.00000000 | 0.00033234 | 0.00000000 |
| E&G DIST | 0.03638726 | 0.06156595 | 0.04223522 | 0.02436647 | 0.00097466 | 0.00422352 | 0.00064977 | 0.00324886 |
| B&I | 0.05574832 | 0.13439741 | 0.03886190 | 0.00555170 | 0.00323849 | 0.05968078 | 0.00092528 | 0.02128152 |
| OWNS.OF DW. | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 |
| PA&D | 0.02924461 | 0.00242785 | 0.00022071 | 0.00016554 | 0.00000000 | 0.00000000 | 0.05688904 | 0.00286928 |
| SERVICES | 0.01261740 | 0.03434209 | 0.00056921 | 0.00322550 | 0.00000000 | 0.00000000 | 0.14676027 | 0.01650697 |
| HOUSEHOLDS | 0.08391786 | 0.01711787 | 0.00908874 | 0.00079844 | 0.01213324 | 0.00725308 | 0.00848431 | 0.00507417 |

| | LS CM | SS CM | LS MM | SS MM | M&Q | CONSTRUCTION | E&G DIST | B&I |
|---|---|---|---|---|---|---|---|---|
| AGRICULTURE | 0.00035192 | 0.00168629 | 0.00005865 | 0.00001466 | 0.00000000 | 0.00784492 | 0.00000000 | 0.00000000 |
| LS AG PR | 0.01129528 | 0.00227185 | 0.00054397 | 0.00000000 | 0.00000000 | 0.00041597 | 0.00000000 | 0.00000000 |
| SS AG PR | 0.00000000 | 0.00213059 | 0.00000000 | 0.00119846 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 |
| FARM INPUTS | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 |
| TS&C (F&F) | 0.00881931 | 0.00595304 | 0.00463014 | 0.00011024 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 |
| T-WR (F&F) | 0.01230939 | 0.00312328 | 0.00055117 | 0.00009186 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 |
| TS&C (OTH) | 0.04542802 | 0.03100775 | 0.02375594 | 0.00083354 | 0.00341752 | 0.00000000 | 0.01542052 | 0.01458698 |
| T-WR (OTH) | 0.09111589 | 0.02337925 | 0.00391760 | 0.00037912 | 0.01743966 | 0.00000000 | 0.05143435 | 0.00000000 |
| LS CM | 0.19004998 | 0.16575613 | 0.04882018 | 0.00395211 | 0.00918284 | 0.27978612 | 0.03940486 | 0.03533651 |
| SS CM | 0.00000000 | 0.21303901 | 0.00000000 | 0.00136893 | 0.00000000 | 0.22416153 | 0.00000000 | 0.00000000 |
| LS MM | 0.04083310 | 0.00000000 | 0.13455741 | 0.00000000 | 0.00000000 | 0.06686763 | 0.00027405 | 0.00465881 |
| SS MM | 0.00000000 | 0.00000000 | 0.00000000 | 0.01183432 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 |
| M&Q | 0.08600337 | 0.08656549 | 0.00393479 | 0.00000000 | 0.00000000 | 0.45587409 | 0.12647555 | 0.00000000 |
| CONSTRUCTION | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00186108 |
| E&G DIST | 0.07001300 | 0.00194932 | 0.00406108 | 0.00000000 | 0.00000000 | 0.00000000 | 0.01234568 | 0.02274204 |
| B&I | 0.03354152 | 0.00462642 | 0.01850567 | 0.00092528 | 0.00393245 | 0.00555170 | 0.00370113 | 0.02220680 |
| OWNS.OF DW. | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 |
| PA&D | 0.00082768 | 0.00049661 | 0.00022071 | 0.00000000 | 0.00662142 | 0.02295426 | 0.00154500 | 0.00838713 |
| SERVICES | 0.01612750 | 0.00132815 | 0.00578693 | 0.00009487 | 0.01214306 | 0.06593302 | 0.00407931 | 0.01774025 |
| HOUSEHOLDS | 0.00699191 | 0.00581291 | 0.00357431 | 0.00014924 | 0.00470853 | 0.03051219 | 0.00980509 | 0.00387279 |

| | OWNS.OF DW. | PA&D | SERVICES | HOUSEHOLDS | EXPORTS | INV./DISC. |
|---|---|---|---|---|---|---|
| AGRICULTURE | 0.00000000 | 0.00263941 | 0.00000000 | 0.40187985 | 0.00407643 | 0.03080781 |
| LS AG PR | 0.00000000 | 0.03263791 | 0.00060796 | 0.45177909 | 0.23364905 | -0.02566236 |
| SS AG PR | 0.00000000 | 0.00000000 | 0.00000000 | 0.85525323 | 0.00000000 | 0.10040392 |
| FARM INPUTS | 0.00000000 | 0.00000000 | 0.00000000 | 0.05732484 | 0.01273885 | 0.17338995 |
| TS&C (F&F) | 0.00000000 | 0.00000000 | 0.00000000 | 0.73288502 | 0.00000000 | 0.00264579 |
| T-WR (F&F) | 0.00000000 | 0.00000000 | 0.00000000 | 0.57541797 | 0.00000000 | 0.16516627 |
| TS&C (OTH) | 0.00000000 | 0.02550638 | 0.01917146 | 0.11194465 | 0.00000000 | 0.47945320 |
| T-WR (OTH) | 0.00000000 | 0.00000000 | 0.00000000 | 0.18159990 | 0.00000000 | -0.12511058 |
| LS CM | 0.01662211 | 0.03812624 | 0.00418459 | 0.33790538 | 0.09647797 | -0.71451819 |
| SS CM | 0.00000000 | 0.00000000 | 0.00000000 | 0.48921971 | 0.00000000 | 0.06006160 |
| LS MM | 0.00000000 | 0.01890929 | 0.00191833 | 0.38229652 | 0.06631954 | 0.15949575 |
| SS MM | 0.00000000 | 0.00000000 | 0.00000000 | 0.80473373 | 0.00000000 | 0.14792899 |
| M&Q | 0.00000000 | 0.00000000 | 0.00000000 | 0.04834177 | 0.04834177 | 0.00449691 |
| CONSTRUCTION | 0.02884679 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.96842805 |
| E&G DIST | 0.00000000 | 0.00341131 | 0.00389864 | 0.05539311 | 0.00000000 | 0.65253411 |
| B&I | 0.00185057 | 0.02822114 | 0.00971548 | 0.49710849 | 0.00000000 | 0.05042794 |
| OWNS.OF DW. | 0.00000000 | 0.00000000 | 0.00000000 | 0.90795338 | 0.00000000 | 0.09204662 |
| PA&D | 0.00000000 | 0.14131214 | 0.00286928 | 0.65645864 | 0.58125034 | -0.51476025 |
| SERVICES | 0.00000000 | 0.34797458 | 0.00132815 | 0.28479271 | 0.00000000 | 0.02874490 |
| HOUSEHOLDS | 0.00699937 | 0.03091514 | 0.01179745 | 0.00000000 | 0.12267558 | 0.61831776 |

