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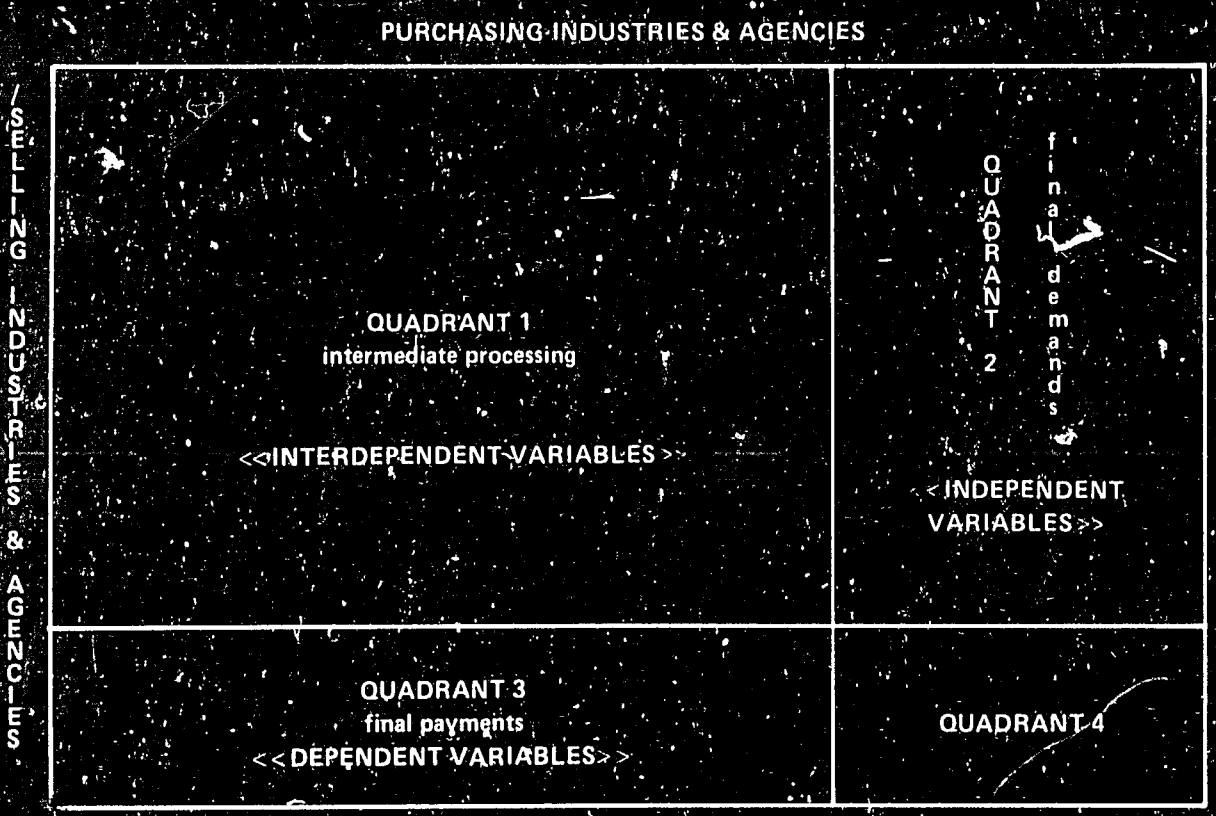
A GUIDE TO INTERINDUSTRY ANALYSIS OF THE PAKISTAN ECONOMY



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A GUIDE TO INTERINDUSTRY ANALYSIS OF THE PAKISTAN ECONOMY

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1. INPUT-OUTPUT: A METHOD TO DESCRIBE AND ANALYZE THE PAKISTAN ECONOMY

1.1 Introduction

Chapter 1 includes a discussion of the practical applications for input-output models and follows this with several numerical examples. The mathematics that is involved in the solution of the simultaneous linear equations which depict interindustry spending equilibrium for an economy is also explained.

1.2 Review of Input-Output Applications

Input-Output comprises both a well defined system of economic accounts and a tool for economic analysis and forecasting. Input-output data are useful both as a consistent descriptor of an economy and all its component parts, and as a tool of economic analysis. The transactions-among-sectors table depicts the economic structure and interdependencies among industries and agencies of a nation. The table shows who the major customers are for each industry and what the major input needs are for each industry. Two other tables are simple distributions derived from the transactions-among-sectors table. The technical coefficients table shows purchases distributions representing the technology and trade patterns for each industry. These are the direct or initial input requirements for an industry to expand production. The sales distribution coefficients show the same transactions data in terms of percentages of total output sold to the industries in the economy. Thus the major sources of demand to each industry can be discerned.

The focus of input-output analysis is the cumulative interdependent nature of expansion or contraction of an economy. The Leontief inverse matrix shows the direct plus indirect, i.e. total, input requirements from each industry when a given industry expands.

The inverse or total requirements coefficients table also implies that without positive gross sales to final demand, i.e. positive industry exports, investment or government spending, the exchange economy will not exist. This component of I/O analysis examines the backward linkages

among sectors, i.e. the increased input requirements when exogenous final demand increases. Forward linked effects may also be studied, where creation of a new supply of inputs allows dependent industries to be created or to expand. Supply driven analysis with the I/O framework depends critically on the assumptions made concerning the strength of the forward links. The model data do not provide this information and such applications are relatively rare.

Business multipliers sum the column elements of the total requirements table to show the total spending created in the nation when a given industry expands sales to final demand. Similarly, summing the column elements of resource requirements multiplier matrices shows the total resource demands that are created when any given industry expands. Resources analyzed in this fashion may include both physical and monetary variables -- workers, energy, water, imports, savings, or any input which rises proportionately with industry production. For example, an imports requirements multiplier may show that when a particular industry expands sales to exports, the stimulus to the economy may result in total imports rising almost as much as the initial increase of exports. Expanding this industry would not improve the balance of trade.

Bottlenecks to expansion for any industry also can be identified from the total requirements table by checking across the rows for each industry to see if large direct, indirect, and induced requirements exist for critical industry inputs, such as energy, skilled labor, or other scarce resources. Constrained optimization of a particular national economic goal, such as maximum trade surplus to create growth of national wealth, maximum growth of national product, payroll, or employment, is possible by combining I/O models and linear programming. The linear program can include both physical resource and monetary technical constraints which affect the optimal mix of high growth industries.

Input-output is most often used to create economic forecasts and impact analyses when growth is caused by changes of industry exports and/or investment and government spending. The I/O forecast generates a new transactions table for the economy, showing the interindustry spending that is required to support the new sales to final demand. A different formulation of the same I/O data can also be used to calculate the inflationary impacts on each intermediate processing sector due to changes in prices on primary inputs. For example, changes in import prices such as are caused by changes in prices of imported goods, falling exchange rates, or the imposition

of tariffs, create direct and indirect cost effects throughout the economy.

New technology or entire new industries can be simulated with the I/O model through the use of "phantom sectors." If the new sector sells its output entirely to final demand, one can build in a new column showing the purchases distribution with total purchases set to a nominal amount (say Rs.1000), with matching sales to final demand. To see the effect of the new industry on other sectors and on the total economy, simply expand the exogenous final demand sales for the phantom sector.

Emergency preparedness planning for a region or nation is facilitated though the use of I/O tables which show the critical inputs directly and indirectly needed to maintain essential services for a society and for an economy. The effects of a catastrophe can be mitigated if plans based partly on I/O total requirements coefficients are in place. These examples of I/O applications show that the I/O technique is adaptable to a wide range of economic issues and questions.

Users of the input-output (I/O) technique require a knowledge of the definitions of the I/O accounts and also an understanding of how the accounts are utilized to model the economic interdependencies in an economy. This section provides a very brief summary of the I/O accounts and compares and relates them to the income and product accounts. The concept of economic interdependencies is introduced with a small numerical example showing I/O business multipliers. Many variants of forecasting and multiplier analyses are possible with the I/O technique and these concepts will be introduced as required to facilitate the presentation of I/O applications and the analysis of the Pakistan economy in the third section of the report.

1.3 Definitions of the I/O Transactions-Among-Sectors Table

Spending flows among sectors in the Input-Output (I/O) framework are displayed as a table or matrix. An I/O table of gross flows (transactions among sectors) can be broken down into the four quadrants shown in Table 1.1: (1) the intermediate processing transactions matrix, (2) the columns of final demands, (3) the rows of primary inputs to processing, and (4) the rows of primary inputs to final demands. Quadrants 3 and 4 together are often referred to as final payments. Each of the component quadrants will be discussed, in that order, with reference to a numerical example shown in Table 1.2.

1.3.1 Quadrant 1: Intermediate Processing Transactions

This quadrant constitutes the bulk of the I/O table. To maintain a double entry accounting framework, the **n** number of purchasing sectors (column headings) are the same **n** number of producing sectors (row headings). Thus, Quadrant 1 is a square n by n matrix, where n is the number of intermediate processing industries in the regional economy. The intermediate processing quadrant only contains industries that purchase inputs to combine, transform, or use them in production. Exports, and end users of inputs such as governments, are excluded from the first quadrant. An exception to this delineation may exist for the household sector. Households may be treated as part of the processing sector if it is assumed that households, like other processors, have stable spending or input purchase functions. Alternatively, households may be treated as possessing discretionary spending power leading to unstable spending distributions which must be projected and entered prior to making a forecast. The latter technique may understate the interdependence within an economy when business expansion leads to immigration and higher household spending. Thus, forecasts using models with households excluded from the first quadrant may tend to understate cumulative expansions or contractions in an economy. Conversely, putting households in the first quadrant may introduce some error if household spending patterns are unstable.

By convention, the columns of an I/O transactions table are the purchasing sectors and rows are the producing or supply sectors. As with standard matrix notation, an entry in the transactions among sectors table is denoted as the ith row and the jth column. In order to maintain equality of row sums and column sums, rows exist for profit and saving as well as spending. Consider the interindustry processing quadrant in the example I/O transactions among sectors shown in Table 1.2. Reading <u>across</u> the first row, farming's total sales (output) are 55,000. Eight thousand is sold among farmers, 18,000 is sold to manufacturing, 22,000 is sold to households, and 7,000 is distributed among the final demand sectors.

Table 1.1 Schematic Of an I/O Transactions Table Showing the Four Quadrants of Accounts

\ SELLING INDUSTRIES & AGENCIES	PURCHASING INDUSTRIES & AGENCIES	
	QUADRANT 1 intermediate processing <<INTERDEPENDENT VARIABLES>>	QUADRANT 2 final demands <<INDEPENDENT VARIABLES>>
	QUADRANT 3 final payments <<DEPENDENT VARIABLES>>	QUADRANT 4

Reading <u>down</u> the first column displays farm purchases (inputs), or how farmers used their total sales revenues (the 55,000) to buy goods and services as factors of production. Purchases from farmers were again 8,000; 10,000 was spent for manufactured goods; 15,000 for household labor inputs; and 22,000 for all primary inputs which includes saving or profit. Each industry can be analyzed similarly.

An important concept is interdependence; each entry in the I/O account shown as a sale by one sector is also a purchase by another sector. In our example, the 5,000 at the intersection of the household row and the manufacturing column is a 5,000 sale by households to manufacturing and conversely a 5,000 purchase by manufacturing from households.

1.3.2 Quadrant 2: Final Demands

This quadrant accounts for the exogenous demand for goods and services made upon regional production capabilities. Since final demand is exogenously determined, it is in effect the driving force for the economy. According to the I/O model framework, if the spending in Quadrant 2 were to disappear, i.e. go to zero, the total economy of the region would also disappear. By exogenous we mean either that purchases of these goods and services are made by sectors located outside the region, or that factors which influence changes in these demands are outside the control of local business or personal spending decisions. In our small example model in Table 1.2, the final demands are 7,000, 21,000, and 13,000 for farming, manufacturing, and households, respectively (if households are assumed to be endogenous). The final demand spending represents sales which are not inputs to local processors but include all other sales. For example, exports could be for final use outside the region, final use inside the region by tourists, or intermediate inputs to processors located outside the region.

1.3.3 Quadrant 3: Primary Inputs (final payments sector)

This quadrant accounts for the purchases of inputs from industries outside the region and for other money flows which are not respent in the study region. Primary inputs are often termed leakages because they are the flow of money out of the economy to savings or to imports if regional industries are unable to produce needed inputs. The more self-sufficient a region is, the smaller these purchases of primary inputs will be and the more a region will depend upon its own industry. In the example transactions table, the farming, manufacturing, and household sectors purchase from primary inputs 22,000, 11,000, and 8,000 rupees of goods and services respecively (if households are assumed to be endogenous).

Table 1.2. Interindustry Model Transactions-Among-Sectors
(in rupees)

	1 FARMING	2 MANUFACTUR	3 HOUSEHOLDS	4 GOVT
1 FARMING	8,000	18,000	22,000	2,000
2 MANUFACTUR	10,000	2,000	3,000	1,000
3 HOUSEHOLDS	15,000	5,000	2,000	10,000
4 TAXES	0	1,000	3,000	0
5 DEPREC	4,000	1,000	0	1,000
6 RENTS	6,000	5,000	4,000	1,000
7 IMPORTS	12,000	4,000	1,000	6,000
COL TOTALS	55,000	36,000	35,000	21,000

Interindustry Model Transactions-Among-Sectors (continued)

	5 INVESTMENT	6 EXPORTS	7 CAP LOSSES	ROW TOTALS
1 FARMING	0	4,000	1,000	55,000
2 MANUFACTUR	1,000	19,000	0	36,000
3 HOUSEHOLDS	0	3,000	0	35,000
4 TAXES	0	0	0	4,000
5 DEPREC	0	0	0	6,000
6 RENTS	0	0	0	16,000
7 IMPORTS	0	0	0	23,000
COL TOTALS	1,000	26,000	1,000	175,000

1.3.4 Quadrant 4 - Primary Inputs to Final Demands (final payments sector)

The fourth quadrant records the primary inputs purchased directly by the sectors of final demand. If households are exogenous, a major entry in this quadrant will be the imports consumed directly by households and the taxes paid by households. Wages and transfers paid by government to households would also show up here. If households are endogenous (contained in Quadrant I), then savings and imports by government will primarily appear in this quadrant. In our example, governments purchased 8,000 rupees of goods and services from primary inputs (if households are considered to be endogenous).

1.4 The I/O Accounting Identity

Armed with the definitions of double entry accounts and descriptions of the four quadrants, we can demonstrate the accounting identity embedded in the I/O matrix. To do this we can use Table 1.3 which shows the four quadrants with notation for the highly aggregated accounts within each quadrant. The accounting identity is obtained by summing all the columns down and all the rows across.

Gross outlay by the ith industry, X_i, is obtained by summing down the ith column. Correspondingly, total gross outlay by all sectors in the region is obtained from summing the column totals:

$$X = (X_1+X_2+X_3 +...+ X_n) + C+G+I+E+L$$

where C is consumption, G is government, I is investment, E is exports, and L is capital losses (see Table 1.3). Thus, total regional outlay is the sum of all column totals of interindustry spending plus the sum of household consumption, state and federal government, investment, exports, and capital losses.

Gross output by the ith industry, X_i, is obtained by summing across the ith row. Correspondingly, total gross output by all sectors in the region is obtained by summing row totals:

$$X = (X_1+X_2+X_3+...+X_n) + H+T+D+R+M$$

where H is household wages, T is taxes, D is depreciation, R is rents, and M is imports (see Table 1.3). Thus, total regional output is the sum of the row totals of interindustry spending plus the sum of wages paid to households, taxes, depreciation, rents, and imports.

We can equate the two parts of the identity using the definition inherent in our I/O double entry accounting principle: total regional outlay is defined to equal total regional output. Thus:

$$(X_1+X_2+X_3+...+X_n)+C+G+I+E+L = (X_1+X_2+X_3+...+X_n)+H+T+D+R+M$$

By further noting that, for intermediate processing sectors, output equals input, we can cancel the processing quadrant flows $(X_1+ X_2+ X_3+...+X_n)$ for the above equation. This gives the desired result of regional final product measured in terms of final payments to factors equaling regional final product measured by final demand:

$$H+T+D+R+M = C+G+I+E+L$$

This identity holds only for the total of all final payment and final demand sectors of the region not for each sector individually.

The final step is to express gross regional income as equal to gross regional product. To obtain gross regional product, exports and imports can be netted out to create net exports (E-M). The accounting identity can now be displayed as:

$$H+V = C+L+G+I+(E-M)$$

where V is the other value added, i.e. V = R+T+D.

In this form, the identity shows that regional income, on the left hand side, is composed of wages and value added and equals gross regional product, on the right hand side, is composed of consumer spending plus capital losses plus government plus investment plus net exports. By subtraction of imports, I/O accounts can be converted to the analogous national income and product accounts (NIPA).

Table 1.3. Schematic of an I/O Transactions-Among-Sectors Table, Labeling the Accounts in the 4 Quadrants [1]/

\ SELLING INDUSTRY \ PURCHASING INDUSTRIES & AGENCIES							
	z_{11}	z_{12}	C_1	G_1	I_1	E_1	L_1
	z_{21}	z_{22}	C_2	G_2	I_2	E_2	L_2
	H_1	H_2	H^3	H_4	H_5	H_6	H_7
	T_1	T_2	T_3	T_4	T_5	T_6	T_7
	D_1	D_2	D_3	D_4	D_5	D_6	D_7
	R_1	R_2	R_3	R_4	R_5	R_6	R_7
	M_1	M_2	M_3	M_4	M_5	M_6	M_7

1/ The normally large intermediate processing sector in Quadrant 1 is aggregated to two industries to save space.