Appendix Table 9 --Sales Coefficients Matrix, 1984/85

| | AGRICULTURE | LS AG PR | SS AG PR | FARM INPUTS | TS&C (F&F) | T-WR (F&F) | TS&C (OTH) | T-WR (OTH) |
|---|---|---|---|---|---|---|---|---|
| AGRICULTURE | 0.13776708 | 0.13103064 | 0.08458352 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 |
| LS AG PR | 0.00000000 | 0.13603378 | 0.02640227 | 0.00000000 | 0.00000000 | 0.00016340 | 0.00000000 | 0.00000000 |
| SS AG PR | 0.00000000 | 0.00134807 | 0.01431995 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 |
| FARM INPUTS | 0.80939495 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 |
| TS&C (F&F) | 0.00000000 | 0.05100428 | 0.04315487 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.03909096 |
| T-WR (F&F) | 0.00000000 | 0.16096887 | 0.03777938 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 |
| TS&C (OTH) | 0.07271470 | 0.00286126 | 0.00274293 | 0.25867671 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 |
| T-WR (OTH) | 0.26283706 | 0.01860330 | 0.00390862 | 0.16170232 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 |
| LS CM | 0.01066648 | 0.02034189 | 0.00133668 | 0.03570957 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00019746 |
| SS CM | 0.00000000 | 0.00000000 | 0.00141887 | 0.06747994 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 |
| LS MM | 0.00000000 | 0.02395017 | 0.00000000 | 0.22181732 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 |
| SS MM | 0.00000000 | 0.00000000 | 0.00801398 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 |
| M&Q | 0.01205953 | 0.00185461 | 0.00000000 | 0.31743642 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 |
| CONSTRUCTION | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.42793027 | 0.00000000 | 0.29735782 | 0.00000000 |
| E&G DIST | 0.00538330 | 0.01750948 | 0.00547249 | 0.14598239 | 0.00000000 | 0.00184850 | 0.00000000 | 0.00111934 |
| B&I | 0.01867336 | 0.08654033 | 0.01140064 | 0.07530579 | 0.00000000 | 0.05913883 | 0.00000000 | 0.01660101 |
| OWNS.OF DW. | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 |
| PA&D | 0.00659786 | 0.00105297 | 0.00004361 | 0.00151238 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00150755 |
| SERVICES | 0.00462001 | 0.02417343 | 0.00018254 | 0.04782812 | 0.00000000 | 0.00000000 | 0.00000000 | 0.01407613 |
| HOUSEHOLDS | 0.04109934 | 0.01611634 | 0.00389851 | 0.01583549 | 0.00000000 | 0.01050872 | 0.00000000 | 0.00578743 |

| | LS CM | SS CM | LS MM | SS MM | M&Q | CONSTRUCTION | E&G DIST | B&I |
|---|---|---|---|---|---|---|---|---|
| AGRICULTURE | 0.00141039 | 0.00613247 | 0.00056594 | 0.00129761 | 0.00000000 | 0.00946486 | 0.00000000 | 0.00000000 |
| LS AG PR | 0.02807208 | 0.00512353 | 0.00325486 | 0.00000000 | 0.00000000 | 0.00031123 | 0.00000000 | 0.00000000 |
| SS AG PR | 0.00000000 | 0.00578658 | 0.00000000 | 0.07920478 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 |
| FARM INPUTS | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 |
| TS&C (F&F) | 0.02398818 | 0.01469306 | 0.03032075 | 0.00662102 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 |
| T-WR (F&F) | 0.04618459 | 0.01063364 | 0.00497883 | 0.00761044 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 |
| TS&C (OTH) | 0.12166121 | 0.07535457 | 0.15317356 | 0.04929164 | 0.00673934 | 0.00000000 | 0.00470914 | 0.00000000 |
| T-WR (OTH) | 0.24383616 | 0.05677350 | 0.02524108 | 0.02240278 | 0.03436528 | 0.00000000 | 0.01569536 | 0.00000000 |
| LS CM | 0.19960184 | 0.15797101 | 0.12344668 | 0.09165229 | 0.00710153 | 0.08846200 | 0.00471911 | 0.00000000 |
| SS CM | 0.00000000 | 0.37645937 | 0.00000000 | 0.05886340 | 0.00000000 | 0.13141437 | 0.00000000 | 0.00000000 |
| LS MM | 0.05760325 | 0.00000000 | 0.45700987 | 0.00000000 | 0.00000000 | 0.02839779 | 0.00004408 | 0.00000000 |
| SS MM | 0.00000000 | 0.00000000 | 0.00000000 | 0.48484964 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 |
| M&Q | 0.13283128 | 0.12132231 | 0.01463152 | 0.00000000 | 0.00000000 | 0.21196475 | 0.02227437 | 0.00000000 |
| CONSTRUCTION | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.15076186 |
| E&G DIST | 0.07456790 | 0.00188395 | 0.01041355 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00149935 | 0.00000000 |
| B&I | 0.08088175 | 0.01012333 | 0.10743751 | 0.04926747 | 0.00698247 | 0.00403021 | 0.00101769 | 0.00000000 |
| OWNS.OF DW. | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 |
| PA&D | 0.00134430 | 0.00073191 | 0.00086308 | 0.00000000 | 0.00791888 | 0.01122359 | 0.00028614 | 0.00000000 |
| SERVICES | 0.04251270 | 0.00317694 | 0.03672680 | 0.00552189 | 0.02356990 | 0.05232251 | 0.00122617 | 0.00000000 |
| HOUSEHOLDS | 0.02465203 | 0.01859780 | 0.03034114 | 0.01161879 | 0.01222420 | 0.03238651 | 0.00394205 | 0.00000000 |

| | OWNS.OF DW. | PA&D | SERVICES | HOUSEHOLDS | EXPORTS | INV./DISC. |
|---|---|---|---|---|---|---|
| AGRICULTURE | 0.00000000 | 0.00438727 | 0.00000000 | 0.55066066 | 0.02851356 | 0.04418600 |
| LS AG PR | 0.00000000 | 0.03364308 | 0.00049505 | 0.38388390 | 0.31229744 | 0.07031939 |
| SS AG PR | 0.00000000 | 0.00000000 | 0.00000000 | 0.87519060 | 0.00000000 | 0.02415002 |
| FARM INPUTS | 0.00000000 | 0.00000000 | 0.00000000 | 0.15095249 | 0.02243726 | 0.01721530 |
| TS&C (F&F) | 0.00000000 | 0.00000000 | 0.00000000 | 0.68154467 | 0.00000000 | 0.10958221 |
| T-WR (F&F) | 0.00000000 | 0.00000000 | 0.00000000 | 0.73814209 | 0.00000000 | -0.00629784 |
| TS&C (OTH) | 0.00000000 | 0.02833170 | 0.01682208 | 0.10250086 | 0.00000000 | 0.10442029 |
| T-WR (OTH) | 0.00000000 | 0.00000000 | 0.00000000 | 0.16615585 | 0.00000000 | -0.01152129 |
| LS CM | 0.00000000 | 0.01660796 | 0.00143994 | 0.12133548 | 0.06760120 | 0.05180888 |
| SS CM | 0.00000000 | 0.00000000 | 0.00000000 | 0.32572259 | 0.00000000 | 0.03864147 |
| LS MM | 0.00000000 | 0.01106383 | 0.00088666 | 0.18438732 | 0.00620239 | 0.00863731 |
| SS MM | 0.00000000 | 0.00000000 | 0.00000000 | 0.51049842 | 0.00000000 | -0.00336204 |
| M&Q | 0.00000000 | 0.00000000 | 0.00000000 | 0.02552706 | 0.00776259 | 0.13233558 |
| CONSTRUCTION | 0.07626645 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.04768360 |
| E&G DIST | 0.00000000 | 0.00150694 | 0.00136045 | 0.02017099 | 0.00000000 | 0.71128137 |
| B&I | 0.00000000 | 0.02822527 | 0.00767588 | 0.40984067 | 0.00000000 | 0.02685777 |
| OWNS.OF DW. | 0.00000000 | 0.00000000 | 0.00000000 | 0.50837760 | 0.00000000 | 0.49162240 |
| PA&D | 0.00000000 | 0.09519399 | 0.00152688 | 0.36453380 | 0.27511737 | 0.23054569 |
| SERVICES | 0.00000000 | 0.38044756 | 0.00114708 | 0.25667086 | 0.00000000 | 0.10579735 |
| HOUSEHOLDS | 0.00000000 | 0.04520887 | 0.01362829 | 0.00000000 | 0.09150534 | 0.62264914 |

Appendix Table 10 --Direct Input Coefficients Matrix, 1984/85

| | AGRICULTURE | LS AG PR | SS AG PR | FARM INPUTS | TS&C (F&F) | T-WR (F&F) | TS&C (OTH) | T-WR (OTH) |
|---|---|---|---|---|---|---|---|---|
| AGRICULTURE | 0.13776724 | 0.30382943 | 0.56072661 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 |
| LS AG PR | 0.00000000 | 0.13603372 | 0.07548306 | 0.00000000 | 0.00000000 | 0.00034504 | 0.00000000 | 0.00000000 |
| SS AG PR | 0.00000000 | 0.00047153 | 0.01432018 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 |
| FARM INPUTS | 0.27132270 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 |
| TS&C (F&F) | 0.00000000 | 0.03429415 | 0.08295674 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.05550314 |
| T-WR (F&F) | 0.00000000 | 0.07622714 | 0.05114827 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 |
| TS&C (OTH) | 0.01465234 | 0.00133690 | 0.00366408 | 0.15549436 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 |
| T-WR (OTH) | 0.05367819 | 0.00880963 | 0.00529176 | 0.09851448 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 |
| LS CM | 0.00418195 | 0.01849291 | 0.00347416 | 0.04176522 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00037907 |
| SS CM | 0.00000000 | 0.00000000 | 0.00247334 | 0.05293259 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 |
| LS MM | 0.00000000 | 0.02318800 | 0.00000000 | 0.27629064 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 |
| SS MM | 0.00000000 | 0.00000000 | 0.01301564 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 |
| M&Q | 0.00078663 | 0.00028051 | 0.00000000 | 0.06176886 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 |
| CONSTRUCTION | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.37470308 | 0.00000000 | 0.37468864 | 0.00000000 |
| E&G DIST | 0.00032122 | 0.00242261 | 0.00216473 | 0.02598524 | 0.00000000 | 0.00054008 | 0.00000000 | 0.00032704 |
| B&I | 0.00183066 | 0.01967253 | 0.00740934 | 0.02202349 | 0.00000000 | 0.02838848 | 0.00000000 | 0.00796900 |
| OWNS.OF DW. | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 |
| PA&D | 0.00240903 | 0.00089148 | 0.00010556 | 0.00164730 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00269522 |
| SERVICES | 0.00090159 | 0.01093857 | 0.00023615 | 0.02784337 | 0.00000000 | 0.00000000 | 0.00000000 | 0.01345034 |
| HOUSEHOLDS | 0.09075861 | 0.08252315 | 0.05707107 | 0.10431744 | 0.00000000 | 0.11362843 | 0.00000000 | 0.06257822 |

| | LS CM | SS CM | LS MM | SS MM | M&Q | CONSTRUCTION | E&G DIST | B&I |
|---|---|---|---|---|---|---|---|---|
| AGRICULTURE | 0.00359735 | 0.02332170 | 0.00135542 | 0.00529650 | 0.00000000 | 0.03727709 | 0.00000000 | 0.00000000 |
| LS AG PR | 0.03097891 | 0.00840305 | 0.00336185 | 0.00000000 | 0.00000000 | 0.00052863 | 0.00000000 | 0.00000000 |
| SS AG PR | 0.00000000 | 0.00331962 | 0.00000000 | 0.04876827 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 |
| FARM INPUTS | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 |
| TS&C (F&F) | 0.01774182 | 0.01620292 | 0.02105716 | 0.00783657 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 |
| T-WR (F&F) | 0.02405760 | 0.00825881 | 0.00243524 | 0.00634403 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 |
| TS&C (OTH) | 0.06252891 | 0.05774556 | 0.07392162 | 0.04054171 | 0.02081940 | 0.00000000 | 0.01590333 | 0.00000000 |
| T-WR (OTH) | 0.12701451 | 0.04409417 | 0.01234588 | 0.01867485 | 0.10759624 | 0.00000000 | 0.05372105 | 0.00000000 |
| LS CM | 0.19960255 | 0.23553703 | 0.11591507 | 0.14667123 | 0.04268501 | 0.13659715 | 0.03100845 | 0.00000000 |
| SS CM | 0.00000000 | 0.37645950 | 0.00000000 | 0.06317791 | 0.00000000 | 0.13609623 | 0.00000000 | 0.00000000 |
| LS MM | 0.06134641 | 0.00000000 | 0.45701101 | 0.00000000 | 0.00000000 | 0.04669926 | 0.00030849 | 0.00000000 |
| SS MM | 0.00000000 | 0.00000000 | 0.00000000 | 0.48484551 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 |
| M&Q | 0.02209961 | 0.03009575 | 0.00228577 | 0.00000000 | 0.00000000 | 0.05445418 | 0.02435049 | 0.00000000 |
| CONSTRUCTION | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.39045802 |
| E&G DIST | 0.01134879 | 0.00042751 | 0.00148818 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00149940 | 0.00000000 |
| B&I | 0.02022459 | 0.00377427 | 0.02522575 | 0.01971467 | 0.01049447 | 0.00155611 | 0.00167211 | 0.00000000 |
| OWNS.OF DW. | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 | 0.00000000 |
| PA&D | 0.00125193 | 0.00101630 | 0.00075473 | 0.00000000 | 0.04432700 | 0.01613979 | 0.00175096 | 0.00000000 |
| SERVICES | 0.02116063 | 0.00235776 | 0.01716532 | 0.00439843 | 0.07051632 | 0.04021442 | 0.00401033 | 0.00000000 |
| HOUSEHOLDS | 0.13885120 | 0.15618483 | 0.16046777 | 0.10472678 | 0.41384654 | 0.28167246 | 0.14589399 | 0.00000000 |

| | OWNS.OF DW. | PA&D | SERVICES | HOUSEHOLDS |
|---|---|---|---|---|
| AGRICULTURE | 0.00000000 | 0.01201590 | 0.00000000 | 0.24936302 |
| LS AG PR | 0.00000000 | 0.03973747 | 0.00109403 | 0.07497056 |
| SS AG PR | 0.00000000 | 0.00000000 | 0.00000000 | 0.05978498 |
| FARM INPUTS | 0.00000000 | 0.00000000 | 0.00000000 | 0.02291466 |
| TS&C (F&F) | 0.00000000 | 0.00000000 | 0.00000000 | 0.08949500 |
| T-WR (F&F) | 0.00000000 | 0.00000000 | 0.00000000 | 0.06826510 |
| TS&C (OTH) | 0.00000000 | 0.01563574 | 0.01737006 | 0.00935319 |
| T-WR (OTH) | 0.00000000 | 0.00000000 | 0.00000000 | 0.01536648 |
| LS CM | 0.00000000 | 0.01783343 | 0.00289294 | 0.02154234 |
| SS CM | 0.00000000 | 0.00000000 | 0.00000000 | 0.03878567 |
| LS MM | 0.00000000 | 0.01265216 | 0.00189710 | 0.03486396 |
| SS MM | 0.00000000 | 0.00000000 | 0.00000000 | 0.05663621 |
| M&Q | 0.00000000 | 0.00000000 | 0.00000000 | 0.00075403 |
| CONSTRUCTION | 0.26082290 | 0.00000000 | 0.00000000 | 0.00000000 |
| E&G DIST | 0.00000000 | 0.00024627 | 0.00041598 | 0.00054504 |
| B&I | 0.00000000 | 0.00757852 | 0.00385612 | 0.01819482 |
| OWNS.OF DW. | 0.00000000 | 0.00000000 | 0.00000000 | 0.01709185 |
| PA&D | 0.00000000 | 0.09519399 | 0.00285680 | 0.06027319 |
| SERVICES | 0.00000000 | 0.20333953 | 0.00114709 | 0.02268245 |
| HOUSEHOLDS | 0.00000000 | 0.27342469 | 0.15421661 | 0.00000000 |