1.5 I/O Technical Coefficients

The technical coefficients, also called the direct requirements coefficients, are the fixed relationship between any sector's flow of output measured in rupees and inputs measured in rupees. The symbolic technical coefficients corresponding to the flows defined in Table 1.3 are shown in Table 1.4.

Table 1.4. Symbolic Technical Coeffecients Table

a_{11}	a_{12}	c_1	
a_{21}	a_{22}	c_2	<-----(A)
h_1	h_2	h_3	
t_1	t_2	t_3	
d_1	d_2	d_3	<-----(B)
r_1	r_2	r_3	
m_1	m_2	m_3	

A technical coefficient gives us direct requirements as a fraction or percent of total spending by an industry. A technical coefficient is the paisas of inputs each industry needs to produce a rupee of output. A technical coefficient is found by dividing the payment flow to each input supply sector (z_{ij}) by the purchasing industry's column total (X_j) and thus is a fraction of the total. The technical coefficients for our example region are shown in Table 1.5. To compute the coefficient of 0.1454, for farmers buying from farmers (coefficient a_{11}) we divide 8,000 by the column total of 55,000. The direct requirements for an industry can be found by reading down a column in Table 1.5. For each rupee of sales to final demand by farming, farmers buy 0.1454 from other farmers, 0.1818 from

Table 1.5. Technical Coefficients For the Example Economy
(Direct Requirements Coefficients)

	1 FARMING	2 MANUFACTUR	3 HOUSEHOLDS	
1 FARMING	.145454	.500000	.628571	local
2 MANUFACTUR	.181818	.055555	.085714	<--spending
3 HOUSEHOLDS	.272727	.138888	.057142	
4 TAXES	.000000	.027777	.085714	
5 DEPREC	.072727	.027777	.000000	
6 RENTS	.109090	.138888	.114285	<---leakages
7 IMPORTS	.218181	.111111	.028571	
COL TOTALS	1.000000	1.000000	1.000000	

manufacturing, and 0.2727 from households for a total of 0.60 rupee from industries in the region. Another 0.40 rupee is purchased from primary inputs (taxes, profits imports).

1.6 I/O Output Equilibrium

The accounting identity and the definition of technical coefficients provide the information necessary to complete the I/O modeling technique. We began by using the accounting identity for the demand side of the I/O accounts (column sums of the transactions table):

$$X = (X_1+X_2+X_3+ \ldots +X_n) + C+G+I+E+L$$

For our condensed example, these accounts would be:

175,000 = (55,000+36,000+35,000)+21,000+1,000+26,000+1,000

To develop the I/O data as a forecasting model we now turn our attention away from aggregated regional output and focus on the interindustry relations among the accounts. Each sector of the economy is in equilibrium when the sum of the interindustry demands plus the sum of the final demands for that same sector equals total gross output. For the ith industry, in the notation above, output equilibrium can be expressed as:

$$X_i = (z_{i1}+\ldots+z_{ij}+\ldots+z_{in})+(C_i+G_i+I_i+E_i+L_i)$$

Notice the similarity between this equation and the above regional aggregate. All that has changed is that we are dealing with a single industry (row of the transactions table) instead of the aggregates of industries. Thus we

have used the sum of the interindustry flows for the ith industry ($z_{i1}+\ldots+z_{ij}+\ldots+z_{in}$) instead of the aggregate for all industries ($X_1+X_2+X_3+\ldots+X_n$) and also the final demands for the ith industry instead of the aggregate final demands. For the household sector in the example this would be: 35,000 = (15,000+5,000+2,000)+10,000+0+3,000+0. Similar balance identities can be written for manufacturing and farming, the other two intermediate processing sectors in our example.

Conceptually, the three processing sectors of the example must always move toward a stable equilibrium where sales equal receipts in each industry. Receipts can be disturbed when final demands such as exports or government purchases from industry change. Changes in final demand set off a series of transactions as each industry responds to either direct or indirect changes in its demands. An example of direct change in demand would occur if agricultural exports increased, while an example of an indirect demand change could be the response of farmers acting to increase their output and, in so doing, purchasing more fuel, fertilizer, machinery, labor and similar inputs, thus creating the indirect or "derived" demand for other sectors of the economy. When the other sectors find their demand rising, they too will buy more inputs, and thus the original export change causes a series of reactions and reverberations throughout the economy. These reverberations gradually die out since, during each round of spending, part of the spending leaks out to saving, taxes, and imports. The greater the leakage the faster the effects die out, or the smaller the multiplier effect is said to be.

In our example model, there are three balance equations corresponding to the three dependent sectors of the model: farming, manufacturing, and households. These three sectors are assumed to react to satisfy all increased demands through a profit motive. Aggregating all exogenous values together as $Y_i = C_i+G_i+I_i+E_i+L_i$, $i=1\ldots3$, the three balance equations are:

$$X_1 = z_{11}+z_{12}+z_{13}+Y_1$$
$$X_2 = z_{21}+z_{22}+z_{23}+Y_2$$
$$X_3 = z_{31}+z_{32}+z_{33}+Y_3$$

where X_i is total output in industry i, the z's are transactions among the intermediate processing sectors, and Y_i stands for the total final demand for industry i. It is evident that we now have nine unknowns (the z's), which are the dependent intermediate spending flows among industries, and only three equations. A solution will not be possible for this system of simultaneous equations unless the number of unknowns can be reduced to equal the number of equations.

In order to reduce the number of unknowns to be equal with the number of balance equations, we can substitute the definition of technical coefficients in place of the z_{ij}'s. A sector's technical coefficient was defined as $a_{ij} = z_{ij}/X_j$. Thus we can replace the z's above with $z_{ij} = (a_{ij})(X_j)$. For our example economy, the technical coefficients are shown in Table 1.5. Now we can write the three balance equations as:

$$X_1 = 0.1454\ X_1 + 0.5000\ X_2 + 0.6286\ X_3 + Y_1$$
$$X_2 = 0.1818\ X_1 + 0.0556\ X_2 + 0.0857\ X_3 + Y_2$$
$$X_3 = 0.2727\ X_1 + 0.1389\ X_2 + 0.0571\ X_3 + Y_3$$

Equation sets of this type are easily solved by a microcomputer, and even a set of over 100 equations can be solved in less than five minutes. The solution is usually presented in the form of a table or matrix called the "inverse" or Leontief matrix after the founder of input-output.

The "inverse" matrix shows the "total requirements" per rupee of exports by the industry named at the head of the column. Total requirements are composed of direct and indirect requirements. If households is included as a dependent sector in Quadrant 1, then the total requirements are said to also include "induced" requirements. Each entry in the inverse matrix is an interdependency coefficient. Each coefficient, b_{ij}, represents the direct and indirect requirements of sector i per unit of final demand in the output of sector j.

The immediate impacts computed in the technical coefficients table (Table 1.5) are followed by even longer term effects which can be found by calculating "total requirements." Successive rounds of production and demand arise because suppliers need local inputs to make and sell their outputs. For example, from Table 1.5, if farmers increase output by 1, they must buy 0.18 worth of inputs from manufacturers. In turn, manufacturers must buy inputs from other industries, and so on. In this way, many direct requirements reciprocate throughout an economy. "Total requirements" coefficients indicate the cumulative influences of each industry on each other and back on itself. Total requirements of the second type -- direct, indirect and induced -are interpreted in our example (Table 1.6) as follows: if farming increases its output by 1 to satisfy final demand, sales among farms rise to 1.85; manufacturers, after successive rounds, will ultimately supply 0.41 worth of inputs; and households will supply 0.59 worth. Note that the total requirements are much larger than the direct requirements shown by the technical coefficients because the total requirements incorporate all

of the cumulative effects of each industry supplying each of the other industries to reach a new equilibrium of the economy, while the technical coefficients show only the initial round of spending.

Table 1.6. Total Requirements Coefficients, the Leontief Inverse Matrix and Business Multipliers

	1 FARMING	2 MANUFACTUR	3 HOUSEHOLDS
1 FARMING	1.847295	1.174792	1.338329
2 MANUFACTUR	.409599	1.333656	.394308
3 HOUSEHOLDS	.594678	.536272	1.505810
4 BUS. MULT.	2.851573	3.044722	3.238447

1.7 Business Multipliers

The business multiplier or output multiplier, for any sector i, is the sum of the direct and indirect (and induced) requirements from all sectors of the regional economy needed to sustain one additional rupee of output to final demand by sector i. The output multiplier is obtained by summing down the column of the inverse matrix for industry i. In the example (Table 1.6), the multiplier for the farming sector is 2.85 = 1.85 + 0.41 + 0.59.

The magnitude of the multiplier indicates the amount of demand stimulus that sector of the economy will create when it makes sales to final demand. Each entry in a column of the Leontief inverse shows the total production requirements from the sector at the left when the sector at the column head increases sales to final demand by one rupee. Sectors with large output multipliers have relatively small leakages in their direct and/or indirect purchases. In other words, a large multiplier means that the sector directly and indirectly purchases a larger proportion of its inputs from within the region instead of importing. Comparing multipliers for similar sectors across different regional I/O models thus gives a measure of the self sufficiency of a region.

The regions with larger multipliers often have greater development in the stages of intermediate production and are thus more able to supply the region's needs. In our example, we see that households has the largest multiplier of 3.24. This means that for a unit increase in sales by households to final demand, i.e. foreign earnings, total regional economic production will increase by 3.24.

1.8 The Input-Output Projection Technique

The input-output forecast procedure requires entry of new values for the exogenous final demands Y_1, Y_2, and Y_3; the computer will then solve for the values of X_1, X_2, and X_3 which are the total outputs for the three intermediate processing sectors, farming, manufacturing, and households. Table 1.7 illustrates the forecasting procedure. The economist provides estimates of future values of Y_1, Y_2, and Y_3 and enters these new final demands (in the case of the IMS program the changes in final demand are entered) into an I/O forecasting computer program. The computer solves the three equations shown above for the X_1, X_2, and X_3 values.

Table 1.7. **The I/O Forecasting Process**

\ SELLING INDUSTRIES & AGENCIES \ PURCHASING INDUSTRIES AND AGENCIES	FARMING	MANUFACT	HOUSEHOLDS	FINAL DEMAND	
	z_{11}	z_{12}	z_{13}	Y_1	X_1
	z_{21}	z_{22}	z_{23}	Y_2	X_2
	z_{31}	z_{32}	z_{33}	Y_3	X_3
	QUADRANT 3			QUADRANT 4	
	X_1	X_2	X_3		

Note that the data in Quadrant 3 and Quadrant 4 have not entered into the solution process directly. It might appear that Quadrants 3 and 4 were unnecessary but that is not

true. Without the knowledge of the leakages to saving, profit, taxes and imports, we could not have estimated the technical coefficients; and without the assumption of fixed technical coefficients we would have nine unknowns and only three equations, which is a system incapable of solution. (See Appendix A-1 for a brief discussion of the implications of the fixed technical coefficients assumption.)

Now that the computer has solved for the new total outputs (row totals) by industry, X_1, X_2, and X_3, the technical coefficients are used to distribute the X's down each column (in the same proportions as in the initial transactions table). This is possible because the column total for each processing industry is equal to the new row total which was solved for in the three equations. In this fashion, the computer provides us with a new transactions table which is consistent with the new final demands which we entered.

1.9 A Matrix Algebra Statement of I/O Equilibrium

The accounting identity and the definition of technical coefficients provide the information necessary to complete the I/O modeling technique. We began by using the accounting identity for the demand side of the I/O accounts (column sums of the transactions table):

$$X = (X_1+X_2+X_3+\ldots+X_n) + C+G+I+E+L.$$

For our condensed example, these accounts would be:

175,000 = (55,000+36,000+35,000)+21,000+1,000+26,000+1,000

To complete the I/O as a model we now turn our attention away from aggregated regional output and focus on the interindustry relations among the accounts. Each sector of the economy is in equilibrium when the sum of the interindustry outputs plus the sum of the final demands for that same sector equals total gross output. For the ith industry in the notation above, output equilibrium can be expressed as:

$$X_i = (z_{i1}+\ldots+z_{ij}+\ldots+z_{in})+(C_i+G_i+I_i+E_i+L_i)$$

Notice the similarity between this equation and the above regional aggregate. All that has changed is that we are dealing with a single industry (row of the transactions table) instead of the aggregates of industries. Thus we have used the sum of the interindustry flows for the ith industry $(z_{i1}+\ldots+z_{ij}+\ldots+z_{in})$ instead of the aggregate for

all industries ($X_1+X_2+X_3+...+X_n$) and also the final demands for the ith industry instead of the aggregate final demands. For the household sector in the example this would be:

$$35{,}000 = (15{,}000+5{,}000+2{,}000) + 10{,}000+0+3{,}000+0$$

To put all n industries into one equation we can use matrix algebra. To simplify notation, let Z equal the intermediate processing matrix (Quadrant 1) and Y equal the final demands matrix (Quadrant 2). The accounting equation for output can now be written as:

$$X = (Z)(U) + (Y)(U)$$

where U is a column vector of ones whose function is to provide conformation of matrices for addition and which results in the summation to column vectors of the matrices which it follows. Again, this is the statement in matrix form, that total output of the regional economy is composed of intermediate processing transactions and final demands, covering all sectors of the economy. The output equilibrium for the example economy shown in Table 1.2 is:

$$\begin{bmatrix} X_1 \\ X_2 \\ X_3 \end{bmatrix} = \begin{bmatrix} z_{11} & z_{12} & C_1 \\ z_{21} & z_{22} & C_2 \\ H_1 & H_2 & H_3 \end{bmatrix} \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix} + \begin{bmatrix} G_1 & I_1 & E_1 & L_1 \\ G_2 & I_2 & E_2 & L_2 \\ G_3 & I_3 & E_3 & L_3 \end{bmatrix} \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}$$

$$\begin{bmatrix} 55{,}000 \\ 36{,}000 \\ 35{,}000 \end{bmatrix} = \begin{bmatrix} 8{,}000 & 18{,}000 & 22{,}000 \\ 10{,}000 & 2{,}000 & 3{,}000 \\ 15{,}000 & 5{,}000 & 2{,}000 \end{bmatrix} \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix} +$$

$$\begin{bmatrix} 2{,}000 & 0 & 4{,}000 & 1{,}000 \\ 1{,}000 & 1{,}000 & 19{,}000 & 0 \\ 10{,}000 & 0 & 3{,}000 & 0 \end{bmatrix} \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}$$

In order to reduce the number of unknowns to be equal to the number of balance equations, we can substitute the definition of technical coefficients in place of the z_{ij}'s. A sector's technical coefficient was defined as $a_{ij} = z_{ij}/X_j$, thus the n by n matrix of technical coefficients is:

$$A=(Z)(X^{\sim})^{-1}$$

where Z is the intermediate processing flows and $X^{\sim}$ is a matrix with the total output vector on the main diagonal and zeros elsewhere. The technical coefficients for the example model are shown in Table 1.5. (Note that an inverse of a diagonal matrix is simply a diagonal matrix of the reciprocals of the original elements.)

$$\begin{bmatrix} a_{11} & a_{12} & c_1 \\ a_{21} & a_{22} & c_2 \\ h_1 & h_2 & c_3 \end{bmatrix} = \begin{bmatrix} z_{11} & z_{12} & C_1 \\ z_{21} & z_{22} & C_2 \\ H_1 & H_2 & H_3 \end{bmatrix} \begin{bmatrix} 1/X_1 & 0 & 0 \\ 0 & 1/X_2 & 0 \\ 0 & 0 & 1/X_3 \end{bmatrix}$$

$$\begin{bmatrix} .145454 & .500000 & .628571 \\ .181818 & .055555 & .085714 \\ .272727 & .138888 & .057142 \end{bmatrix} =$$

$$\begin{bmatrix} 8,000 & 18,000 & 22,000 \\ 10,000 & 2,000 & 3,000 \\ 15,000 & 5,000 & 2,000 \end{bmatrix} \begin{bmatrix} 1/55,000 & 0 & 0 \\ 0 & 1/36,000 & 0 \\ 0 & 0 & 1/35,000 \end{bmatrix}$$

Post multiplying through by $X^{\sim}$ and rearranging terms gives us an expression for the intermediate processing quadrant Z:

$$Z=(A)(X^{\sim})$$

$$\begin{bmatrix} z_{11} & z_{12} & z_{13} \\ z_{21} & z_{22} & z_{23} \\ z_{31} & z_{32} & z_{33} \end{bmatrix} = \begin{bmatrix} a_{11} & a_{12} & c_1 \\ a_{21} & a_{22} & c_2 \\ h_1 & h_2 & h_3 \end{bmatrix} \begin{bmatrix} X_1 & 0 & 0 \\ 0 & X_2 & 0 \\ 0 & 0 & X_3 \end{bmatrix}$$

$$\begin{bmatrix} 8{,}000 & 18{,}000 & 22{,}000 \\ 10{,}000 & 2{,}000 & 3{,}0000 \\ 15{,}000 & 5{,}000 & 2{,}000 \end{bmatrix} =$$

$$\begin{bmatrix} .145454 & .500000 & .628571 \\ .181818 & .055555 & .085714 \\ .272727 & .138888 & .057142 \end{bmatrix} \begin{bmatrix} 55{,}000 & 0 & 0 \\ 0 & 36{,}000 & 0 \\ 0 & 0 & 35{,}000 \end{bmatrix}$$

For the example, intermediate processing flows expressed in terms of the matrix of technical coefficients is illustrated above. This term, $(A)(X^{\sim})$, we will substitute into the accounting equation in place of Z. Output equilibrium in the regional economy can now be stated as:

$$X = (A)(X^{\sim})(U)+(Y)(U)$$

which reduces to:

$$X = (A)(X)+(Y)(U), \text{ since } (X^{\sim})(U) = X$$

Further, we can solve the equation for final demands by isolating the final demand vector:

$$X - (A)(X) = (Y)(U)$$

which can be restated as:

$$(I-A)(X) = (Y)(U)$$

where I is the identity matrix with ones on the diagonal and zeros elsewhere and U is a column vector of ones.