Appendix Table 11 --Indirect Input Requirements Matrix, 1984/85

| | AGRICULTURE | LS AG PR | SS AG PR | FARM INPUTS | TS&C (F&F) | T-WR (F&F) | TS&C (OTH) | T-WR (OTH) |
|---|---|---|---|---|---|---|---|---|
| AGRICULTURE | 0.13066102 | 0.21038782 | 0.24560770 | 0.16739872 | 0.10003839 | 0.05720766 | 0.10003453 | 0.03782949 |
| LS AG PR | 0.03190450 | 0.05235649 | 0.04613853 | 0.05219607 | 0.02651491 | 0.01549696 | 0.02651389 | 0.01036126 |
| SS AG PR | 0.01841821 | 0.01809134 | 0.02078857 | 0.02755184 | 0.01412144 | 0.00995946 | 0.01412090 | 0.00642573 |
| FARM INPUTS | 0.07912762 | 0.14569425 | 0.22536506 | 0.05477471 | 0.03190434 | 0.01894684 | 0.03190311 | 0.01246937 |
| TS&C (F&F) | 0.04210963 | 0.04254599 | 0.04498500 | 0.07020398 | 0.02860536 | 0.01676109 | 0.02860426 | 0.01106047 |
| T-WR (F&F) | 0.02587014 | 0.03712002 | 0.03446409 | 0.04204320 | 0.02119543 | 0.01277217 | 0.02119462 | 0.00839756 |
| TS&C (OTH) | 0.09032848 | 0.05672251 | 0.07581651 | 0.08952341 | 0.03101655 | 0.01060806 | 0.03101536 | 0.00794520 |
| T-WR (OTH) | 0.07673123 | 0.06775675 | 0.09337592 | 0.07761569 | 0.03762405 | 0.01215848 | 0.03762260 | 0.00889219 |
| LS CM | 0.09906996 | 0.08297464 | 0.09895472 | 0.19825048 | 0.12670455 | 0.02232639 | 0.12669967 | 0.01912979 |
| SS CM | 0.06459976 | 0.04729068 | 0.06456883 | 0.09786410 | 0.10600265 | 0.01792966 | 0.10599857 | 0.01536917 |
| LS MM | 0.21547305 | 0.13707684 | 0.15852243 | 0.32941977 | 0.08035098 | 0.02480884 | 0.08034788 | 0.01832858 |
| SS MM | 0.03067691 | 0.03009760 | 0.04474616 | 0.04558268 | 0.02320232 | 0.01668461 | 0.02320143 | 0.01074331 |
| M&Q | 0.03070665 | 0.01765138 | 0.02470824 | 0.02360452 | 0.03039917 | 0.00377968 | 0.03039800 | 0.00363495 |
| CONSTRUCTION | 0.06677899 | 0.06818970 | 0.09194613 | 0.14263768 | 0.02830383 | 0.02425391 | 0.02830274 | 0.03303391 |
| E&G DIST | 0.01107472 | 0.00612578 | 0.00818335 | 0.00574501 | 0.00271986 | 0.00096957 | 0.00271975 | 0.00070310 |
| B&I | 0.02490774 | 0.02422938 | 0.02574088 | 0.03613016 | 0.01290128 | 0.00575711 | 0.01290078 | 0.00403304 |
| OWNS.OF DW. | 0.00469684 | 0.00460621 | 0.00491413 | 0.00697829 | 0.00355168 | 0.00255475 | 0.00355154 | 0.00164497 |
| PA&D | 0.02359785 | 0.02266973 | 0.02546094 | 0.03653514 | 0.02345904 | 0.01091703 | 0.02345814 | 0.00775013 |
| SERVICES | 0.03479217 | 0.02777450 | 0.03220714 | 0.04965191 | 0.03407420 | 0.00880054 | 0.03407289 | 0.00734641 |
| HOUSEHOLDS | 0.18404124 | 0.18697420 | 0.23044196 | 0.30396411 | 0.20779957 | 0.03584346 | 0.20779156 | 0.03366464 |

| | LS CM | SS CM | LS MM | SS MM | M&Q | CONSTRUCTION | E&G DIST | B&I |
|---|---|---|---|---|---|---|---|---|
| AGRICULTURE | 0.15048272 | 0.24013294 | 0.20577758 | 0.27303500 | 0.22532973 | 0.22970334 | 0.08429590 | 0.10424465 |
| LS AG PR | 0.05121224 | 0.08036670 | 0.06707648 | 0.07659258 | 0.06476937 | 0.07023382 | 0.02426011 | 0.02762977 |
| SS AG PR | 0.02273545 | 0.03706986 | 0.03381187 | 0.08024390 | 0.03912335 | 0.03768702 | 0.01462509 | 0.01471520 |
| FARM INPUTS | 0.04960648 | 0.08349481 | 0.06780903 | 0.08656642 | 0.07459786 | 0.08514566 | 0.02790239 | 0.03324581 |
| TS&C (F&F) | 0.05773711 | 0.08880378 | 0.08486172 | 0.08932752 | 0.07315217 | 0.07634141 | 0.02884625 | 0.02980812 |
| T-WR (F&F) | 0.03989798 | 0.06480775 | 0.05379213 | 0.06659724 | 0.05153975 | 0.05656595 | 0.01978725 | 0.02208663 |
| TS&C (OTH) | 0.05688111 | 0.11447133 | 0.12206717 | 0.12398831 | 0.04701582 | 0.08277635 | 0.01906777 | 0.03232069 |
| T-WR (OTH) | 0.07264292 | 0.14614016 | 0.09250674 | 0.13371873 | 0.05380114 | 0.10041030 | 0.02565204 | 0.03920601 |
| LS CM | 0.13601742 | 0.33999889 | 0.24900793 | 0.36625794 | 0.09446474 | 0.20154940 | 0.04131180 | 0.13203203 |
| SS CM | 0.04960831 | 0.29986204 | 0.07468112 | 0.20510788 | 0.06482926 | 0.14680151 | 0.02501272 | 0.11045969 |
| LS MM | 0.14905372 | 0.15677281 | 0.50957139 | 0.14838168 | 0.10246520 | 0.16773981 | 0.04082685 | 0.08372945 |
| SS MM | 0.03800244 | 0.05865939 | 0.05655277 | 0.51258921 | 0.06557082 | 0.06192188 | 0.02450728 | 0.02417790 |
| M&Q | 0.01834001 | 0.04615155 | 0.02537852 | 0.03292627 | 0.01435300 | 0.02667451 | 0.00609849 | 0.03167735 |
| CONSTRUCTION | 0.09291710 | 0.12266716 | 0.14453808 | 0.12851741 | 0.06944866 | 0.07553670 | 0.02953408 | 0.02949391 |
| E&G DIST | 0.00607270 | 0.01004872 | 0.00808026 | 0.00935875 | 0.00446786 | 0.00725870 | 0.00191010 | 0.00283422 |
| B&I | 0.02683726 | 0.03837092 | 0.04944724 | 0.05279686 | 0.02536725 | 0.03287456 | 0.01021973 | 0.01344373 |
| OWNS.OF DW. | 0.00581874 | 0.00896083 | 0.00865916 | 0.00824118 | 0.01004029 | 0.00947865 | 0.00375258 | 0.00370101 |
| PA&D | 0.02853907 | 0.04435317 | 0.04046914 | 0.03879419 | 0.04774738 | 0.04646723 | 0.01760051 | 0.02444541 |
| SERVICES | 0.03661064 | 0.05435793 | 0.05676250 | 0.05041558 | 0.04627466 | 0.05072212 | 0.01687994 | 0.03550690 |
| HOUSEHOLDS | 0.20158842 | 0.36809024 | 0.34615739 | 0.37744336 | 0.17358480 | 0.27289882 | 0.07365959 | 0.21653680 |

| | OWNS.OF DW. | PA&D | SERVICES | HOUSEHOLDS |
|---|---|---|---|---|
| AGRICULTURE | 0.06963461 | 0.19708536 | 0.07758555 | 0.22609338 |
| LS AG PR | 0.01845647 | 0.06013619 | 0.02132738 | 0.05382195 |
| SS AG PR | 0.00982964 | 0.03072204 | 0.01349220 | 0.02406216 |
| FARM INPUTS | 0.02220794 | 0.06729461 | 0.02569229 | 0.13494810 |
| TS&C (F&F) | 0.01991159 | 0.05500355 | 0.02285308 | 0.05019532 |
| T-WR (F&F) | 0.01475369 | 0.04401136 | 0.01743883 | 0.03818160 |
| TS&C (OTH) | 0.02158997 | 0.04438957 | 0.01476620 | 0.07558685 |
| T-WR (OTH) | 0.02618931 | 0.04444915 | 0.01674108 | 0.08123079 |
| LS CM | 0.08819636 | 0.07932710 | 0.02994329 | 0.14130540 |
| SS CM | 0.07378621 | 0.05211522 | 0.02282733 | 0.09114706 |
| LS MM | 0.05593062 | 0.09874985 | 0.03505336 | 0.16186829 |
| SS MM | 0.01615065 | 0.05144443 | 0.02261025 | 0.08395020 |
| M&Q | 0.02116022 | 0.01186069 | 0.00476986 | 0.02439617 |
| CONSTRUCTION | 0.01970170 | 0.05681684 | 0.02612555 | 0.10818058 |
| E&G DIST | 0.00189324 | 0.00385053 | 0.00135143 | 0.00723753 |
| B&I | 0.00898031 | 0.02228769 | 0.00797191 | 0.02892268 |
| OWNS.OF DW. | 0.00247225 | 0.00787713 | 0.00346210 | 0.00443506 |
| PA&D | 0.01632934 | 0.04431889 | 0.01496849 | 0.02953251 |
| SERVICES | 0.02371833 | 0.05032799 | 0.01236999 | 0.04567994 |
| HOUSEHOLDS | 0.14464489 | 0.18744592 | 0.04834220 | 0.25948390 |