This output equilibrium shows the amount of output from each of the sectors necessary to supply the exogenously determined final demands.

$$\begin{bmatrix} X_1 \\ X_2 \\ X_3 \end{bmatrix} - \begin{bmatrix} a_{11} & a_{12} & c_1 \\ a_{21} & a_{22} & c_2 \\ h_1 & h_2 & h_3 \end{bmatrix} \begin{bmatrix} X_1 \\ X_2 \\ X_3 \end{bmatrix} = \begin{bmatrix} Y_1 \\ Y_2 \\ Y_3 \end{bmatrix}$$

$$\begin{bmatrix} 1 & 0 & 0 & -a_{11} & -a_{12} & -c_1 \\ 0 & 1 & 0 & -a_{21} & -a_{22} & -c_2 \\ 0 & 0 & 1 & -h_1 & -h_2 & -h_3 \end{bmatrix} \begin{bmatrix} X_1 \\ X_2 \\ X_3 \end{bmatrix} = \begin{bmatrix} Y_1 \\ Y_2 \\ Y_3 \end{bmatrix}$$

$$\begin{bmatrix} (1-a_{11}) & -a_{12} & -c_1 \\ -a_{21} & (1-a_{22}) & -c_2 \\ -h_1 & -h_2 & (1-h_3) \end{bmatrix} \begin{bmatrix} X_1 \\ X_2 \\ X_3 \end{bmatrix} = \begin{bmatrix} Y_1 \\ Y_2 \\ Y_3 \end{bmatrix}$$

For the example this is:

$$\begin{bmatrix} .854545 & -.500000 & -.628571 \\ -.181818 & .944444 & -.085714 \\ -.272727 & -.138888 & .942857 \end{bmatrix} \begin{bmatrix} 55,000 \\ 36,000 \\ 35,000 \end{bmatrix} = \begin{bmatrix} 7,000 \\ 21,000 \\ 13,000 \end{bmatrix}$$

Final demands can exist at any given positive level and regional production is assumed to be able to fulfill those demands.

The goal of solving the equilibrium statement for regional production is accomplished in several steps:[1]

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

For ease of notation, the Leontief matrix is relabelled as $B = (I-A)^{-1}$. Thus:

$$X = (B)(Y)(U).$$

$$\begin{bmatrix} X_1 \\ X_2 \\ X_3 \end{bmatrix} = \begin{bmatrix} (1-a_{11}) & -a_{12} & -c_1 \\ -a_{21} & (1-a_{22}) & -c_2 \\ -h_1 & -h_2 & (1-h_3) \end{bmatrix}^{-1} \begin{bmatrix} Y_1 \\ Y_2 \\ Y_3 \end{bmatrix}$$

$$\begin{bmatrix} 55{,}000 \\ 36{,}000 \\ 35{,}000 \end{bmatrix} =$$

$$\begin{bmatrix} .854545 & -.500000 & -.628571 \\ -.181818 & .944444 & -.085714 \\ -.272727 & -.138888 & .942857 \end{bmatrix}^{-1} \begin{bmatrix} 7{,}000 \\ 21{,}000 \\ 13{,}000 \end{bmatrix}$$

In this form, the equilibrium shows the "total requirements" in matrix B which are composed of direct and indirect requirements. If the household sector is included in Quadrant 1, then the total requirements are said to include "induced" requirements in addition to direct and indirect requirements. Each entry in the inverse matrix is sometimes called an interdependency coefficient. Each

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[1]. The inversion of the Leontief matrix of course assumes that the matrix is nonsingular i.e. that $|I-A|$ N.E. O.

coefficient, b_{ij}, represents the direct and indirect requirements of sector i per unit of final demand sold by sector j.[2] By setting the level of final demands at any level we can now obtain the gross regional economic activity (direct, indirect, and induced, thus total) in each sector that goes to supplying that level of demand.

This solution has a more intuitive explanation than equilibrium conditions for demand. The immediate impacts computed in the direct requirements table are followed by even longer term effects which can be found by calculating "total requirements." Successive rounds of production and demand arise because suppliers need local inputs to make and sell their outputs. For example, from Table 1.5, if farmers increase output by 1, they must buy 0.18 worth of inputs from manufacturers. In turn, manufacturers must buy inputs from other industries, and so on. In this way, many direct requirements reciprocate throughout an economy. "Total requirements" determine the cumulative influences of each industry on each other and back on itself. Total requirements of the second type --direct, indirect and induced-- are interpreted in our example (Table 1.6) as follows: if farming increases its output by 1 to satisfy final demand, sales among farms rise to 1.85; manufacturers, after successive rounds, will ultimately supply 0.41 worth of inputs; and households will supply 0.59 worth.

1.10 Measuring Inflation Impacts Caused by Primary Inputs

The input-output (I/O) accounts provide a framework for a wide variety of analyses. Here, the I/O accounts are utilized in an unconventional manner in order to trace and quantify the inflationary impacts of changes in the prices or margins of the "primary" inputs on the intermediate processing part of the economy. The purpose of the analysis is to measure the amount of processing sector inflation, on an industry by industry basis, caused by cost changes of the" primary" inputs. Primary inputs include all inputs that are not created by local producers. Examples of primary input inflation include, rising tax rates, changes in the terms of trade or duties which raise import costs, inflation in the costs of certain imports such as energy, or increases in the markup or profit rate in certain industries.

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[2] In calculus terms, $b_{ij} = dX_i/dY_j$, the change in the ith sector of the regional economy when the jth final demand changes by an infinitesimal amount.

This section will contrast this "primary" inputs-driven inflation analysis with the conventional final demand driven I/O model, and provide some examples of the application of the I/O primary input driven inflation model.

The goal of the primary input inflation analysis is to show the total effects or multiplier relationship between the price indices on each of the primary inputs and the intermediate processing sector price indices (P_1 ... P_3). The prices or rates on the primary inputs are taken as exogenous. Changes in import prices, tax rates, profit margin rates, etc. lead to direct and indirect cost effects on the intermediate processing sectors. The relationship between the intermediate processing industry price indices and primary input prices or margins will be derived below.

Two major differences exist between the I/O price analysis framework and the I/O total requirements multiplier analysis discussed above. First, the conventional I/O analysis constructs balance equations which sum across rows of the transactions-among-sectors table. In contrast, the I/O price analysis constructs equations which sum down columns of the transactions-among-sectors table. Secondly, the conventional I/O multiplier analysis is demand-driven: exogenous changes in final demand create the driving force for production by the economy. In contrast, the I/O price analysis is driven by exogenous changes in the price indices of final payments, i.e. primary inputs. The conventional I/O model focuses on Quadrants 1 and 2 of the transactions-among-sectors table while the I/O price analysis focuses on Quadrants 1 and 3.

While the conventional I/O analysis is based upon the production balance equation definitions, the I/O price analysis is based upon industry price index definitions. Define price indices for the three intermediate processing industries as P_1, P_2, and P_3 respectively. Assume that these price indices are weighted averages of the prices (actually index numbers themselves since each I/O industry is an aggregate of many industries)[3] on each of the input sectors selling to the processing industries. Each intermediate processing sector can purchase from itself, from the other intermediate processing sectors, and from

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[3] Henderson and Quandt, and Miller and Blair describe similar price models except that they treat prices as actual input values not as index numbers and their technical coefficients refer to physical production relations rather than the usual I/O spending flow relationships.

each of the primary inputs sectors. Thus, the price index for industry j is defined as:

$$P_j = a_{1j}\ P_1 + a_{2j}\ P_2 + h_j\ P_3 + t_j\ P_4 + d_j\ P_5 + r_j\ P_6 + m_j\ P_7$$
$$j = 1 \ldots 3.$$

This price index uses the spending share coefficients down column j of the technical coefficients table as weights on the price indices for each input purchased by industry j. (see Table 1.4). The technical coefficients, or spending shares, are a conventional weighting method for a price index. For example, the Laspeyres price index, like the consumer price index, uses spending shares to weight price relatives of a market basket of goods and services. Further define matrices A and B as shown in Table 1.4. Matrix A is the matrix of the technical coefficients for the intermediate processing sectors while B is the matrix of technical coefficients on the primary input sectors. The price indices for the intermediate processing sectors, $P_1 \ldots P_3$, can be expressed in matrix terms as:

$$\begin{aligned}
(P) - (A^T)(P) &= (B^T)(R) \\
(I-A^T)(P) &= (B^T)(R) \\
(I-A^T)^{-1}(I-A^T)(P) &= (I-A^T)^{-1}\ (B^T)(R) \\
(I)(P) &= (I-A^T)^{-1}\ (B^T)(R) \\
(P) &= (I-A^T)^{-1}\ (B^T)(R) \\
(P) &= [(I-A)^{-1}]^T\ (B^T)(R)
\end{aligned}$$

where the superscript T denotes a transposed matrix, P is column vector of intermediate processing sector price indices, R is a column vector of primary input price indices, and matrices A and B are the technical coefficients for intermediate inputs and primary inputs respectively. The total price effect on the intermediate processing sectors (P), is directly and indirectly related to the vector of index numbers on the primary input sectors (R), by the transpose of the Leontief inverse $[(I-A)^{-1}]^T$, times the transpose of the technical coefficients on the primary inputs (B^T). Thus, a slight manipulation of the conventional Leontief inverse and the primary input coefficients from the I/O model provides the multiplier between any primary input price index (markup, tax increase, import duty, etc.) and each of the price indices on the intermediate processing industries of the economy.

1.11 The Stone Model

A related model has been constructed by Richard Stone. He derives the balance equations down instead of across the transactions table as in the conventional I/O model. Once

again, using the notation described in Table 1.3, Stone's model becomes:

$$
\begin{aligned}
(X) &= (Z^T)(U) + (X^{\sim})(B^T)(U), \\
(X^{\sim})^{-1}(X) &= (X^{\sim})^{-1}(Z^T)(U) + (X^{\sim})^{-1}(X^{\sim})(B^T)(U) \\
(U) &= (A^T)(U) + (B^T)(U) \\
(U)-(A^T)(U) &= (B^T)(U) \\
(U)(I-A^T) &= (B^T)(U) \\
(U) &= (I-A^T)^{-1}(B^T)(U) \\
(U) &= [(I-A)^{-1}]^T (B^T)(U)
\end{aligned}
$$

where U is a column vector of ones, the T superscript denotes a transposed matrix, and $X^{\sim}$ is a matrix with X values on the main diagonal and zeros elsewhere.

When Stone's model is contrasted to the primary input price index model, the similarity is apparent. The right hand side of Stone's final equation differs only because the vector of primary input prices is replaced with the vector of ones. Thus Stone has set all price indices on primary inputs at unity and he derives the direct and indirect intermediate price indices on the left of the equation as also equal to unity. Stone's model is thus a special case of the more general Leontief price index model when the price indices are unity (the base period). If Stone had multiplied both sides of his equations by the vector of primary input price indices his results would be identical to the Leontief price multipliers. Thus the Stone-derived I/O balance equations (down columns of the transactions table) are equivalent to the spending share weighted price index aggregation model. Sector prices in the I/O model are consistent with conventional methods of price aggregation. This was Stone's main point.

1.12 Example Calculations of the Leontief Price Multipliers

A small example I/O model is shown in Table 1.8. These data will be used to calculate the technical coefficients matrix and the Leontief inverse which are shown in Tables 1.9 and 1.10 respectively. The transpose of the Leontief inverse and the transpose of the primary inputs technical coefficients are multiplied times the vector of primary input price indices to calculate the Leontief price multipliers, as in the formula:

$$(P) = [(I-A)^{-1}]^T (B^T)(R).$$

Table 1.8. Transactions-Among-Sectors Table

	1 FARMING	2 MANUFACTUR	3 HOUSEHOLDS
1 FARMING	8000.	18000.	22000.
2 MANUFACTUR	10000.	2000.	3000.
3 HOUSEHOLDS	15000.	5000.	2000.
4 TAXES	0.	1000.	3000.
5 DEPREC	4000.	1000.	0.
6 RENTS	6000.	5000.	4000.
7 IMPORTS	12000.	4000.	1000.
TOTALS	55000.	36000.	35000.

Transactions-Among-Sectors Table (continued)

	4 GOVT	5 INVESTMENT	6 EXPORTS	7 CAP LOSSES
1 FARMING	2000.	0.	4000.	1000.
2 MANUFACTUR	1000.	1000.	19000.	0.
3 HOUSEHOLDS	10000.	0.	3000.	0.
4 TAXES	0.	0.	0.	0.
5 DEPREC	1000.	0.	0.	0.
6 RENTS	1000.	0.	0.	0.
7 IMPORTS	6000.	0.	0.	0.
TOTALS	21000.	1000.	26000.	1000.

Table 1.9. Technical Coefficients Matrix

	1 FARMING	2 MANUFACTUR	3 HOUSEHOLDS
1 FARMING	0.145454	0.500000	0.628571
2 MANUFACTUR	0.181818	0.055555	0.085714
3 HOUSEHOLDS	0.272727	0.138888	0.057142
4 TAXES	0.000000	0.027777	0.085714
5 DEPREC	0.072727	0.027777	0.000000
6 RENTS	0.109090	0.138888	0.114285
7 IMPORTS	0.218181	0.111111	0.028571

Table 1.10. Leontief Inverse Matrix With Households Endogenous

	1 FARMING	2 MANUFACTUR	3 HOUSEHOLDS
1 FARMING	1.847295	1.174792	1.338329
2 MANUFACTUR	.409599	1.333656	.394308
3 HOUSEHOLDS	.595678	.536272	1.505810
4 BUS. MULT.	2.851573	3.044722	3.238447

Leontief Inverse Matrix with Households Endogenous (contd)

$$\begin{bmatrix} P_{FARM,i} \\ P_{MFG,i} \\ P_{HH,i} \end{bmatrix} = \text{where } i = 1...4, \text{ for tax, depreciation, rent or imports respectively.}$$

$$\begin{bmatrix} 1.8473 & 0.4096 & 0.5947 \\ 1.1748 & 1.334 & 0.5363 \\ 1.3383 & 0.3943 & 1.5058 \end{bmatrix} \begin{bmatrix} 0.0000 & 0.0727 & 0.1091 & 0.2180 \\ 0.0278 & 0.0278 & 0.1389 & 0.1111 \\ 0.0857 & 0.0000 & 0.1143 & 0.0286 \end{bmatrix} \begin{bmatrix} R_{TAX} \\ R_{DEPR} \\ R_{RENT} \\ R_{IMP} \end{bmatrix}$$

$$= \begin{bmatrix} 0.0624\ R_{TAX} + 0.1456\ R_{DEPR} + 0.3263\ R_{RENT} + 0.4657\ R_{IMP} \\ 0.0831\ R_{TAX} + 0.1224\ R_{DEPR} + 0.3748\ R_{RENT} + 0.4197\ R_{IMP} \\ 0.1402\ R_{TAX} + 0.1085\ R_{DEPR} + 0.3720\ R_{RENT} + 0.3792\ R_{IMP} \end{bmatrix}$$

Each row of the Leontief Price Matrix shows the effect of each of the primary input prices on a given intermediate processing industry. If all four primary input prices were to double simultaneously, i.e. if all R values increased to 2.0, then it is easily seen that all three intermediate processing industry prices will also double. This is because the coefficients in the price multiplier matrix shown above sum to unity across the rows. The result is consistent with Stone's paper. It is apparent from this result that intermediate processing sector prices are assumed to be totally dependent in this formulation. Independent movement of the intermediate processing prices is impossible (such as might occur with union or business monopolization, or crop failure etc.). Thus, just as the intermediate processing sector sales are totally dependent on final demand values in the conventional Leontief I/O model, the intermediate processing sector prices are totally dependent in the Leontief price model. In the Leontief price multiplier however, it is primary input prices, not final demands, that drive the model.

The price matrix can be used to find the effects of inflation, in any combination in the primary inputs prices, on each of the intermediate processing sector prices. Comparison of the coefficients reveals that household wages, farm prices, and manufacturing prices, are all more sensitive to changes in the prices of imports, R_{IMP}, than to other primary input prices.

The coefficients times one hundred indicate the effect of a 100 percent rise of the indicated primary input price. Thus, if taxes double, then farm prices will rise by 12.48 percent, manufacturing prices will rise by 16.62 percent, and household wages will rise by 28.04 percent. This is based upon the direct and indirect cost components of the inputs (including intermediate processing sector production) to the three intermediate processing industries.

Since the household sector is likely to be an instigator of price rises and also may not be forced to pass along cost increases like a competitive industry must, it may be preferable to construct the Leontief price multipliers with households defined as a primary input rather than an intermediate processing sector. The households endogenous model shown in our example is useful, however, to analyze an economy that has abundant labor supplies, many small firms, and weak unions. Comparison of the relative sizes of the coefficients in the price multiplier matrix indicates that, of the four primary inputs, a given percentage rise of import prices has the greatest overall impact on intermediate processing sector costs. Doubling of import prices (perhaps due to decline in the value of the country's money relative to the exporting nations) results in a rise of some 93.16 percent in farm prices, 83.96 percent in manufacturing prices, and 75.78 percent in household living costs. Since imports are a much smaller share of the total budget for these sectors than 93 percent to 76 percent, it is clear that the Leontief price multipliers include the indirect and induced effects of higher import costs throughout the economy.

1.13 Combining I/O With Linear Programming Analysis

A small input-output (I/O) model is used to demonstrate the use of linear programming optimization within the I/O framework. An I/O model with two endogenous intermediate processing sectors driven by one exogenous final demand sector and supplied by two final payments sectors is used to show the uses, as well as the assumptions and limitations, of the technique. Applications of linear programming with I/O include the maximization of value

added (growth of regional product), and the maximization of net exports (growth of regional wealth), subject to the constraints provided by the interdependency matrix of the I/O system and other physical constraints such as water or energy inputs.

Table 1.11. Transactions-Among-Sectors

Selling Industry \ Purchasing Industries	X_1	X_2	Y	
X_1	4	2	4	10
X_2	3	1	6	10
VA	1	4	0	5
IM	2	3	8	13
	10	10	18	38

1.14 The Example I/O Model

An example of input-output transactions is shown in Table 1.11. Sectors X_1 and X_2 are the two intermediate processing industries, Y is final demands, and VA and IM are value added and imports respectively. Given the total outlay of ten by both industries, the technical coefficients are shown in matrix A as:

$$A = \begin{bmatrix} .4 & .2 \\ .3 & .1 \end{bmatrix} \quad \text{and} \quad I-A \text{ is;} \quad \begin{bmatrix} .6 & -.2 \\ -.3 & .9 \end{bmatrix} \text{ so that the}$$

Leontief inverse or interdependency matrix becomes:

$$\left[I-A \right]^{-1} = \begin{bmatrix} 1.875 & .4166 \\ .6250 & 1.2500 \end{bmatrix}$$

and the output multipliers (column sums of the inverse) are 2.500 and 1.666 for industries X_1 and X_2 respectively.

The basis for the multiplier calculation is the assumption of equilibrium balance equations such that sales by each industry to intermediate and final demands is equal to their cost of production plus profit or:

$$z_{11} + z_{12} + Y_1 = X_1$$
$$z_{21} + z_{22} + Y_2 = X_2$$

where the z's are the intermediate processing demands, the Y's are final demands, and the X's are total gross outlays (including retained earnings) for the two industries.

Since only the final demands (Y's) are known, the two simultaneous balance equations contain six unknown variables which must be reduced to two if a solution is to be obtained. The assumption of fixed technical coefficients allows substitution to eliminate the z's leaving only X_1 and X_2 as unknowns. The technical coefficients represent production technology and trade flow constants assumed to be fixed spending shares down each purchases column of the transactions table. The technical coefficients or spending shares are given by:

$$a_{11} = z_{11}/X_1,\ a_{12} = z_{12}/X_2,\ a_{21} = z_{21}/X_1 \text{ and } a_{22} = z_{22}/X_2$$

Substitution into the balance equations results in:

$$a_{11} X_1 + a_{12} X_2 + Y_1 = X_1$$
$$a_{21} X_1 + a_{22} X_2 + Y_2 = X_2$$

or

$$(1-a_{11}) X_1 - a_{12} X_2 = Y_1$$
$$a_{21} X_1 + (1-a_{22}) X_2 = Y_2$$

which can be expressed in matrix algebra as

$$\begin{bmatrix} I - A \end{bmatrix} \begin{bmatrix} X \end{bmatrix} = \begin{bmatrix} Y \end{bmatrix} \quad \text{or}$$

$$\begin{bmatrix} X \end{bmatrix} = \begin{bmatrix} I - A \end{bmatrix}^{-1} \begin{bmatrix} Y \end{bmatrix}$$

In addition to the economic interdependencies expressed in the I/O tables, there exists a water limit of 5,000,000 units per year in the region. Industry 1 requires 4,000 units of water per rupee of output while Industry 2 requires only 100 units of water per rupee of output produced. (Industry 1 is clearly agriculture.) The water constraint can be expressed as the industry water use coefficients times the sales for each industry set equal to the annual water use limit of 5,000,000:

$$W_1 X_1 + W_2 X_2 = 5{,}000{,}000$$

or for our example:

$$4{,}000 X_1 + 100 X_2 = 5{,}000{,}000$$

The combined I/O LP model now has at least five equations relating X_1 and X_2.

The two balance equations can be expressed in a form to be plotted in Figure 1.1 as:

$$X_1 = a_{12}/(1-a_{11}) X_2 + Y_1/(1-a_{11})$$
$$X_1 = (1-a_{22})/a_{21} X_2 - Y_2/a_{21}$$
(where all $a_{ij} < 1.0$)

The two balance equations can be identified on the graph: since the first equation (for industry 1 since it sells to final demand Y_1) has a positive intercept value of $Y_1/(1-a_{11})$, it is the flatter of the two balance equations, with an intercept of $Y_1/0.6$. The balance equation of Industry 2 is steeper and has a negative intercept at $- Y_2/0.3$.

The water constraint can be graphed for its maximum value of 5,000,000 as $X_1 = 1{,}250 - 1/40 X_2$. While the I/O constraints are equalities, the water constraint is really an inequality since available water need not all be used. Note that the I/O balance equations are positively sloped,

indicating that one industry cannot expand without concurrent expansion of the other. This shows the interdependent nature of the economy. The water constraint line is negatively sloped, indicating a tradeoff between the two water using industries. When all 5,000,000 units of water have been used, if Industry 1 reduces its output this releases water, allowing Industry 2 to expand further and vice versa. However, if less that 5,000,000 units of water are used, then the constraint is not binding and industries are free to expand without limit along the balance equation lines below the water constraint line.

The I/O equilibrium condition is shown in Figure 1.1 by the intersection of the two balance equations. A new equilibrium intersection point is reached whenever Y_1 or Y_2 change. If Y_1 (final demand for Industry 1) falls, then the equilibrium point will slide down the balance equation for Industry 2 and vice versa. Figure 1.1 demonstrates that it is impossible for the I/O industry outputs to change unless there is a change in one or more of the final demands. It also shows that if both final demands are zero, $Y_1 = Y_2 = 0$, equilibrium output for all industries is also zero, thus a commercial economy exists only if there are positive final demands.

An import requirements equation can be derived by using the technical coefficients based on the transactions table values. Imports are 0.2 of X_1 and 0.3 of X_2, yielding the equation:

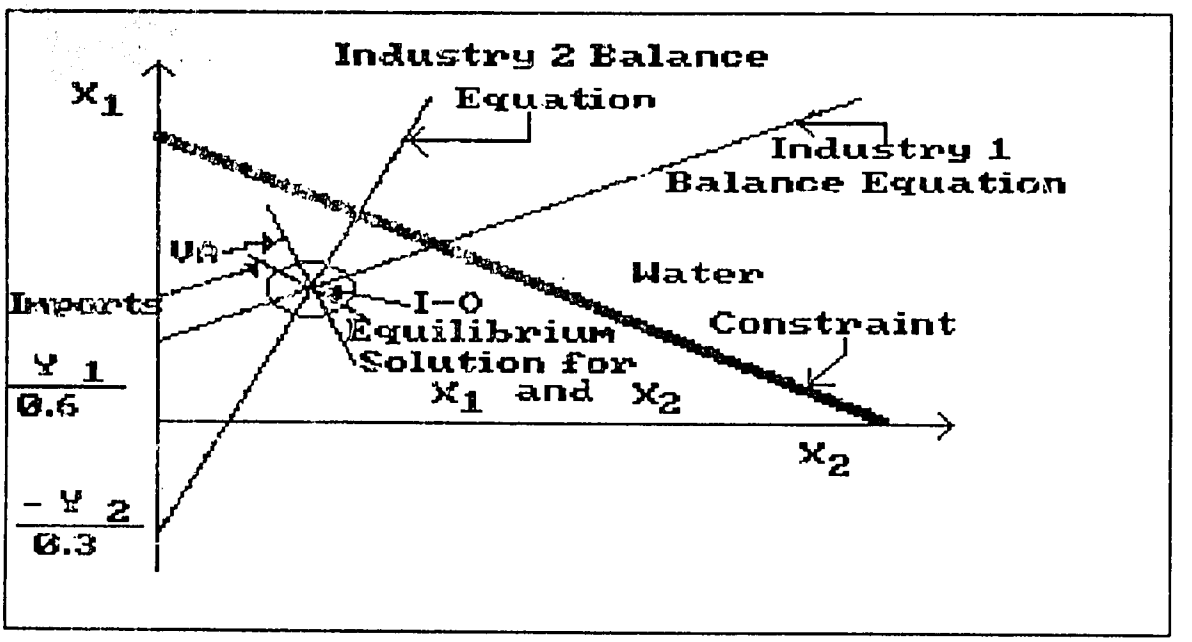
$$IM = 0.2\ X_1 + 0.3\ X_2 \text{ or } X_1 = 5\ IM - 1.5\ X_2$$

The import requirements line in Figure 1.1 must intersect the equilibrium point for the economy where the two balance equations cross because it is the equilibrium X values that are used to calculate import requirements. A similar situation exists for the value added equation which is:

$$VA = 0.1\ X_1 + 0.4\ X_2 \quad \text{or} \quad X_1 = 10\ VA - 4\ X_2$$

A comparison of the coefficients on X_2 for the imports and value added equations shows that the steeper of the two lines is for the value added function. The slope of the value added function indicates the relative effectiveness of the two industries in creating value added. The value added line is very steep (with a slope of -4) since it takes four times as much of X_1 as it does of X_2 to create the same value added.

Figure 1.1. Unconstrained I/O Equilibrium



1.15 Linear Programming Optimization of Regional Product (VA)

A specific goal variable and specific choice variables must be stipulated for optimization. A first example will assume a goal of maximum value added, which is equivalent to maximum regional product. It is further assumed that the policy tools are the final demands Y_1 and Y_2. The final demand variables are the exports of goods produced by Industries 1 and 2. The remaining variables of the model are the outlays (outputs) of Industries 1 and 2, X_1 and X_2.

In this condensed example, a graph alone would be sufficient to discover the linear programming solution. Since X_2 is four times as effective in creating value added as X_1, the final demand for Industry 1 will be diminished to zero while the final demand for Industry 2 will be set to its maximum possible level as allowed by the available water input of 5,000,000 units. Thus, in the graph shown in Figure 1.2, the Industry 1 balance line will shift rightward as far as it can, i.e. to where the intercept value $Y_1/(1-a_{11})$ is zero. The balance line passing through the origin represents the supply of intermediate inputs to Industry 2 by Industry 1. Industry 1 has been reduced to a service sector with no final demand sales. The balance line for Industry 2 will also shift rightward as far it can--

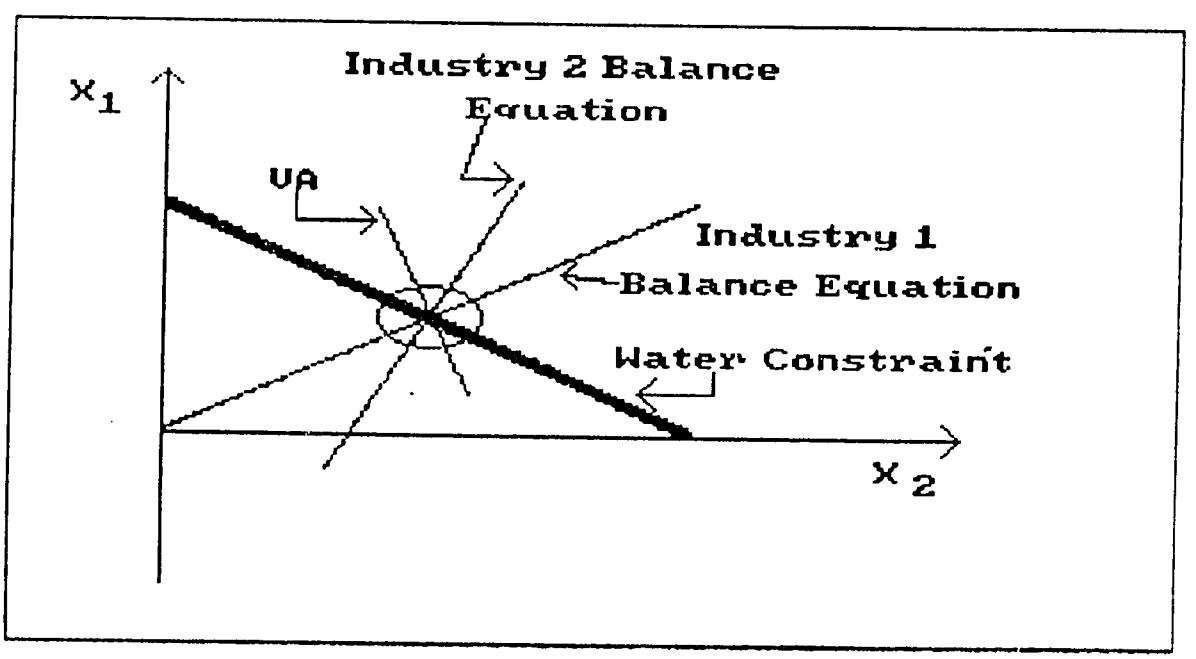
to the point where the Industry 1 balance line intersects the water constraint line.

1.16 Policy Implications Affected by Characteristics of the Water Constraint Vis-a-Vis the Objective Function

At this optimal equilibrium, shown in Figure 1.2, no greater value added can be achieved unless the water constraint shifts out or the industry technology shown by the two I/O balance lines changes. For example, if the balance line for production by Industry 1 became flatter, then a new equilibrium could be reached with increased value added.

Inspection of the equation for the balance line of Industry 1 reveals the slope is $a_{12}/(1-a_{11})$ which becomes smaller as either a_{12} or a_{11} become smaller. Less use of input X_1 in both industries is desired in order to increase value added. Intuitively, industry X_1 is the best one to substitute out of because the industry water requirements are 4,000 units of water per unit of X_1 produced as compared to only 100 units of water to produce a unit of X_2. However, it is the relative slopes of the water constraint line and the value added objective function which determine which industry to contract. If the water constraint line had been steeper than the value added objective function, it would be Industry 2, not Industry 1, which was reduced to a mere service sector.

Figure 1.2. Constrained I/O Equilibrium



Another type of policy implication suggests minimizing the use of X_1 both for final demand sales and substitution, or technology change to reduce intermediate production use as well. This latter result provides an example of the advantages of parametric programming whereby the various technical coefficients can be iterated to test for the effects on the optimization outcome. (Unfortunately the Lindo linear programming package will only parameterize the right hand side constant.)

1.16.1 An Intuitive Solution

Optimal production to maximize value added will occur at the intersection of the Industry 1 balance line and the water constraint line. Total water is 5,000,000 and final demand Y_1 is zero. Given this information, the solution involves only the balance equation $X_1 = (.2/1-.4)\ X_2 + Y_1/(1-.4)$, where $Y_1 = 0$, and the water constraint $4{,}000\ X_1 + 100\ X_2 = 5{,}000{,}000$. Substitution of these two equations results in $X_1 = 1{,}162.8$ and $X_2 = 3{,}488.4$.

1.16.2 Solution Using Lindo

The I/O linear program can be formulated in several ways. One way is to enter the functions which are plotted on the graphs. The following entries were made in Lindo, a computer program designed to solve linear programming problems:

```
MAX   0.1 X1 + 0.4 X2
SUBJECT TO
0.6 X1 -0.2 X2 -Y1 = 0
-0.3 X1 + 0.9 X2 - Y2 =0
4000 X1 + 100 X2 < 5000000
X1 => 0
X2 => 0
```

where value added is maximized subject to the two I/O balance equations expressed as equal to zero and the water constraint expressed less than or equal to maximum available water. The solution values found by Lindo were: $X_1 = 1{,}162.791$, $X_2 = 3{,}488.372$, $Y_1 = 0.0$ and $Y_2 = 2{,}790.698$. The optimal value found of value added was VA = 1,511.628. The solution required three iterations. Non-zero dual prices are shown for Industry 1 and for the water constraint. The shadow price for water is 0.000302 indicating that for every unit of water added above the 5,000,000 units currently available the value added will

rise by 0.000302. The shadow price for Industry 1 (-1.85), indicates that for every unit increase in final demand sales by Industry 1, the cost is 1.85 units of value added. Value added sales by Industry 1 were set to zero in the optimization. The shadow price on final demand sales by Industry 2 is zero because this is the choice variable which was maximized in order to optimize the value added function. Thus any increase in Y_2 is costless in terms of value added since it is the source of any value added increase.