Appendix Table 12 --Total (Direct, Indirect and Induced) Requirements Matrix, 1984/85

| | AGRICULTURE | LS AG PR | SS AG PR | FARM INPUTS | TS&C (F&F) | T-WR (F&F) | TS&C (OTH) | T-WR (OTH) |
|---|---|---|---|---|---|---|---|---|
| AGRICULTURE | 1.26842826 | 0.51421725 | 0.80633431 | 0.16739872 | 0.10003839 | 0.05720766 | 0.10003453 | 0.03782949 |
| LS AG PR | 0.03190450 | 1.18839021 | 0.12162159 | 0.05219607 | 0.02651491 | 0.01584200 | 0.02651389 | 0.01036126 |
| SS AG PR | 0.01841821 | 0.01856287 | 1.03510875 | 0.02755184 | 0.01412144 | 0.00995946 | 0.01412090 | 0.00642573 |
| FARM INPUTS | 0.35045032 | 0.14569425 | 0.22536506 | 1.05477471 | 0.03190434 | 0.01894684 | 0.03190311 | 0.01246937 |
| TS&C (F&F) | 0.04210963 | 0.07684014 | 0.12794174 | 0.07020398 | 1.02860536 | 0.01676109 | 0.02860426 | 0.06656361 |
| T-WR (F&F) | 0.02587014 | 0.11334716 | 0.08561236 | 0.04204320 | 0.02119543 | 1.01277217 | 0.02119462 | 0.00839756 |
| TS&C (OTH) | 0.10498082 | 0.05805941 | 0.07948059 | 0.24501777 | 0.03101655 | 0.01060806 | 1.03101536 | 0.00794520 |
| T-WR (OTH) | 0.13040942 | 0.07656638 | 0.09866768 | 0.17613017 | 0.03762405 | 0.01215848 | 0.03762260 | 1.00889219 |
| LS CM | 0.10325191 | 0.10146755 | 0.10242888 | 0.24001570 | 0.12670455 | 0.02232639 | 0.12669967 | 0.01950886 |
| SS CM | 0.06459976 | 0.04729068 | 0.06704217 | 0.15079669 | 0.10600265 | 0.01792966 | 0.10599857 | 0.01536917 |
| LS MM | 0.21547305 | 0.16026484 | 0.15852243 | 0.60571041 | 0.08035098 | 0.02480884 | 0.08034788 | 0.01832858 |
| SS MM | 0.03067691 | 0.03009760 | 0.05776180 | 0.04558268 | 0.02320232 | 0.01668461 | 0.02320143 | 0.01074331 |
| M&Q | 0.03149328 | 0.01793189 | 0.02470824 | 0.08537338 | 0.03039917 | 0.00377968 | 0.03039800 | 0.00363495 |
| CONSTRUCTION | 0.06677899 | 0.06888970 | 0.09194613 | 0.14263768 | 0.40300691 | 0.02425391 | 0.40299138 | 0.03303391 |
| E&G DIST | 0.01139594 | 0.00854839 | 0.01034808 | 0.03173025 | 0.00271986 | 0.00150965 | 0.00271975 | 0.00103014 |
| B&I | 0.02673840 | 0.04390191 | 0.03315022 | 0.05815365 | 0.01290128 | 0.03414559 | 0.01290078 | 0.01200204 |
| OWNS.OF DW. | 0.00469684 | 0.00460621 | 0.00491413 | 0.00697829 | 0.00355168 | 0.00255475 | 0.00355154 | 0.00164497 |
| PA&D | 0.02600688 | 0.02356121 | 0.02556650 | 0.03818244 | 0.02345904 | 0.01091703 | 0.02345814 | 0.01044535 |
| SERVICES | 0.03569376 | 0.03871307 | 0.03244329 | 0.07749528 | 0.03407420 | 0.00880054 | 0.03407289 | 0.02079675 |
| HOUSEHOLDS | 0.27479985 | 0.26949735 | 0.28751303 | 0.40828155 | 0.20779957 | 0.14947189 | 0.20779156 | 0.09624286 |
| BUS. MULT. | 2.86417686 | 3.00644807 | 3.47647698 | 3.72625446 | 2.34519270 | 1.47143831 | 2.34514086 | 1.40166530 |

| | LS CM | SS CM | LS MM | SS MM | M&Q | CONSTRUCTION | E&G DIST | B&I |
|---|---|---|---|---|---|---|---|---|
| AGRICULTURE | 0.15408007 | 0.26345464 | 0.20713300 | 0.27833150 | 0.22532973 | 0.26698043 | 0.08429590 | 0.10424465 |
| LS AG PR | 0.08209115 | 0.08876975 | 0.07043833 | 0.07659258 | 0.06476937 | 0.07076245 | 0.02426011 | 0.02762977 |
| SS AG PR | 0.02273545 | 0.04038948 | 0.03381187 | 0.12901217 | 0.03912335 | 0.03768702 | 0.01462509 | 0.01471520 |
| FARM INPUTS | 0.04960648 | 0.08349481 | 0.06780903 | 0.08656642 | 0.07459786 | 0.08514566 | 0.02790239 | 0.03324581 |
| TS&C (F&F) | 0.07547893 | 0.10500670 | 0.10591888 | 0.09716409 | 0.07315217 | 0.07634141 | 0.02884625 | 0.02980812 |
| T-WR (F&F) | 0.06395558 | 0.07306656 | 0.05622737 | 0.07294127 | 0.05153975 | 0.05656595 | 0.01978725 | 0.02208663 |
| TS&C (OTH) | 0.11941002 | 0.17221689 | 0.19598879 | 0.16453002 | 0.06783522 | 0.08277635 | 0.03497110 | 0.03232069 |
| T-WR (OTH) | 0.19965743 | 0.19023433 | 0.10485262 | 0.15239358 | 0.16139738 | 0.10041030 | 0.07937309 | 0.03920601 |
| LS CM | 1.33561997 | 0.57553592 | 0.36492300 | 0.51292917 | 0.13714975 | 0.33814655 | 0.07232025 | 0.13203203 |
| SS CM | 0.04960831 | 1.67632154 | 0.07468112 | 0.26828579 | 0.06482926 | 0.28289774 | 0.02501272 | 0.11045969 |
| LS MM | 0.21040013 | 0.15677281 | 1.96658240 | 0.14838168 | 0.10246520 | 0.21443907 | 0.04113534 | 0.08372945 |
| SS MM | 0.03800244 | 0.05865939 | 0.05655277 | 1.99743472 | 0.06557082 | 0.06192188 | 0.02450728 | 0.02417790 |
| M&Q | 0.04043962 | 0.07624730 | 0.02766429 | 0.03292627 | 1.01435300 | 0.08112869 | 0.03044898 | 0.03167735 |
| CONSTRUCTION | 0.09291710 | 0.12266716 | 0.14453808 | 0.12851741 | 0.06944866 | 1.07553670 | 0.02953408 | 0.41995193 |
| E&G DIST | 0.01742149 | 0.01047623 | 0.00956844 | 0.00935875 | 0.00446786 | 0.00725870 | 1.00340950 | 0.00283422 |
| B&I | 0.04706185 | 0.04214519 | 0.07467299 | 0.07251153 | 0.03586172 | 0.03443067 | 0.01189184 | 1.01344373 |
| OWNS.OF DW. | 0.00581874 | 0.00896083 | 0.00865916 | 0.00824118 | 0.01004029 | 0.00947865 | 0.00375258 | 0.00370101 |
| PA&D | 0.02979100 | 0.04536947 | 0.04122387 | 0.03879419 | 0.09207438 | 0.06260702 | 0.01935147 | 0.02444541 |
| SERVICES | 0.05777127 | 0.05671569 | 0.07392782 | 0.05481401 | 0.11679098 | 0.09093654 | 0.02089027 | 0.03550690 |
| HOUSEHOLDS | 0.34043962 | 0.52427507 | 0.50662516 | 0.48217014 | 0.58743134 | 0.55457128 | 0.21955358 | 0.21653680 |
| BUS. MULT. | 3.03230664 | 4.37077978 | 4.19179901 | 4.81189646 | 3.05822806 | 3.59002307 | 1.81586907 | 2.40175330 |