The LP problem was reformulated to include the added statement $Y_1 > 1.0$ and a new solution was found for value added equal to 1,509.778 showing the opportunity cost of maintaining final demand sales equal to one is 1.85 as was indicated by the shadow price found in the first LP run. A third run was made in which the water constraint right hand side was increased from 5,000,000 to 6,000,000 and the new maximum value added was 1,813.954 which is consistent with the shadow price of water of 302 per million found in the first run. Increasing scare water supplies by 1,000,000 units allowed value added to rise from 1511.628 to 1,813.954, a change of 302.

1.16.3 Optimization of National Wealth (Exports-Imports)

The input to Lindo to maximize net exports was as follows:

$$
\begin{aligned}
&\text{MAX} \quad Y_1 + Y_2 - 0.2\,X_1 - 0.3\,X_2 \\
&\text{SUBJECT TO} \\
&-Y_1 + 0.6\,X_1 - 0.2\,X_2 = 0 \\
&-Y_2 - 0.3\,X_1 + 0.9\,X_2 = 0 \\
&4000\,X_1 + 100\,X_2 < 5000000 \\
&X_1 \Rightarrow 0 \\
&X_2 \Rightarrow 0
\end{aligned}
$$

Once again the solution was found with X_1 equal to zero as indicated by the relative slopes of the objective function and the water constraint. Optimal net exports were 1,511.629.

2. DESCRIPTION OF THE PAKISTAN ECONOMY: THE P.I.D.E. I/O MODEL

2.1 Introduction

Chapter 2 describes some adjustments made to the P.I.D.E. I/O data for Pakistan and provides some sensitivity tests indicating a need for further data refinement in the model. The detailed P.I.D.E. transactions-among-sectors data (see Appendix A-2) are aggregated to produce Table 2.4 which reduces the industry classifications from 108 to 15 sectors. The structure of the economy is more easily comprehended using the condensed model, and tests for structural deficiencies are more easily carried out. The Pakistan economy is described using a condensed transactions-among-sectors table, an industry purchases distribution (technical coefficients), and an industry sales distribution.

2.2 Modifications Made to the P.I.D.E I/O Model

The Pakistan Institute of Development Economics (P.I.D.E.) published a report entitled, Final P.I.D.E. Input-Output Table of Pakistan's Economy: 1975-76. The report included the columns of a very detailed transactions-among-sectors table for Pakistan. Comparison of the numbers used to complete the table with data published elsewhere (if any) provides useful information on the accuracy and consistency of existing data sources for the Pakistan economy. This summary lists the major problems noted in the available data and describes some modifications and sensitivity tests made on the P.I.D.E. model prior to the solution for the Leontief inverse and various economic multipliers on the MS input-output microcomputer program. The 108 sector modified PIDE transactions table used for this study is shown in Appendix A-2.

2.2.1. Household Purchases

The Household Purchases column allowed no money toward savings. A savings rate of 8.6% was used and the entire column was reduced to allow this amount to be allocated to savings. Household saving is estimated at 8.9% of GNP in Table 2.9 on page 32 of Pakistan Economic Survey 1984-85 (although the previous year it was only 5.1%). Data on savings are very weak since it is estimated as a residual and varies widely from year to year. Consumption in the

P.I.D.E. model, and in the national accounts, is also estimated as a residual (see Chapter 3 of Pakistan Economic Survey, 1984-85).

2.2.2. Investment

After reduction of the household column (column 106) to include savings, this left a residual or excess production in each column that had previously been sold to households. This residual was included in the investment column (column 108) which was renamed investment and discrepancy.

2.2.3. Household Wages and Salaries

A new row for household wages and salaries (row 109) was introduced into the I/O model. Spending by industries and agencies on household wages was estimated on the basis of ratios of employment cost to value of production contained in: Census of Manufacturing Industries 1975-76; Survey of Small and Household Manufacturing Industries 1976-77; Census of Mining Industries 1975-76; and the ratio of employment cost to gross margin in Survey of Wholesale and Retail Trade and Restaurants 1975-76. Wages in the agricultural sectors were estimated from secondary data. Wages in the remaining sectors were based upon ratios typical in other I/O models. Balance of the model was retained by subtracting the numbers added in the new wages row from the numbers in the value added row. In a very few instances the value added row became slightly negative. The value added row was renamed Self & Sav which stands for self employment income, profits, rents, and savings.

Self employment accounts for a significant part of personal income received, especially in farm production, services, and trade. Unfortunately, little or no data are readily available to measure the amount of self employment income versus the amount of savings in these sectors. If the household income row were corrected to contain self employment income, the multipliers throughout the Pakistan economy and particularly in the farm production, services, and trade sectors, could be considerably larger.

As a test of the sensitivity of the multipliers to the exclusion of self employment income, an adjustment was made in the farm production, services, and trade payments to households. The share of spending to self employment, rent and saving was initially very high for these three sectors, as might be expected with their large amount of self employment. An arbitrary rent plus savings rate of 20 percent was assumed for the three sectors with the balance

of the former self and saving entries shifted to the household row entry. Very large increases in the multipliers were observed as shown in Table 2.1.

It is common for input-output models to ignore self employment income since data are usually non-existent. In highly developed economies the error of omission may cause relatively small understatement of the multiplier effects (at least in the non-agricultural sectors). The Pakistan economy differs from the fully developed economies in that major parts of the economy depend strongly upon the small entrepreneur. Our arbitrary assumption of rent plus savings rates of 20 percent in the farm production, services, and trade sectors results in large changes in the multipliers for those sectors and significant increases can be noted in virtually all sectors of the economy. This result suggests that the construction of I/O models for nations with a large amount of self employment, such as Pakistan, must very accurately measure self employment incomes in each industry as well as rents and savings. The large allocation to value added found in the farm production, services, and trade sectors of the P.I.D.E. transactions data suggests that the problem could be particularly acute in those sectors. The communications industry also shows a relatively large share allocated to value added although self employment does not appear as likely in that sector.

Table 2.1. Sensitivity of Business Multipliers to Exclusion of Self Employment Income

Sector	Original Multiplier	Adjusted Multiplier 1/	Ratio
FARM PROD	2.3553	4.1779	1.77
AG PROCESS	2.9074	4.1509	1.43
FARM INPUT	2.3319	2.9432	1.26
COMMUNICAT	2.1928	2.7894	1.27
ENERGY	2.0631	2.6003	1.26
TRANSPORT	2.0375	2.5475	1.25
COMMOD MFG	2.7000	3.4759	1.29
MACH MFG	2.3594	2.8733	1.22
SERVICES	1.6450	4.1693	2.53
TRADE	1.3835	4.2433	3.07
CONSTRUCT	2.5842	3.2003	1.24
GOVT SERV	3.0119	3.8898	1.29
HOUSEHOLDS	2.9888	4.1061	1.37

1/ Rent plus savings was arbitrarily reduced to 20 percent of total sales in the farm production, services, and trade sectors and the excess was added to the corresponding household row cells.

2.2.4. Adjustments

The household spending column was compared with the spending distribution found in the report Household Income and Expenditure Survey 1979, and the figures did not match. However the share of spending for food matched that reported elsewhere. The 1979 survey looked no more realistic than the existing P.I.D.E. distribution, so no adjustments were made other than the inclusion of savings discussed above.

2.2.5. Exports

The exports column of the P.I.D.E. I/O table matched the exports reported in the annual Pakistan Statistical Yearbook and were left unchanged. However, few of the other total spending figures in the table matched published numbers.

2.2.6. Sales by Manufacturing Industry

The total sales by the manufacturing industry did not match those reported in the census of manufacturing and were often larger than reported. For example, the total sales found by adding up the sales figures of the 75-76 census of large manufacturers, plus those of the 76-77 survey of small and household manufacturers, results in total sales of approximately Rs. 36.8 billion, while the P.I.D.E. table shows approximately Rs.77.4 billion of manufacturing sales. The P.I.D.E. report states that census of manufacturing data were used, adjusted for nonresponse. Other industries, such as mines, electricity and gas distribution, etc. were usually larger, and sometimes quite a bit larger, than reported in government publications. Agricultural data on total value of production and spending distributions are not published in the census so no comparisons can be made for agriculture. Apparently, agricultural cost and spending data are a major gap in the available published data for Pakistan.

2.2.7. Spending and Income

Total household spending matched available data on household incomes and was left with minor change.

2.2.8. Repair and Maintenance

With the exception of government, little or no purchases

from the construction sectors for repair and maintenance were shown on the P.I.D.E. I/O table (see 1.2.11 below).

2.2.9. Arrangement by Size

The table was reorganized so that small and large size units of the same industry were next to each other.

2.2.10. Revised Table

The revised table with 106 intermediate processing sectors, including the new households sector, was entered into the IMS (Interindustry Modeling System) microcomputer program and solved for the business multipliers and related Leontief inverse matrix (see Appendix A-3).

2.2.11. Condensed Model

A condensed table and model with 13 intermediate processing sectors was built by aggregating the large I/O table. This condensed model was also entered into the IMS program and solved for business multipliers and the Leontief inverse.

2.2.12. Testing Error of Omission

To test the sensitivity of the I/O multipliers to the omission of maintenance spending from industry budgets, "reasonable" sized coefficients to show repair and maintenance purchases from the building sector for a number of industries were inserted in the condensed Pakistan I/O model. The amount of the maintenance spending was removed from the respective sectors' savings in order to maintain balance and accounting consistency. Multipliers rose by only 0.01 or 0.02 (a change in the second decimal place) and thus the error of omission did not warrant trying to estimate and insert coefficients in the 108 sector model.

2.2.13. Household Income Row

The major change to the original P.I.D.E. model was the insertion of a household income row. Although the coefficients for mining, trade and manufacturing were based upon published data, agriculture and most other sectors required rough estimates based on fragmented information. The sensitivity of the multipliers to error in the household row estimate is thus of importance. It can be expected that the household row values would have an

important effect on the multipliers since payroll is a major expense for all sectors. The larger the payroll value, the smaller the amount left for savings. Thus the multiplier tends to rise as payroll is inserted into the P.I.D.E. model since leakages to saving are reduced.

As a test of the magnitude of error caused by incorrect payroll estimates, the household row values were inflated by 50 percent (multiplied by 1.5) and the resulting increase in spending was removed from the savings row for the respective industries. The business multipliers for the condensed Pakistan I/O model, before and after adjustment, are shown in Table 2.2.

Table 2.2. Sensitivity of Business Multipliers to Error in Estimated Pay Rates

Sector	Original Multiplier	Multiplier After 50% Payroll Increase	Ratio
FARM PROD	2.3553	2.8847	1.22
AG PROCESS	2.9074	3.3917	1.17
FARM INPUT	2.3319	2.7319	1.17
COMMUNICAT	2.1928	2.6536	1.21
ENERGY	2.0631	2.6009	1.26
TRANSPORT	2.0375	2.4627	1.21
COMMOD MFG	2.7000	3.2616	1.21
MACH MFG	2.3594	2.8401	1.20
SERVICES	1.6450	1.9905	1.21
TRADE	1.3835	1.5942	1.15
CONSTRUCT	2.5842	3.2722	1.27
GOVT SERV	3.0119	3.7035	1.23
HOUSEHOLDS	2.9888	3.3886	1.13

Comparison of the business multipliers before and after the 50 percent increase of payroll reveals a 13% to 27% change in the multipliers. There was also a slight change in the relative size rankings of the multipliers. This test shows the critical nature of the household sector and the importance of the missing payroll data series for agriculture and other non-manufacturing industries. Improved and complete data on household incomes by sector are a critical need for analyzing the Pakistan economy.

2.3 Condensed Version of the Pakistan I/O Model

The original P.I.D.E. I/O data provide a wealth of detail. However, a simpler model is useful to gain an overview of

Pakistan's economy and to examine the effects of missing information on model performance. The original data, after the modifications discussed above, were aggregated down from 108 to 15 sectors. The condensed model is used in much of the discussion which follows.

2.4 I/O Sector Definitions

The Pakistan I/O model sectors after aggregation are defined below.

FARM PROD: wheat, rice, cotton, sugar, tobacco, oilseeds, pulses, other crops, livestock, fish, and forestry.

AG PROCESS: grain mills, rice husking, rice mills, gur/khandsari, sugar refining, edible oils, tea blending, fish processing, bakery, other food, beverages, tobacco production, cotton textiles, cotton yarn, cotton fabric, silk textiles, other textiles, wool textiles, thread, carpets, footwear, apparel, wood products, wood furniture, paper, leather products, and soaps.

FARM INPUT: fertilizer manufacturing, and agricultural machinery manufacturing.

COMMUNICAT: printing and publishing, radio , television, telephone, and postoffice.

ENERGY: petroleum refining, electrical distribution, and gas distribution.

TRANSPORT: road transport, railroad transport, air transport, water transport, and road construction.

COMMOD MFG: mining, chemical manufacturing, medicine production, paint production, plastics, cement production, glass production, non-metallic substances, iron production, steel products, sport equipment manufacturing, and other manufacturing.

MACH MFG: non-electrical machinery manufacturing, electrical machinery manufacturing, transport equipment manufacturing, bicycle manufacturing, automobile manufacturing and ship construction.

SERVICES: finance, insurance and real estate, other services.

TRADE: wholesale and retail trade.

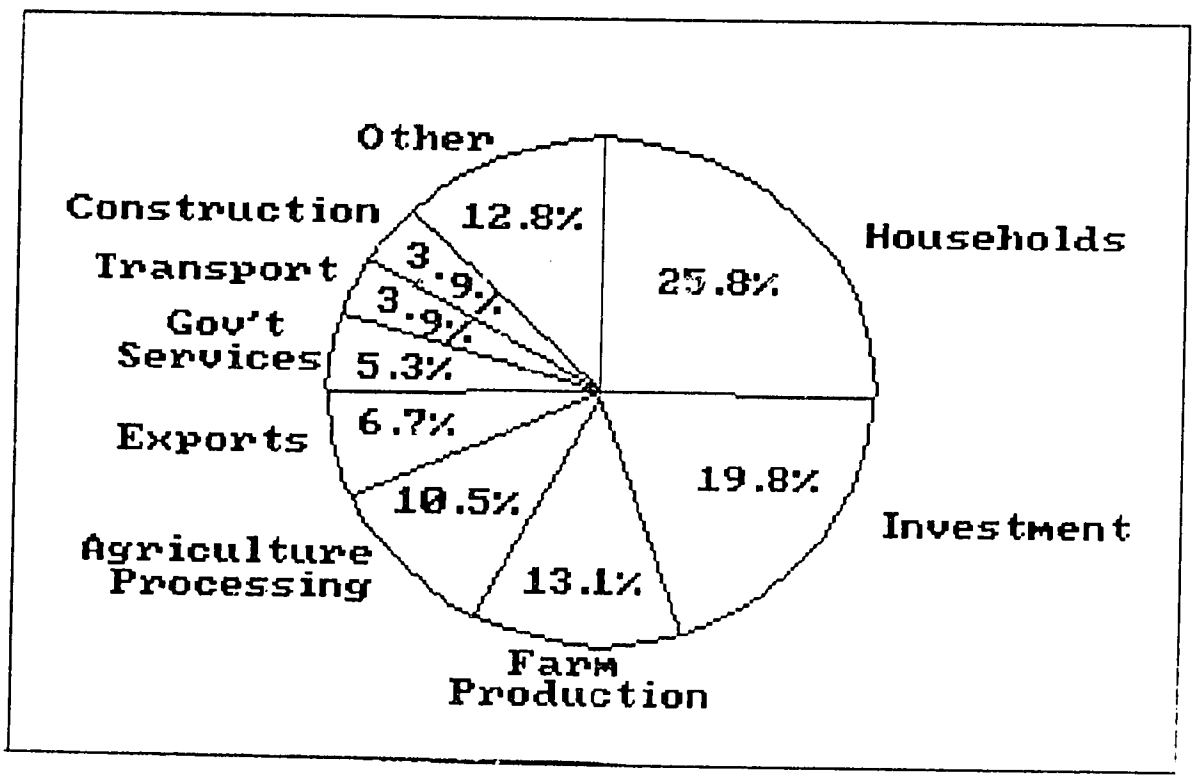
CONSTRUCT: dwellings, low cost residences, high cost residences, rural buildings, factory buildings, public buildings, and infrastructure.

GOVT SERVICE: government production and services.

HOUSEHOLDS: consumer spending (the household column) and employment cost including wages and salaries (the household row).

The relative size of the sectors defined above is shown in Figure 2.1.

Figure 2.1. Share of Total Transactions: Pakistan Industrial Sectors 1975



2.5 The Pakistan Transactions-Among-Sectors

Consider the interindustry processing quadrant in the Pakistan I/O table shown in Table 2.3. Reading across the first row, farm producers' total sales (output) are approximately Rs.67.9 billion: 16.625 billion consists of transactions among farms; 20.173 billion is sales to agricultural processing; very small amounts are sold to the farm inputs sector and to the communications sector; there

are no sales to the energy sector; 495 million is sales to the transportation sector; and so forth, on across the row. Reading down the first column displays farm purchases (inputs), or how farmers used their total sales revenues (the 67.9 billion) to buy goods and services as factors of production. Purchases from farmers were again 16.625 billion; nothing was spent on commodity processing; 1.068 billion was spent on farm inputs (fertilizer and agricultural machinery); nothing was spent on communications; 754 million was spent on energy, and so forth, down the column. Each industry can be analyzed similarly.

An important concept is interdependence; each entry in the I/O account shown as a sale by one sector is also a purchase by another sector. In our example, the 2.1 billion at the intersection of the household row and the service column is 2.1 billion rupees of sales by household labor to services and conversely 2.1 billion rupees of purchases by services from household labor.

In the condensed Pakistan transactions table, the transportation sector purchases around Rs.7 billion of imports, followed by agricultural processing which imports some 4.94 billion. The largest importing sector, however, is households, which imports some 15.9 billion rupees. Leakages to indirect taxes are relatively small, except in the commodity processing industries where they reach 2.8 billion. Large savings leakages occur in the farm production and trade and service sectors which also account for a large share of the employment and small business in the economy. As discussed earlier, part of the apparently high rent plus savings rate is really self employment income which should be reallocated to the household row. Although savings is a leakage in the I/O model which lowers the size of the multiplier, it is highly desired since it reduces reliance on foreign capital and tends to support new investment.

Table 2.3. Transactions-Among-Sectors: Pakistan 1975
[thousands of rupees]

		1 FARM PROD	2 AG PROCESS	3 FARM INPUT	4 COMMUNICAT
1	FARM PROD	16625120.	20172570.	35.	22.
2	AG PROCESS	0.	10041700.	123.	128166.
3	FARM INPUT	1068846.	0.	0.	0.
4	COMMUNICAT	0.	118728.	6643.	50238.
5	ENERGY	754007.	780290.	166872.	16640.
6	TRANSPORT	2345447.	1881738.	200109.	46063.
7	COMMOD MFG	198803.	576022.	99857.	8712.
8	MACH MFG	0.	238402.	101872.	61149.
9	SERVICES	373402.	1112190.	58158.	51392.
10	TRADE	5595116.	2945934.	85339.	66470.
11	CONSTRUCT	150.	537185.	6891.	12925.
12	GOVT SERV	529900.	47400.	2727.	19212.
	SUB-TOTALS	27490800.	38452150.	728626.	460989.
13	HOUSEHOLDS	11246470.	3512087.	106688.	215336.
14	IMPORTS	725717.	4947902.	270122.	44916.
15	TAX - SUB	0.	2819446.	7355.	154.
16	SELF&SAV[1/]	28481300.	3986905.	265342.	695559.
	TOTALS	67944280.	53718500.	1378133.	1416954.

[1/] Self employment income, rent, and savings.

Transactions-Among-Sectors: Pakistan 1975 (continued)

		5 ENERGY	6 TRANSPORT	7 COMMOD MFG	8 MACH MFG
1	FARM PROD	0.	495200.	147862.	4592.
2	AG PROCESS	0.	0.	363280.	44420.
3	FARM INPUT	0.	0.	300.	0.
4	COMMUNICAT	2157.	0.	95038.	25067.
5	ENERGY	395624.	1509741.	770565.	46555.
6	TRANSPORT	183968.	0.	1033443.	313175.
7	COMMOD MFG	243947.	1106428.	4375211.	397176.
8	MACH MFG	1482.	72800.	125866.	492589.
9	SERVICES	58662.	1536545.	486979.	136696.
10	TRADE	407464.	0.	1164545.	53386.
11	CONSTRUCT	6158.	20486.	80326.	18433.
12	GOVT SERV	28456.	1012381.	144466.	3488.
13	HOUSEHOLDS	1313958.	2738307.	2286304.	499020.
14	IMPORTS	2627842.	7002575.	1937947.	1099016.
15	TAX - SUB	-106266.	359073.	535134.	126933.
16	SELF&SAV[1/]	994568.	4632351.	2517891.	426252.
	TOTALS	6158020.	20485890.	16065160.	3686798.

[1/] Self employment income, rent, and savings.

Transactions-Among-Sectors: Pakistan 1975 (continued)

	9 SERVICES	10 TRADE	11 CONSTRUCT	12 GOVT SERV
1 FARM PROD	0.	0.	534848.	180037.
2 AG PROCESS	19308.	5389.	13465.	1020208.
3 FARM INPUT	0.	0.	0.	0.
4 COMMUNICAT	233146.	39612.	0.	184825.
5 ENERGY	299488.	46096.	0.	185745.
6 TRANSPORT	291848.	368175.	0.	705407.
7 COMMOD MFG	84210.	0.	4550538.	56749.
8 MACH MFG	23719.	0.	243976.	69032.
9 SERVICES	340664.	523800.	726266.	3789861.
10 TRADE	0.	0.	0.	0.
11 CONSTRUCT	28015.	118434.	434226.	9017610.
12 GOVT SERV	204298.	52163.	415942.	2560936.
13 HOUSEHOLDS	2100176.	1651869.	4896893.	4142714.
14 IMPORTS	91394.	0.	1979213.	166724.
15 TAX - SUB	0.	0.	0.	0.
16 SELF&SAV[1/]	11149890.	15993200.	6634078.	5538234.
TOTALS	14866160.	18798740.	20429440.	27618080.

1/ Self employment income, rent, and savings.

Transactions-Among-Sectors: Pakistan 1975 (continued)

		13 HOUSEHOLDS	14 EXPORTS	15 INVST/DISC	TOTALS
1	FARM PROD	27406790.	277588.	2099614.	67944280.
2	AG PROCESS	33386800.	7302479.	1393161.	53718500.
3	FARM INPUT	81478.	18299.	209210.	1378133.
4	COMMUNICAT	739634.	14507.	-92641.	1416954.
5	ENERGY	866566.	192134.	127697.	6158020.
6	TRANSPORT	7426508.	0.	5690006.	20485890.
7	COMMOD MFG	5151090.	829268.	-1612855.	16065160.
8	MACH MFG	1531125.	120763.	604023.	3686798.
9	SERVICES	5150328.	0.	521214.	14866160.
10	TRADE	7701129.	0.	779356.	18798740.
11	CONSTRUCT	5297452.	0.	4851153.	20429440.
12	GOVT SERV	11896840.	9495916.	1203958.	27618080.
13	HOUSEHOLDS	0.	16440040.	82862020.	134011900.
14	IMPORTS	15909340.	167060.	0.	36969770.
15	TAX - SUB	0.	0.	0.	3741829.
16	SELF&SAV[1/]	11466810.	0.	0.	92782380.
	TOTALS	134011900.	34858050.	98635910.	520072000.

[1/] Self employment income, rent, and savings.

2.6 The Direct Input Requirements

The technical coefficients or direct requirements coefficients for Pakistan are shown in Table 2.4. The technical coefficients show the distribution of purchases for each industry. For example, to compute the coefficient of 0.2447, for farmer producers buying from other farm producers (coefficient a_{11}) we divide 16.625 billion by the column total of 67.944 billion. The direct requirements for an industry can be found by reading down a column in Table 2.4.

Table 2.4. Technical Coefficients: Pakistan 1975
(Direct Requirements Table)

	1 FARM PROD	2 AG PROCESS	3 FARM INPUT	4 COMMUNICAT
1 FARM PROD	.244687	.375523	.000025	.000015
2 AG PROCESS	.000000	.186931	.000089	.090451
3 FARM INPUT	.015731	.000000	.000000	.000000
4 COMMUNICAT	.000000	.002210	.004820	.035454
5 ENERGY	.011097	.014525	.121085	.011743
6 TRANSPORT	.034520	.035029	.145203	.032508
7 COMMOD MFG	.002925	.010722	.072458	.006148
8 MACH MFG	.000000	.004437	.073920	.043155
9 SERVICES	.005495	.020704	.042200	.036269
10 TRADE	.082348	.054840	.061923	.046910
11 CONSTRUCT	.000002	.010000	.005000	.009121
12 GOVT SERV	.007799	.000882	.001978	.013558
13 HOUSEHOLDS	.165524	.065379	.077414	.151971
14 IMPORTS	.010681	.092107	.196005	.031698
15 TAX - SUB	.000000	.052485	.005336	.000108
16 SELF&SAV[1/]	.419186	.074218	.192537	.490883

[1/] Self employment income, rent, and savings.

Technical Coefficients: Pakistan 1975 (continued)

	5 ENERGY	6 TRANSPORT	7 COMMOD MFG	8 MACH MFG
1 FARM PROD	.000000	.024172	.009203	.001245
2 AG PROCESS	.000000	.000000	.022612	.012048
3 FARM INPUT	.000000	.000000	.000018	.000000
4 COMMUNICAT	.000350	.000000	.005915	.006799
5 ENERGY	.064245	.073696	.047964	.012627
6 TRANSPORT	.029874	.000000	.064328	.084944
7 COMMOD MFG	.039614	.054009	.272341	.107729
8 MACH MFG	.000240	.003553	.007834	.133608
9 SERVICES	.009526	.075005	.030312	.037077
10 TRADE	.066168	.000000	.072488	.014480
11 CONSTRUCT	.000999	.001000	.005000	.004999
12 GOVT SERV	.004620	.049418	.008992	.000946
13 HOUSEHOLDS	.213373	.133668	.142314	.135353
14 IMPORTS	.426734	.341824	.120630	.298095
15 TAX - SUB	.017256	.017527	.033310	.034429
16 SELF&SAV[1/]	.161507	.226124	.156729	.115615

[1/] Self employment income, rent, and savings.

Technical Coefficients: Pakistan 1975 (continued)

	9 SERVICES	10 TRADE	11 CONSTRUCT	12 GOVT SERV
1 FARM PROD	.000000	.000000	.026180	.006518
2 AG PROCESS	.001298	.000286	.000659	.036939
3 FARM INPUT	.000000	.000000	.000000	.000000
4 COMMUNICAT	.015683	.002107	.000000	.006692
5 ENERGY	.020145	.002452	.000000	.006725
6 TRANSPORT	.019631	.019585	.000000	.025541
7 COMMOD MFG	.005664	.000000	.222744	.002054
8 MACH MFG	.001595	.000000	.011942	.002499
9 SERVICES	.022915	.027863	.035549	.137223
10 TRADE	.000000	.000000	.000000	.000000
11 CONSTRUCT	.001884	.006300	.021254	.326511
12 GOVT SERV	.013742	.002774	.020359	.092726
13 HOUSEHOLDS	.141272	.087871	.239697	.150000
14 IMPORTS	.006147	.000000	.096880	.006036
15 TAX - SUB	.000000	.000000	.000000	.000000
16 SELF&SAV[1/]	.750018	.850759	.324731	.200529

1/ Self employment income, rent, and savings.

Technical Coefficients: Pakistan 1975 (continued)

	13 HOUSEHOLDS	14 EXPORTS	15 INVST/DISC
1 FARM PROD	.204510	.007963	.021286
2 AG PROCESS	.249133	.209491	.014124
3 FARM INPUT	.000607	.000524	.002121
4 COMMUNICAT	.005519	.000416	-.000939
5 ENERGY	.006466	.005511	.001294
6 TRANSPORT	.055416	.000000	.057686
7 COMMOD MFG	.038437	.023789	-.016351
8 MACH MFG	.011425	.003464	.006123
9 SERVICES	.038431	.000000	.005284
10 TRADE	.057466	.000000	.007901
11 CONSTRUCT	.039529	.000000	.049182
12 GOVT SERV	.088774	.272416	.012206
13 HOUSEHOLDS	.000000	.471628	.840079
14 IMPORTS	.118715	.004792	.000000
15 TAX - SUB	.000000	.000000	.000000
16 SELF & SAV[1/]	.085565	.000000	.000000

1/ Self employment income, rent, and savings.

For each rupee of output from farming, farmers buy 0.2447 from other farmers, 0.0157 from farm inputs, and 0.0111 from energy, and so forth on down the column. Households

(hired labor), and in some cases imports, often make up the largest share of inputs to the industries in Pakistan.

2.7 The Distribution of Sales

The sales coefficients shown in Table 2.5 are useful to find the major customers for each industry. For example, farm producers sell 24% of their output to other farms, 30% to agricultural processors, small amounts to transport, manufacturing, construction, and government, and over 40% to households. The P.I.D.E. I/O data are margined with respect to the trade sector. This means that the trade sector is bypassed and the sales distribution (and the other I/O tables) show goods flowing directly from producer to user. The trade sector is paid a commission (margin) by the seller of the goods or services in the P.I.D.E. I/O data. It is more common to assume that the buyer pays a margin to the trade sector but neither assumption is totally correct since both buyer and seller are likely to bear the incidence of selling costs.

Table 2.5. Sales Distribution Coefficients: Pakistan 1975

	1 FARM PROD	2 AG PROCESS	3 FARM INPUT	4 COMMUNICAT
1 FARM PROD	.244687	.296898	.000000	.000000
2 AG PROCESS	.000000	.186931	.000002	.002385
3 FARM INPUT	.775575	.000000	.000000	.000000
4 COMMUNICAT	.000000	.083791	.004688	.035454
5 ENERGY	.122443	.126711	.027098	.002702
6 TRANSPORT	.114490	.091855	.009768	.002248
7 COMMOD MFG	.012374	.035855	.006215	.000542
8 MACH MFG	.000000	.064663	.027631	.016585
9 SERVICES	.025117	.074813	.003912	.003456
10 TRADE	.297632	.156709	.004539	.003535
11 CONSTRUCT	.000007	.026294	.000337	.000632
12 GOVT SERV	.019186	.001716	.000098	.000695
13 HOUSEHOLDS	.083921	.026207	.000796	.001606
14 IMPORTS	.019630	.133836	.007306	.001214
15 TAX - SUB	.000000	.753494	.001965	.000041
16 SELF&SAV[1/]	.306968	.042970	.002859	.007496

1/ Self employment income, rent, and savings.

Sales Distribution Coefficients: Pakistan 1975 (continued)

	5 ENERGY	6 TRANSPORT	7 COMMOD MFG	8 MACH MFG
1 FARM PROD	.000000	.007288	.002176	.000067
2 AG PROCESS	.000000	.000000	.006762	.000826
3 FARM INPUT	.000000	.000000	.000217	.000000
4 COMMUNICAT	.001522	.000000	.067072	.017690
5 ENERGY	.064245	.245166	.125131	.007560
6 TRANSPORT	.008980	.000000	.050446	.015287
7 COMMOD MFG	.015184	.068871	.272341	.024722
8 MACH MFG	.000401	.019746	.034139	.133608
9 SERVICES	.003946	.103358	.032757	.009195
10 TRADE	.021675	.000000	.061948	.002839
11 CONSTRUCT	.000301	.001002	.003931	.000902
12 GOVT SERV	.001030	.036656	.005230	.000126
13 HOUSEHOLDS	.009804	.020433	.017060	.003723
14 IMPORTS	.071080	.189413	.052419	.029727
15 TAX - SUB	-.028399	.095961	.143014	.033922
16 SELF&SAV[1/]	.010719	.049927	.027137	.004594

1/ Self employment income, rent, and savings.

Sales Distribution Coefficients: Pakistan 1975 (continued)

	9 SERVICES	10 TRADE	11 CONSTRUCT	12 GOVT SERV
1 FARM PROD	.000000	.000000	.007871	.002649
2 AG PROCESS	.000359	.000100	.000250	.018991
3 FARM INPUT	.000000	.000000	.000000	.000000
4 COMMUNICAT	.164540	.027955	.000000	.130438
5 ENERGY	.048633	.007485	.000000	.030163
6 TRANSPORT	.014246	.017972	.000000	.034433
7 COMMOD MFG	.005241	.000000	.283255	.003532
8 MACH MFG	.006433	.000000	.066175	.018724
9 SERVICES	.022915	.035234	.048853	.254932
10 TRADE	.000000	.000000	.000000	.000000
11 CONSTRUCT	.001371	.005797	.021254	.441402
12 GOVT SERV	.007397	.001888	.015060	.092726
13 HOUSEHOLDS	.015671	.012326	.036540	.030913
14 IMPORTS	.002472	.000000	.053535	.004509
15 TAX - SUB	.000000	.000000	.000000	.000000
16 SELF&SAV[1/]	.120172	.172373	.071501	.059690

1/ Self employment income, rent, and savings.

Sales Distribution Coefficients: Pakistan 1975 (continued)

	13 HOUSEHOLDS	14 EXPORTS	15 INVST/DISC
1 FARM PROD	.403371	.004085	.030902
2 AG PROCESS	.621514	.135939	.025934
3 FARM INPUT	.059122	.013278	.151806
4 COMMUNICAT	.521988	.010238	-.065380
5 ENERGY	.140721	.031200	.020736
6 TRANSPORT	.362518	.000000	.277752
7 COMMOD MFG	.320637	.051619	-.100394
8 MACH MFG	.415299	.032755	.163834
9 SERVICES	.346446	.000000	.035060
10 TRADE	.409662	.000000	.041457
11 CONSTRUCT	.259304	.000000	.237458
12 GOVT SERV	.430762	.343829	.043593
13 HOUSEHOLDS	.000000	.122676	.618318
14 IMPORTS	.430333	.004518	.000000
15 TAX - SUB	.000000	.000000	.000000
16 SELF&SAV[1/]	.123588	.000000	.000000

[1/] Self employment income, rent, and savings.