| | OWNS.OF DW. | PA&D | SERVICES | HOUSEHOLDS |
|---|---|---|---|---|
| AGRICULTURE | 0.06963461 | 0.20910126 | 0.07758555 | 0.47545640 |
| LS AG PR | 0.01845647 | 0.09987366 | 0.02242141 | 0.12879251 |
| SS AG PR | 0.00982964 | 0.03072204 | 0.01349220 | 0.08384714 |
| FARM INPUTS | 0.02220794 | 0.06729461 | 0.02569229 | 0.15786276 |
| TS&C (F&F) | 0.01991159 | 0.05500355 | 0.02285308 | 0.13969032 |
| T-WR (F&F) | 0.01475369 | 0.04401136 | 0.01743883 | 0.10644670 |
| TS&C (OTH) | 0.02158997 | 0.06002531 | 0.03213626 | 0.08494004 |
| T-WR (OTH) | 0.02618931 | 0.04444915 | 0.01674108 | 0.09659727 |
| LS CM | 0.08819636 | 0.09716053 | 0.03283623 | 0.16284774 |
| SS CM | 0.07378621 | 0.05211522 | 0.02282733 | 0.12993273 |
| LS MM | 0.05593062 | 0.11140201 | 0.03695046 | 0.19673225 |
| SS MM | 0.01615065 | 0.05144443 | 0.02261025 | 0.14058641 |
| M&Q | 0.02116022 | 0.01186069 | 0.00476986 | 0.02515020 |
| CONSTRUCTION | 0.28052460 | 0.05681684 | 0.02612555 | 0.10818058 |
| E&G DIST | 0.00189324 | 0.00409680 | 0.00176741 | 0.00778257 |
| B&I | 0.00898031 | 0.02986621 | 0.01182803 | 0.04711750 |
| OWNS.OF DW. | 1.00247225 | 0.00787713 | 0.00346210 | 0.02152691 |
| PA&D | 0.01632934 | 1.13951288 | 0.01782529 | 0.08980570 |
| SERVICES | 0.02371833 | 0.25366752 | 1.01351708 | 0.06836239 |
| HOUSEHOLDS | 0.14464489 | 0.46087061 | 0.20255881 | 1.25948390 |
| BUS. MULT. | 1.93636023 | 2.88717182 | 1.62543909 | 3.53114202 |

Appendix Table 13 --Final Demands for 1985/85 (Million Rupees)

| | EXPORTS | INV./DISC. |
|---|---|---|
| AGRICULTURE | 5406.00 | 8377.40 |
| LS AG PR | 25535.00 | 5749.66 |
| SS AG PR | 0.00 | 690.69 |
| FARM INPUTS | 1426.00 | 1094.12 |
| TS&C (F&F) | 0.00 | 6024.50 |
| T-WR (F&F) | 0.00 | -243.85 |
| TS&C (OTH) | 0.00 | 3989.27 |
| T-WR (OTH) | 0.00 | -446.10 |
| LS CM | 5025.00 | 3851.11 |
| SS CM | 0.00 | 1926.43 |
| LS MM | 491.00 | 683.76 |
| SS MM | 0.00 | -156.16 |
| M&Q | 96.00 | 1636.59 |
| CONSTRUCTION | 0.00 | 2295.44 |
| E&G DIST | 0.00 | 8046.73 |
| B&I | 0.00 | 499.21 |
| OWNS.OF DW. | 0.00 | 6920.08 |
| PA&D | 19045.00 | 15959.53 |
| SERVICES | 0.00 | 3914.40 |
| HOUSEHOLDS | 38311.00 | 260687.63 |

Appendix Table 14 -- Total Dependence of Each Industry on Final Demand, 1984/85 (Million Rupees)

| | EXPORTS | INV./DISC. |
|---|---|---|
| AGRICULTURE | 6857.12 | 10626.13 |
| LS AG PR | 30345.54 | 6832.85 |
| SS AG PR | 0.00 | 714.94 |
| FARM INPUTS | 1504.11 | 1154.05 |
| TS&C (F&F) | 0.00 | 6196.83 |
| T-WR (F&F) | 0.00 | -246.97 |
| TS&C (OTH) | 0.00 | 4113.00 |
| T-WR (OTH) | 0.00 | -450.07 |
| LS CM | 6711.49 | 5143.62 |
| SS CM | 0.00 | 3229.32 |
| LS MM | 965.59 | 1344.66 |
| SS MM | 0.00 | -311.93 |
| M&Q | 97.38 | 1660.08 |
| CONSTRUCTION | 0.00 | 2468.83 |
| E&G DIST | 0.00 | 8074.16 |
| B&I | 0.00 | 505.92 |
| OWNS.OF DW. | 0.00 | 6937.19 |
| PA&D | 21702.02 | 18186.09 |
| SERVICES | 0.00 | 3967.31 |
| HOUSEHOLDS | 48252.09 | 328331.87 |

Appendix Table 15 --Decomposition of Total Requirements, 1984/85

| | Direct | Indirect | Total (1+direct+ indirect) |
|---|---|---|---|
| AGRICULTURE | 0.57861016 | 1.28556670 | 2.86417686 |
| LS AG PR | 0.71941226 | 1.28703581 | 3.00644807 |
| SS AG PR | 0.87954069 | 1.59693629 | 3.47647698 |
| FARM INPUTS | 0.86858299 | 1.85767147 | 3.72625446 |
| TS&C (F&F) | 0.37470308 | 0.97048962 | 2.34519270 |
| T-WR (F&F) | 0.14290203 | 0.32853628 | 1.47143831 |
| TS&C (OTH) | 0.37468864 | 0.97045222 | 2.34514086 |
| T-WR (OTH) | 0.14290203 | 0.25876327 | 1.40166530 |
| LS CM | 0.74170481 | 1.29060183 | 3.03230664 |
| SS CM | 0.96719878 | 2.40358100 | 4.37077978 |
| LS MM | 0.89479077 | 2.29700824 | 4.19179901 |
| SS MM | 0.95099646 | 2.86090000 | 4.81189646 |
| M&Q | 0.71028498 | 1.34794308 | 3.05822806 |
| CONSTRUCTION | 0.75123532 | 1.83878775 | 3.59002307 |
| E&G DIST | 0.28011860 | 0.53575047 | 1.81586907 |
| B&I | 0.39045802 | 1.01129528 | 2.40175330 |
| OWNS.OF DW. | 0.26082290 | 0.67553733 | 1.93636023 |
| PA&D | 0.67765770 | 1.20951412 | 2.88717182 |
| SERVICES | 0.18574673 | 0.43969236 | 1.62543909 |
| HOUSEHOLDS | 0.86088255 | 1.67025947 | 3.53114202 |

Appendix Table 16 --Business Multipliers

| | 1975/76 | 1984/85 |
|---|---|---|
| AGRICULTURE | 2.35257951 | 2.85417686 |
| LS AG PR | 2.66074346 | 3.00644807 |
| SS AG PR | 3.04889753 | 3.47647698 |
| FARM INPUTS | 2.36735217 | 3.72625446 |
| TS&C (F&F) | 1.75307267 | 2.34519270 |
| T-WR (F&F) | 1.31052353 | 1.47143831 |
| TS&C (OTH) | 2.17664386 | 2.34514086 |
| T-WR (OTH) | 1.41844898 | 1.40166530 |
| LS CM | 2.44622016 | 3.03230664 |
| SS CM | 3.02676902 | 4.37077978 |
| LS MM | 2.27779345 | 4.19179901 |
| SS MM | 2.69798701 | 4.81189646 |
| M&Q | 2.60343159 | 3.05822806 |
| CONSTRUCTION | 2.85326759 | 3.59002307 |
| E&G DIST | 2.06202195 | 1.81586907 |
| B&I | 1.90333354 | 2.40175330 |
| OWNS.OF DW. | 1.74168859 | 1.93636023 |
| PA&D | 2.62079537 | 2.88717182 |
| SERVICES | 1.52490051 | 1.62543909 |
| HOUSEHOLDS | 2.90368562 | 3.53114202 |