2.8 Summary

The Pakistan economy can be characterized as a transitional agricultural economy. A large part of the market transactions in the economy are in agricultural production, the processing of foodstuffs and other farm produced commodities, and the household sector which is employed in agriculture-related activities. In addition, agriculture provides full or part time employment to many family members who are outside the formal marketplace. As the economy grows, workers will be drawn towards work or business opportunities in urban areas. The transition will result in a more market-oriented economy. The growth of widely separated and concentrated population centers creates increasing burdens on the transport and related energy sectors. This is strongly supported by an input-output/linear programming analysis in the following chapter. Agricultural production creates less demands directly and indirectly upon the transport system, per rupee of value added created, than most other exporting sectors. Many structural changes in the economy must occur if Pakistan is to move from its current agrarian based economy toward a more diversified and complex system. Increased emphasis on the industrial, service and commercial sectors does not imply a lack of growth by the agricultural sectors. Growth in agriculture continues to receive high priority in succeeding five year plans. For the most part, commercial agriculture is on the increase and both private and public capital are continuing to flow into farming and agricultural business. However, as the <u>relative</u> size of the agricultural sector declines, new demands will be created directly and indirectly upon sectors such as energy, transport, services, communication, and government. Economic planning for an economy in transition, such as in Pakistan, requires economic projections which take account of the many interdependencies among the economic sectors of the economy. Attempts to stimulate export industries, for example, require development of supporting sectors to satisfy the needs of the additional intermediate processors, services, and labor required to expand exportable output. Economic planning requires knowledge of the full implications of the plan. The economic input-output method provides the best tool for measuring and projecting the cumulative forces which determine input requirements in a developing economy.

3. INPUT-OUTPUT ANALYSIS OF THE PAKISTAN ECONOMY

3.1 Introduction

The total requirements or general equilibrium analysis is applied primarily to the condensed Pakistan I/O model. Space does not permit a detailed discussion of the full 106 intermediate processing sectors in this report. However, the business multipliers and growth impact multipliers for the entire 106 sectors are discussed and are shown in Appendix A-3. Several backward linked economic multipliers for the 13 intermediate-processing-sector Pakistan model also are calculated and discussed in this chapter. In addition, the effects of changes of the primary input prices on the prices in the intermediate processing sectors is shown by a Leontief price multiplier table. Finally, an example of optimization in combination with I/O is demonstrated using the Lindo microcomputer program with the Pakistan I/O model.

3.2 The IMS Input-Output Microcomputer Program

Program IMS is an interactive double precision computer program which uses permanent files containing transactions-among-sectors data for various regional economies. A new version of IMS called IMS110 was developed specifically to accommodate the large 108 sector P.I.D.E. I/O model of Pakistan. This version of IMS operates in single precision. The program can solve the 106 simultaneous linear equations of the Pakistan I/O model in approximately 10 minutes on an IBM AT microcomputer. Longer solution times may be required on smaller computers.

I/O transactions-among-sectors data files are created and stored by the user of the IMS program. The data files can be retrieved at any time for further analysis by user selection from the alphabetized file catalog displayed by the IMS program. The program responds to user commands to retrieve and display numerous descriptive tables showing transactions and business and income multipliers, input and sales coefficients, and resource requirements (such as employment by industry), with the analysis menu selection. The forecast menu selection allows the user to enter changes in final demand in order to make economic projections of transactions, and resource requirements. Up to 30 resource requirement vectors that vary

proportionately with industry sales may be projected in this manner. The user must first estimate changes in investment and construction spending, any exogenous government spending, and export demand in each sector of the model and enter these final demand data to enable the program to calculate a new transactions-among-sectors table and new employment or other resource requirements. All data entries are in response to user-friendly prompts. It is important to note that complete and accurate changes in final demands must be entered if the IMS program is to provide accurate economic projections. All output from the IMS program can be directed to monitor screen, printer, or permanent file, on floppy or hard disk, or any combination of these peripheral components.

3.3 Equilibrium Conditions for the Condensed Model

There are 13 balance equations in the condensed Pakistan I/O model corresponding to the 13 dependent sectors of the model. It is assumed that the private industries act to satisfy all increased demands through a profit motive. Aggregating the two final demand columns together as $Y_i = I_i + E_i$, $i = 1 \ldots 13$, the 13 balance equations across columns of the transactions table are:

X_1 = SUM OF ALL $Z_{1,j}$ PLUS Y_1 $j = 1 \ldots 13$

. . . . . .

. . . . . .

. . . . . .

X_{13} = SUM OF ALL $Z_{13,j}$ PLUS Y_{13} $j = 1 \ldots 13$

where X_i is total output produced in industry i, the Z's are input demands among the intermediate processing sectors, and Y_i stands for the total final demand for industry i. It is evident that we now have $(13)^2 = 169$ unknowns (the Z's) which are the dependent intermediate processing spending flows among industries and only 13 equations. A solution will not be possible for this system of simultaneous equations unless the number of unknowns can be reduced to equal the number of equations.

In order to reduce the number of unknowns to be equal with the number of balance equations, we can substitute the definition of technical coefficients in place of the Z_{ij}'s. A sector's technical coefficient was defined as $a_{ij} = Z_{ij}/X_j$. Thus we can replace the Z's above with $Z_{ij} = (a_{ij})(X_j)$. For the Pakistan economy, the technical coefficients are shown in Table 2.4. We can now write the 13 balance equations as:

$$X_1 = 0.24468\ X_1 + 0.37552\ X_2 + 0.00002\ X_3 + \ldots + 0.20451\ X_{13} + Y_1$$

$$\vdots$$

$$X_{13} = 0.16552\ X_1 + 0.06537\ X_2 + 0.07741\ X_3 + \ldots + 0.00000\ X_{13} + Y_{13}$$

Equation sets of this type are easily solved by a microcomputer, and even the 106 equation Pakistan I/O model was solved in less than 10 minutes using an IBM AT microcomputer and the IMS (interindustry modeling system) program. The solution is presented in the form of a table or matrix called the "inverse" or Leontief matrix after the Nobel prize winning founder of input-output.

The "inverse" matrix shows the "total requirements" per rupee of exports by the industry named at the head of the column. Total requirements are composed of the direct and indirect requirements. If households is included as a dependent sector in Quadrant 1, then the total requirements are said to also include "induced" requirements. The multiplier estimates for the Pakistan economy include induced requirements. Each entry in the inverse matrix is an interdependency coefficient. Each coefficient, b_{ij} represents the direct, indirect, and induced requirements of sector i per unit of final demand in the output of sector j.

The immediate impacts computed in the technical coefficients table shown previously in Table 2.4 are followed by even longer term effects which can be found by calculating "total requirements". Successive rounds of production and demand arise because suppliers need local inputs to make and sell their outputs. In turn, manufacturers must buy inputs from other industries, and so on. In this way, many direct requirements reciprocate throughout an economy. "Total requirements" coefficients indicate the cumulative influences of each industry on each other and back on itself. The total requirements matrix for Pakistan is shown in Table 3.1. Total requirements of the second type, which include direct, indirect and induced requirements, are interpreted as follows: if farming increases its output by 1 to satisfy an increase of final demand, sales among farms rise to 1.463; agricultural processors, after successive, rounds will ultimately supply 0.10 worth of inputs, and the farm input sector will supply 0.023 worth; and so forth, down the column. Note that the total requirements are much larger than the direct requirements shown by the technical coefficients because the total requirements incorporate all of the cumulative effects of each industry supplying each other industry to

reach a new equilibrium of the economy while the technical coefficients show only the initial round of spending.

Table 3.1. Total Requirements or Leontief Inverse Matrix with Households Endogenous: Pakistan 1975

	1 FARM PROD	2 AG PROCESS	3 FARM INPUT	4 COMMUNICAT
1 FARM PROD	1.463113	.740817	.114298700	.180293
2 AG PROCESS	.100018	1.322497	.081561630	.204153
3 FARM INPUT	.023207	.011828	1.001945000	.003002
4 COMMUNICAT	.003896	.006985	.010259600	1.041383
5 ENERGY	.034974	.046610	.161378800	.032684
6 TRANSPORT	.084656	.101962	.193855900	.077059
7 COMMOD MFG	.045932	.064384	.161535500	.056760
8 MACH MFG	.008249	.013743	.092559430	.058458
9 SERVICES	.044934	.067327	.090602700	.076537
10 TRADE	.151308	.158968	.113702900	.097833
11 CONSTRUCT	.032096	.041780	.032165710	.041384
12 GOVT SERV	.050472	.044642	.042017320	.051304
13 HOUSEHOLDS	.312449	.285854	.236043200	.271972
14 BUS. MULT.	2.355311	2.907403	2.331926000	2.192827

Total Requirements or Leontief Inverse Matrix with Households Endogenous (continued)

	5 ENERGY	6 TRANSPORT	7 COMMOD MFG	8 MACH MFG
1 FARM PROD	.141834	.147044	.186118	.144082
2 AG PROCESS	.102633	.084940	.146026	.113750
3 FARM INPUT	.002425	.002467	.003156	.002443
4 COMMUNICAT	.004389	.004981	.013361	.013284
5 ENERGY	1.086555	.096119	.094016	.046264
6 TRANSPORT	.070012	1.038878	.133421	.143590
7 COMMOD MFG	.094603	.113389	1.427349	.214409
8 MACH MFG	.007224	.010558	.020470	1.162713
9 SERVICES	.045558	.112472	.088288	.086553
10 TRADE	.114760	.046306	.153200	.070621
11 CONSTRUCT	.031287	.042389	.043528	.034959
12 GOVT SERV	.044480	.086988	.059098	.043019
13 HOUSEHOLDS	.317375	.250948	.331659	.283715
14 BUS. MULT.	2.063141	2.037486	2.699694	2.359407

Total Requirements or Leontief Inverse Matrix
with Households Endogenous (continued)

	9 SERVICES	10 TRADE	11 CONSTRUCT	12 GOVT SERV
1 FARM PROD	.092680	.055810	.223916	.231713
2 AG PROCESS	.069207	.040351	.140156	.185312
3 FARM INPUT	.001582	.000953	.003776	.003896
4 COMMUNICAT	.018968	.003967	.007240	.015674
5 ENERGY	.032228	.009552	.035196	.037990
6 TRANSPORT	.043696	.033319	.067734	.086953
7 COMMOD MFG	.034475	.016984	.363222	.167114
8 MACH MFG	.007014	.002805	.025423	.018711
9 SERVICES	1.046666	.041843	.090029	.215248
10 TRADE	.028868	1.016103	.079061	.068575
11 CONSTRUCT	.025132	.018559	1.067419	.408725
12 GOVT SERV	.040505	.018938	.074966	1.163805
13 HOUSEHOLDS	.203945	.124328	.406085	.408174
14 BUS. MULT.	1.644973	1.383518	2.584227	3.011896

Total Requirements or Leontief Inverse Matrix
with Households Endogenous (continued)

	13 HOUSEHOLDS	TOTALS
1 FARM PROD	.538905	4.260627
2 AG PROCESS	.390362	2.980970
3 FARM INPUT	.009231	1.069917
4 COMMUNICAT	.011895	1.156288
5 ENERGY	.042090	1.755663
6 TRANSPORT	.122042	2.197182
7 COMMOD MFG	.121548	2.881709
8 MACH MFG	.023289	1.451223
9 SERVICES	.102647	2.108709
10 TRADE	.149875	2.249185
11 CONSTRUCT	.102356	1.921785
12 GOVT SERV	.138548	1.858788
13 HOUSEHOLDS	1.235979	4.668532
14 BUS. MULT.	2.988772	

3.4 Four Multiplier Analyses of the Pakistan Economy

This section provides a brief description of several multiplier concepts applied to the Pakistan economy. The multipliers are shown as the column sums of resource multiplier matrices just as the business multiplier is the column sum of the Leontief inverse. The resource matrices provide a disaggregation of the multiplier effects across

sectors. Multipliers can be estimated for endogenous interdependent variables which are part of the intermediate processing sector, for endogenous non-interdependent variables which are the primary inputs, and for dependent physical variables such as water, workers, or the creation of pollutants or congestion.

Table 3.1 contains the Leontief matrix or (I-A) inverse matrix which shows total requirements or business multipliers for Pakistan. The inverse provides a disaggregation of the multipliers across sectors. For example, column 1 of Table 3.1 shows the total effects of an added unit of exports by farm producers. The column sum of 2.35 is the total added spending in the economy for one unit of added exports by farm producers. The numbers down the column show sector by sector impacts. Households, for example, receive 0.31 directly and indirectly for each unit of farm producers' exports. Farm producers expand by more than the amount of the export due to indirect effects of 0.46, giving them a total expansion of 1.46. Each element of the inverse has a similar interpretation. Each column refers to the expansion of exports by the industry named at the column head with the impacts disaggregated across sectors listed at the left.

The resource multiplier matrices are similar to the Leontief matrix except that the numbers are converted into units of payroll, imports, or savings. If data were available, tables could also be calculated for physical inputs such as workers or water requirements. Several types of variables can be analyzed via this type of multiplier calculation. First, there is the physical input that varies proportionally with outputs or production in each sector. If the physical units of input per monetary unit of output can be estimated by sector,then this type of variable can be analyzed via multipliers. Examples would be the employment or water input multiplier.

The multipliers shown here are for monetary variables rather than for physical input requirements. Some monetary input multipliers are shown directly by the Leontief inverse matrix and do not require added calculations. Any monetary variable that is in Quadrant 1 of the transactions table (see Table 1.1) has a multiplier in the Leontief inverse matrix. To demonstrate this we have included Table 3.1 with the Leontief inverse and Table 3.3 (derived as the column sums of Table 3.2). If Table 3.3, which shows the payroll multipliers for Pakistan, is compared with the HOUSEHOLD row of the Leontief inverse shown in Table 3.1, it is apparent that the HOUSEHOLD row of the Leontief inverse also shows the payroll multipliers. Of course, the Leontief inverse cannot show the industry by industry

disaggregation of the payroll multipliers which is contained in Table 3.2. Thus, if a disaggregation of the payroll multiplier is desired, it is necessary to create the resource input coefficient vector in the IMS program. The same holds true for energy sector multipliers or any other monetary variable which is contained in Quadrant 1 of the transactions table.

Another type of monetary variable is contained in Quadrant 3 of the transactions table (see Table 1.1). Variables in this quadrant are dependent variables just as in Quadrant 1 but they are <u>not mutually dependent</u>, i.e. not interdependent, as are the variables in Quadrant 1. Thus multipliers for these variables do not appear in the Leontief inverse at all. The only way to obtain multipliers for variables which appear in Quadrant 3 is to set up resource requirement coefficients in the IMS program.

For the monetary variables which appear in both Quadrants 1 and 3, the resource requirements coefficients are simply the technical coefficients from the appropriate row of the A matrix i.e. the direct requirements coefficients. These coefficients are shown in Table 2.4.

An example of the disaggregation of the input multipliers is shown by examining the first column of Table 3.6. The first column refers to a one rupee expansion of exports (final demand) by farm producers. The elements of the column show the total impact on saving (profits) for each of the sectors listed at the left of the table. The column sum is the aggregate multiplier. Thus 0.87 rupees of savings occurs per unit rupee of exports by farmers, and the bulk of the saving is actually by farmers who save 0.61 rupee; the other major beneficiary is the trade sector with savings of 0.13 rupee. Similar analyses can be conducted for other columns of the savings resource matrix and for the other resource matrices.

Comparison of economic multipliers can be misleading unless consideration is made as to the capability of a sector to export. Service sectors, for example, by definition rarely make a large contribution toward national exports. Certain sectors in the Pakistan economy are unlikely to expand their exports to any great extent because of natural resource limitations, inability to compete internationally, or other considerations. The relative contributions toward Pakistan exports in 1975 by the sectors of the condensed I/O model are shown in the Figure 3.1.