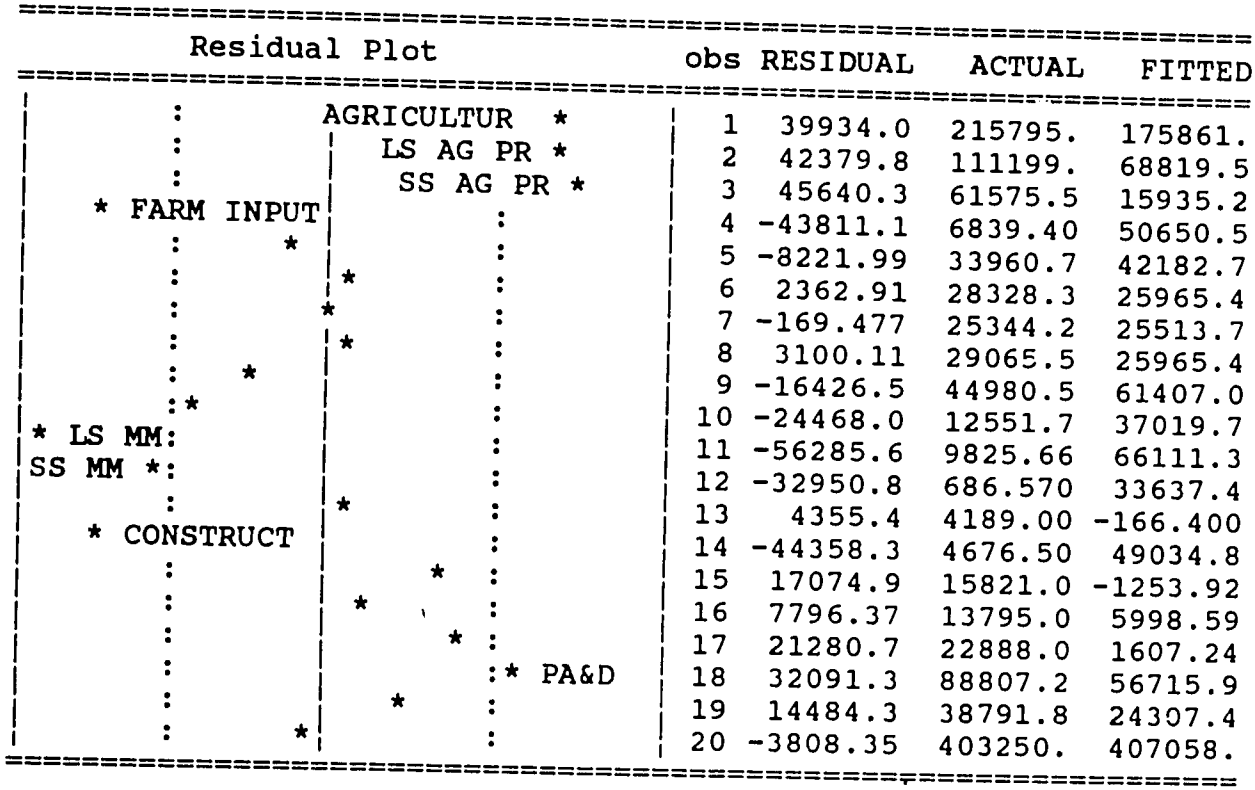
Appendix Table 17 -- Final Payments for 1984/85

| | IMPORTS | TAX-SUBSID | SELF-EMP.S |
|---|---|---|---|
| AGRICULTURE | 2113 | 0 | 77780 |
| LS AG PR | 9472 | 4180 | 9290 |
| SS AG PR | 0 | 242 | 3204 |
| FARM INPUTS | 1743 | 21 | 6588 |
| TS&C (F&F) | 20550 | 0 | 13827 |
| T-WR (F&F) | 0 | 0 | 33187 |
| TS&C (OTH) | 14280 | 0 | 9609 |
| T-WR (OTH) | 0 | 0 | 33187 |
| LS CM | 5263 | 8113 | 5824 |
| SS CM | 0 | 0 | 1635 |
| LS MM | 3728 | 216 | 4385 |
| SS MM | 0 | 0 | 2276 |
| M&Q | 715 | 0 | 2868 |
| CONSTRUCTION | 5352 | 0 | 6623 |
| E&G DIST | 871 | 779 | 6494 |
| B&I | 0 | 10 | 11319 |
| OWNS.OF DW. | 0 | 0 | 10405 |
| PA&D | 1165 | 0 | 21149 |
| SERVICES | 96 | 133 | 29898 |
| HOUSEHOLDS | 24431 | 7001 | 26813 |

Appendix Table 18 --Primary Input Requirements Embodied in One Unit of Final Demand for Agricultural Sector, 1984/85

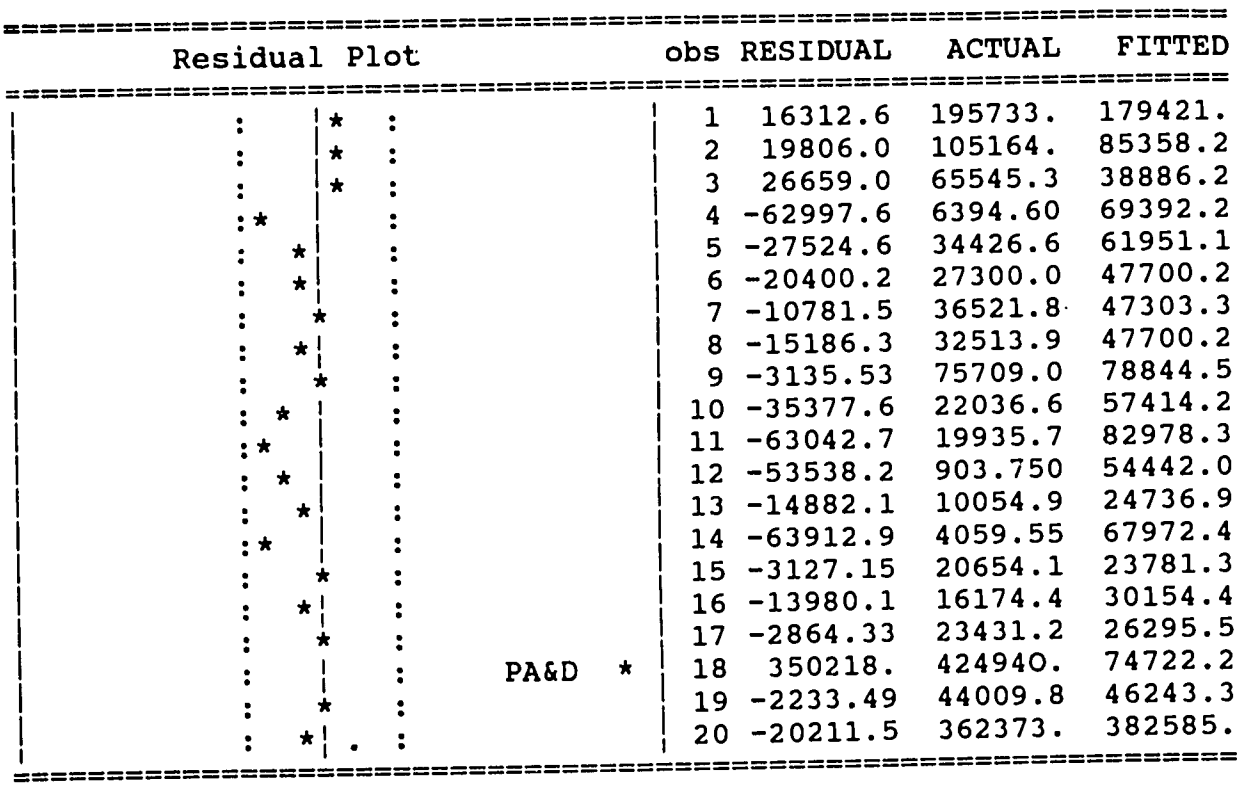
| | IMPORTS | TAX-SUBSIDY | SELF-EMP.&S. | TOTAL |
|---|---|---|---|---|
| AGRICULTURE | 0.01413646 | 0.00000000 | 0.52036717 | 0.53450363 |
| LS AG PR | 0.00369595 | 0.00163103 | 0.00362503 | 0.00895200 |
| SS AG PR | 0.00000000 | 0.00015585 | 0.00206305 | 0.00221890 |
| FARM INPUTS | 0.00961112 | 0.00011580 | 0.03632695 | 0.04605387 |
| TS&C (F&F) | 0.01574027 | 0.00000000 | 0.01059069 | 0.02633096 |
| T-WR (F&F) | 0.00000000 | 0.00000000 | 0.02217321 | 0.02217321 |
| TS&C (OTH) | 0.03924003 | 0.00000000 | 0.02640594 | 0.06564596 |
| T-WR (OTH) | 0.00000000 | 0.00000000 | 0.11177345 | 0.11177345 |
| LS CM | 0.00731055 | 0.01126932 | 0.00808987 | 0.02666974 |
| SS CM | 0.00000000 | 0.00000000 | 0.00211897 | 0.00211897 |
| LS MM | 0.01014721 | 0.00058793 | 0.01193510 | 0.02267023 |
| SS MM | 0.00000000 | 0.00000000 | 0.00150303 | 0.00150303 |
| M&Q | 0.00182079 | 0.00000000 | 0.00730361 | 0.00912440 |
| CONSTRUCTION | 0.00742436 | 0.00000000 | 0.00918793 | 0.01661229 |
| E&G DIST | 0.00087739 | 0.00078471 | 0.00654175 | 0.00820384 |
| B&I | 0.00000000 | 0.00001439 | 0.01628367 | 0.01629806 |
| OWNS.OF DW. | 0.00000000 | 0.00000000 | 0.00347178 | 0.00347178 |
| PA&D | 0.00043767 | 0.00000000 | 0.00794544 | 0.00838312 |
| SERVICES | 0.00009261 | 0.00012831 | 0.02884289 | 0.02906381 |
| HOUSEHOLDS | 0.01603543 | 0.00459515 | 0.01759911 | 0.03822970 |

Appendix Figure 1 --Final Demand Method




| obs | RESIDUAL | ACTUAL | FITTED |
|---|---|---|---|
| 1 | 39934.0 | 215795. | 175861. |
| 2 | 42379.8 | 111199. | 68819.5 |
| 3 | 45640.3 | 61575.5 | 15935.2 |
| 4 | -43811.1 | 6839.40 | 50650.5 |
| 5 | -8221.99 | 33960.7 | 42182.7 |
| 6 | 2362.91 | 28328.3 | 25965.4 |
| 7 | -169.477 | 25344.2 | 25513.7 |
| 8 | 3100.11 | 29065.5 | 25965.4 |
| 9 | -16426.5 | 44980.5 | 61407.0 |
| 10 | -24468.0 | 12551.7 | 37019.7 |
| 11 | -56285.6 | 9825.66 | 66111.3 |
| 12 | -32950.8 | 686.570 | 33637.4 |
| 13 | 4355.4 | 4189.00 | -166.400 |
| 14 | -44358.3 | 4676.50 | 49034.8 |
| 15 | 17074.9 | 15821.0 | -1253.92 |
| 16 | 7796.37 | 13795.0 | 5998.59 |
| 17 | 21280.7 | 22888.0 | 1607.24 |
| 18 | 32091.3 | 88807.2 | 56715.9 |
| 19 | 14484.3 | 38791.8 | 24307.4 |
| 20 | -3808.35 | 403250. | 407058. |

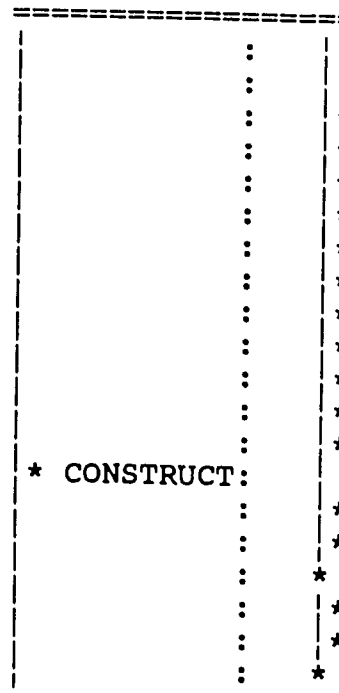
Appendix Figure 2 --Transactions Proportional to Value Added Method




| obs | RESIDUAL | ACTUAL | FITTED |
|---|---|---|---|
| 1 | 16312.6 | 195733. | 179421. |
| 2 | 19806.0 | 105164. | 85358.2 |
| 3 | 26659.0 | 65545.3 | 38886.2 |
| 4 | -62997.6 | 6394.60 | 69392.2 |
| 5 | -27524.6 | 34426.6 | 61951.1 |
| 6 | -20400.2 | 27300.0 | 47700.2 |
| 7 | -10781.5 | 36521.8 | 47303.3 |
| 8 | -15186.3 | 32513.9 | 47700.2 |
| 9 | -3135.53 | 75709.0 | 78844.5 |
| 10 | -35377.6 | 22036.6 | 57414.2 |
| 11 | -63042.7 | 19935.7 | 82978.3 |
| 12 | -53538.2 | 903.750 | 54442.0 |
| 13 | -14882.1 | 10054.9 | 24736.9 |
| 14 | -63912.9 | 4059.55 | 67972.4 |
| 15 | -3127.15 | 20654.1 | 23781.3 |
| 16 | -13980.1 | 16174.4 | 30154.4 |
| 17 | -2864.33 | 23431.2 | 26295.5 |
| 18 | 350218. | 424940. | 74722.2 |
| 19 | -2233.49 | 44009.8 | 46243.3 |
| 20 | -20211.5 | 362373. | 382585. |

Appendix Figure 3 --RAS Method

Residual Plot




| obs | RESIDUAL | ACTUAL | FITTED |
|---|---|---|---|
| 1 | 1756.16 | 18954.0 | 187838. |
| 2 | 904.433 | 81765.0 | 80860.6 |
| 3 | 591.521 | 28599.5 | 28008.0 |
| 4 | 852.749 | 63555.2 | 62702.5 |
| 5 | 737.478 | 54977.2 | 54239.7 |
| 6 | 688.254 | 38720.4 | 38032.1 |
| 7 | 622.994 | 38203.7 | 37580.7 |
| 8 | 688.254 | 38720.4 | 38032.1 |
| 9 | 880.165 | 74332.7 | 73452.5 |
| 10 | 774.140 | 49854.0 | 49079.8 |
| 11 | 1008.85 | 79162.8 | 78153.9 |
| 12 | 749.823 | 46449.4 | 45699.6 |
| 13 | 450.795 | 12366.8 | 11916.0 |
| 14 | -12948.8 | 48139.0 | 61087.7 |
| 15 | 483.437 | 11312.6 | 10829.2 |
| 16 | 509.893 | 18587.2 | 18077.3 |
| 17 | 387.576 | 10476.2 | 13688.6 |
| 18 | 460.795 | 69225.0 | 68764.2 |
| 19 | 623.571 | 36998.8 | 36375.2 |
| 20 | -222.141 | 418674. | 418896. |

## LIST OF ABBREVIATIONS

| | |
|---|---|
| AGRICULTUR | Agriculture |
| FARM INPUT | Farm Inputs Manufacturing |
| INV/DISC | Investment and Discrepancy |
| LS AG PR | Large Scale Agricultural Processing |
| LS CM | Large Scale Commodity Manufacturing |
| LS MM | Large Scale Machinery Manufacturing |
| M&Q | Mining and Quarrying |
| OWNS OF D | Ownership of Dwelling |
| PA&D | Public Administration and Defense |
| SELF-EMP.S | Self-employment Income, Savings, Interest and Profits |
| SS AG PR | Small Scale Agricultural Processing |
| SS CM | Small Scale Commodity Manufacturing |
| SS MM | Small Scale Machinery Manufacturing |
| TAX-SUBSID | Taxes Minus Subsidy |