Figure 3.1. Share of Total Exports: Pakistan Industrial Sectors 1976

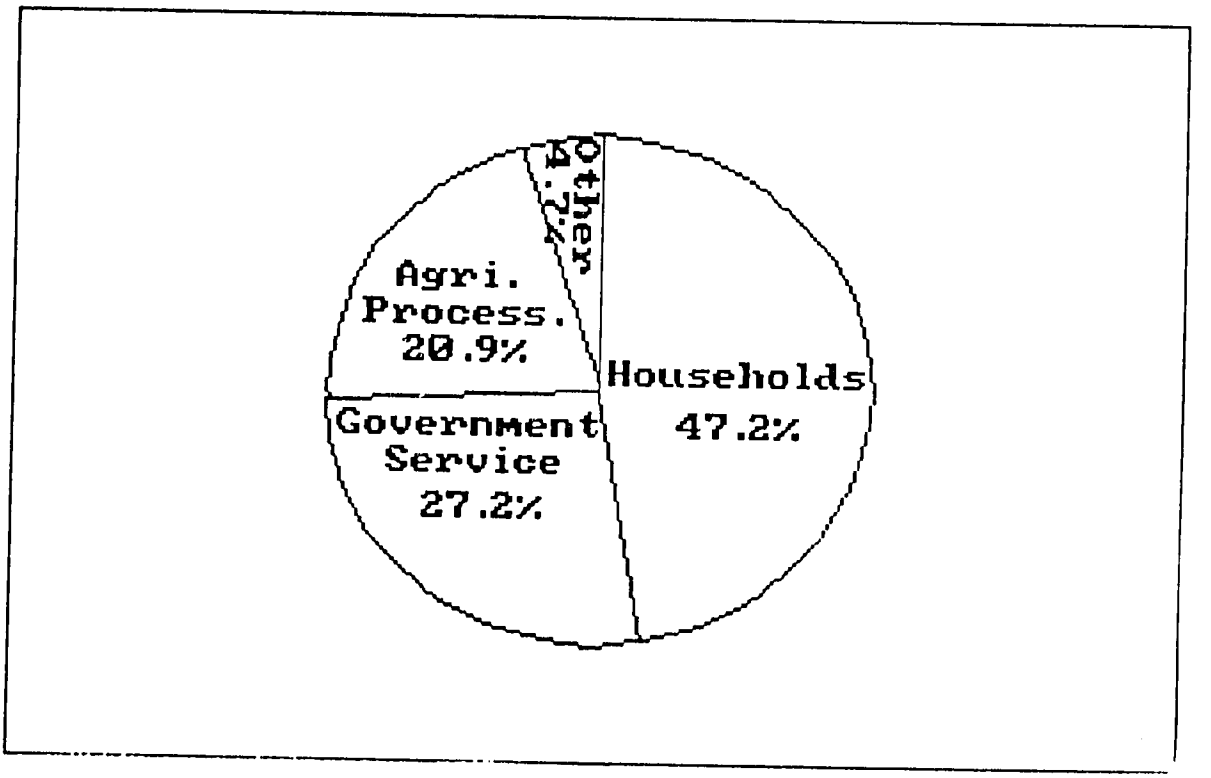


Table 3.5 shows that the least total import requirements are created if the farm producer sector expands sales to exports while the most import requirements would be created if the energy sector expanded. Expansion of the energy sector creates a total requirement of 0.554 rupees of imports for every rupee of energy produced for sale to final demand. Table 3.3 shows that the greatest total payroll increase will result if the government sector expands. Total payroll will rise by 0.408 rupee for every added rupee of government services sales to final demand. Table 3.7 shows that 100 rupees of final demand sales by the trade sector generates a total increase in self employment income, profits, and saving of 95.7 rupees--larger than for any other sector.

Table 3.2. Resource Multiplier Matrix For Payroll with Households Endogenous: Pakistan 1975

		1 FARM PROD	2 AG PROCESS	3 FARM INPUT
1	FARM PROD	.242181E+00	.122623E+00	.189192E-01
2	AG PROCESS	.653913E-02	.864641E-01	.533245E-02
3	FARM INPUT	.179659E-02	.915737E-03	.775654E-01
4	COMMUNICAT	.592220E-03	.106161E-02	.155916E-02
5	ENERGY	.746269E-02	.994552E-02	.344339E-01
6	TRANSPORT	.113159E-01	.136291E-01	.259123E-01
7	COMMOD MFG	.653681E-02	.916281E-02	.229888E-01
8	MACH MFG	.111665E-02	.186019E-02	.125282E-01
9	SERVICES	.634795E-02	.951148E-02	.127996E-01
10	TRADE	.132956E-01	.139687E-01	.999121E-02
11	CONSTRUCT	.769348E-02	.100148E-01	.771004E-02
12	GOVT SERV	.757088E-02	.669630E-02	.630259E-02
13	HOUSEHOLDS	.000000E+00	.000000E+00	.000000E+00
14	RES. MULT	.312449E+00	.285854E+00	.236043E+00

Resource Multiplier Matrix for Payroll with Households Endogenous (continued)

		4 COMMUNICAT	5 ENERGY	6 TRANSPORT
1	FARM PROD	.298429E-01	.234771E-01	.243396E-01
2	AG PROCESS	.133474E-03	.671013E-02	.555335E-02
3	FARM INPUT	.232449E-03	.187804E-03	.191051E-03
4	COMMUNICAT	.158260E+00	.667024E-03	.756989E-03
5	ENERGY	.697396E-00	.231842E+00	.205092E-01
6	TRANSPORT	.103003E-01	.935836E-02	.138864E+00
7	COMMOD MFG	.807788E-02	.134634E-01	.161369E-01
8	MACH MFG	.791247E-02	.977873E-03	.142915E-02
9	SERVICES	.108126E-01	.643614E-02	.158893E-01
10	TRADE	.859673E-02	.100841E-01	.406904E-02
11	CONSTRUCT	.991978E-02	.749954E-02	.101607E-01
12	GOVT SERV	.769563E-02	.667205E-02	.130483E-01
13	HOUSEHOLDS	.000000E+00	.000000E+00	.000000E+00
14	RES. MULT.	.27[illegible]972E+00	.317375E+00	.250948E+00

Resource Multiplier Matrix for Payroll
with Households Endogenous (continued)

		7 COMMOD MFG	8 MACH MFG	9 SERVICES
1	FARM PROD	.308071E-01	.238492E-01	.153409E-01
2	AG PROCESS	.954715E-02	.743694E-02	.452473E-02
3	FARM INPUT	.244334E-03	.189131E-03	.122518E-03
4	COMMUNICAT	.203050E-02	.201881E-02	.288265E-02
5	ENERGY	.200605E-01	.987162E-02	.687680E-02
6	TRANSPORT	.178342E-01	.191934E-01	.584080E-02
7	COMMOD MFG	.203132E+00	.305136E+01	.490637E-02
8	MACH MFG	.277072E-02	.157377E+00	.949442E-03
9	SERVICES	.124726E-01	.122275E-01	.147864E+00
10	TRADE	.134619E-01	.620560E-02	.253670E-02
11	CONSTRUCT	.104336E-01	.837962E-02	.602424E-02
12	GOVT SERV	.886471E-02	.645298E-02	.607589E-02
13	HOUSEHOLDS	.000000E+00	.0000000+00	.000000E+00
14	RES. MULT.	.331659E+00	.283715E+00	.203945E+00

Resource Multiplier Matrix for Imports
with Households Endogenous (continued)

		10 TRADE	11 CONSTRUCT	12 GOVT SERV
1	FARM PROD	.923798E-02	.370637E-01	.383542E-01
2	AG PROCESS	.263817E-02	.916335E-02	.121156E-01
3	FARM INPUT	.738438E-04	.292330E-03	.301640E-03
4	COMMUNICAT	.602960E-03	.110028E-02	.238209E-02
5	ENERGY	.203830E-02	.751002E-02	.810625E-02
6	TRANSPORT	.445373E-02	.905386E-02	.116229E-01
7	COMMOD MFG	.241707E-02	.516917E-01	.237827E-01
8	MACH MFG	.379758E-03	.344115E-02	.253264E-02
9	SERVICES	.591128E-02	.127186E-01	.304086E-01
10	TRADE	.892862E-01	.694724E-02	.602578E-02
11	CONSTRUCT	.444869E-02	.255857E+00	.979706E-01
12	GOVT SERV	.284075E-02	.112449E-01	.174570E+00
13	HOUSEHOLDS	.000000E+00	.000000E+00	.000000E+00
14	RES. MULT.	.124328E+00	.406085E+00	.408174E+00

Resource Multiplier Matrix for Payroll
with Households Endogenous (continued)

		13 HOUSEHOLDS	TOTALS
1	FARM PROD	.892021E-01	.705239E+00
2	AG PROCESS	.255216E-01	.194894E+00
3	FARM INPUT	.714644E-03	.828275E-01
4	COMMUNICAT	.180778E-02	.175722E+00
5	ENERGY	.898089E-02	.374612E+00
6	TRANSPORT	.163131E-01	.293692E+00
7	COMMOD MFG	.172981E-01	.410108E+00
8	MACH MFG	.315236E-02	.196427E+00
9	SERVICES	.145012E-01	.297902E+00
10	TRADE	.131697E-01	.197638E+00
11	CONSTRUCT	.245346E-01	.460647E+00
12	GOVT SERV	.207823E-01	.278818E+00
13	HOUSEHOLDS	.000000E+00	.000000E+00
14	RES. MULT.	.235978E+00	

Table 3.3 Ranking of Resource Multipliers for Payroll

NAME	(RANK)	MULTIPLIER
FARM PROD	(5)	.312449E+00
AG PROCESS	(6)	.285854E+00
FARM INPUT	(10)	.236043E+00
COMMUNICAT	(8)	.271972E+00
ENERGY	(4)	.317375E+00
TRANSPORT	(9)	.250948E+00
COMMOD MFG	(3)	.331659E+00
MACH MFG	(7)	.283715E+00
SERVICES	(12)	.203945E+00
TRADE	(13)	.124328E+00
CONSTRUCT	(2)	.406085E+00
GOVT SERV	(1)	.408174E+00
HOUSEHOLDS	(11)	.235978E+00

Table 3.4. Resource Multiplier Matrix for Imports with Households Endogenous: Pakistan 1975

		1 FARM PROD	2 AG PROCESS	3 FARM INPUT
1	FARM PROD	.156276E-01	.791271E-02	.122083E-02
2	AG PROCESS	.921246E-02	.121812E+00	.751247E-02
3	FARM INPUT	.454878E-02	.231854E-02	.196386E+00
4	COMMUNICAT	.123528E-03	.221436E-03	.325218E-03
5	ENERGY	.149249E-01	.198904E-01	.688659E-01
6	TRANSPORT	.289378E-01	.348532E-01	.662646E-01
7	COMMOD MFG	.554082E-02	.776671E-02	.194861E-01
8	MACH MFG	.245926E-02	.409679E-02	.275915E-01
9	SERVICES	.276246E-03	.413913E-03	.557006E-03
10	TRADE	.000000E+00	.000000E+00	.000000E+00
11	CONSTRUCT	.310953E-02	.404775E-02	.311622E-02
12	GOVT SERV	.304691E-03	.269493E-03	.253648E-03
13	HOUSEHOLDS	.370927E-01	.339354E-01	.280220E-01
14	RES. MULT.	.122158E+00	.237539E+00	.419602E+00

Resource Multiplier Matrix for Imports with Households Endogenous (continued)

		4 COMMUNICAT	5 ENERGY	6 TRANSPORT
1	FARM PROD	.192572E-02	.151494E-02	.157059E-02
2	AG PROCESS	.188041E-01	.945337E-02	.782368E-02
3	FARM INPUT	.588535E-03	.475501E-03	.483720E-03
4	COMMUNICAT	.330107E-01	.139131E-03	.157897E-03
5	ENERGY	.139475E-01	.463671E+00	.410173E-01
6	TRANSPORT	.263407E-01	.239318E-01	.355113E+00
7	COMMOD MFG	.684708E-02	.114120E-01	.136781E-01
8	MACH MFG	.174260E-01	.215362E-02	.314749E-02
9	SERVICES	.470536E-03	.280083E-03	.691459E-03
10	TRADE	.000000E+00	.000000E+00	.000000E+00
11	CONSTRUCT	.400935E-02	.303114E-02	.410673E-02
12	GOVT SERV	.309711E-03	.268517E-03	.525132E-03
13	HOUSEHOLDS	.322874E-01	.376775E-01	.297915E-01
14	RES. MULT.	.155967E+00	.554008E+00	.458107E+00

Resource Multiplier Matrix for Imports
with Households Endogenous (continued)

	7 COMMOD MFG	8 MACH MFG	9 SERVICES
1 FARM PROD	.198793E-02	.153895E-02	.989924E-03
2 AG PROCESS	.134502E-01	.104773E-01	.637453E-02
3 FARM INPUT	.618626E-03	.478859E-03	.310201E-03
4 COMMUNICAT	.423533E-03	.421095E-03	.601279E-03
5 ENERGY	.401199E-01	.197426E-01	.137532E-01
6 TRANSPORT	.456067E-01	.490825E-01	.149364E-01
7 COMMOD MFG	.172181E+00	.258643E-01	.415880E-02
8 MACH MFG	.610211E-02	.346599E+00	.209100E-02
9 SERVICES	.542776E-03	.532109E-03	.643467E-02
10 TRADE	.000000E+00	.000000E+00	.000000E+00
11 CONSTRUCT	.421703E-02	.338685E-02	.243486E-02
12 GOVT SERV	.356761E-03	.259701E-03	.244525E-03
13 HOUSEHOLDS	.393733E-01	.336815E-01	.242116E-01
14 RES. MULT.	.324980E+00	.492065E+00	.765411E-01

Resource Multiplier Matrix for Imports
with Households Endogenous (continued)

	10 TRADE	11 CONSTRUCT	12 GOVT SERV
1 FARM PROD	.596112E-03	.239166E-02	.247494E-02
2 AG PROCESS	.371671E-02	.129095E-01	.170687E-01
3 FARM INPUT	.186964E-03	.740148E-03	.763720E-03
4 COMMUNICAT	.125768E-03	.229502E-03	.496870E-03
5 ENERGY	.407648E-02	.150196E-01	.162120E-01
6 TRANSPORT	.113893E-01	.231531E-01	.297229E-01
7 COMMOD MFG	.204879E-02	.438156E-01	.201590E-01
8 MACH MFG	.836360E-03	.757861E-02	.557776E-02
9 SERVICES	.257243E-03	.553481E-03	.132330E-02
10 TRADE	.000000E+00	.000000E+00	.000000E+00
11 CONSTRUCT	.179806E-02	.103411E+00	.395975E-01
12 GOVT SERV	.114326E-03	.452555E-03	.702562E-02
13 HOUSEHOLDS	.147598E-01	.482087E-01	.484567E-01
14 RES. MULT.	.399060E-01	.258464E+00	.188879E+00

Resource Multiplier Matrix for Imports
with Households Endogenous (continued)

		13 HOUSEHOLDS	TOTALS
1	FARM PROD	.575607E-02	.455080E-01
2	AG PROCESS	.359554E-01	.274571E+00
3	FARM INPUT	.180940E-02	.209709E+00
4	COMMUNICAT	.377077E-03	.366531E-01
5	ENERGY	.179612E-01	.749202E+00
6	TRANSPORT	.417170E-01	.751050E+00
7	COMMOD MFG	.146624E-01	.347621E+00
8	MACH MFG	.694260E-02	.432602E+00
9	SERVICES	.631056E-03	.129639E-01
10	TRADE	.000000E+00	.000000E+00
11	CONSTRUCT	.991635E-02	.186183E+00
12	GOVT SERV	.836386E-03	.112210E-01
13	HOUSEHOLDS	.146730E+00	.554229E+00
14	RES. MULT.	.283295E+00	

Table 3.5. Ranking of Resource Multipliers for Imports

NAME	(RANK)	MULTIPLIER
FARM PROD	(11)	.122158E+00
AG PROCESS	(8)	.237539E+00
FARM INPUT	(4)	.419602E+00
COMMUNICAT	(10)	.155967E+00
ENERGY	(1)	.554008E+00
TRANSPORT	(3)	.458107E+00
COMMOD MFG	(5)	.324980E+00
MACH MFG	(2)	.492065E+00
SERVICES	(12)	.765411E-01
TRADE	(13)	.399060E-01
CONSTRUCT	(7)	.258464E+00
GOVT SERV	(9)	.188879E+00
HOUSEHOLDS	(6)	.283295E+00

Table 3.6. Resource Multiplier Matrix for Self Employment Income and Saving with Households Endogenous: Pakistan 1975

	1 FARM PROD	2 AG PROCESS	3 FARM INPUT
1 FARM PROD	.613316E+00	.310540E+00	.479124E-01
2 AG PROCESS	.742319E-02	.981536E-01	.605338E-02
3 FARM INPUT	.446828E-02	.227751E-02	.192911E+00
4 COMMUNICAT	.191293E-02	.342911E-02	.503626E-02
5 ENERGY	.564870E-02	.752802E-02	.260639E-01
6 TRANSPORT	.191429E-01	.230561E-01	.438354E-01
7 COMMOD MFG	.719894E-02	.100909E-01	.253174E-01
8 MACH MFG	.953821E-03	.158893E-02	.107013E-01
9 SERVICES	.337014E-01	.504967E-01	.679536E-01
10 TRADE	.128727E+00	.135244E+00	.967338E-01
11 CONSTRUCT	.104227E-01	.135675E-01	.104452E-01
12 GOVT SERV	.101212E-01	.895203E-02	.842570E-02
13 HOUSEHOLDS	.267349E-01	.244592E-01	.201971E-01
14 RES. MULT.	.869773E+00	.689384E+00	.561587E+00

Resource Multiplier Matrix For Self Employment Income and Savings with Households Endogenous (continued)

	4 COMMUNICAT	5 ENERGY	6 TRANSPORT
1 FARM PROD	.755763E-01	.594549E-01	.616391E-01
2 AG PROCESS	.151519E-01	.761731E-02	.630414E-02
3 FARM INPUT	.578121E-03	.467086E-03	.475160E-03
4 COMMUNICAT	.511197E+00	.215456E-02	.244515E-02
5 ENERGY	.527877E-02	.175487E+00	.155239E-01
6 TRANSPORT	.174249E-01	.158314E-01	.234915E+00
7 COMMOD MFG	.889611E-02	.148271E-01	.177714E-01
8 MACH MFG	.675867E-02	.835279E-03	.122075E-02
9 SERVICES	.574045E-01	.341696E-01	.843567E-01
10 TRADE	.832325E-01	.976333E-01	.393960E-01
11 CONSTRUCT	.134388E-01	.101600E-01	.137652E-01
12 GOVT SERV	.102880E-01	.891961E-02	.174438E-01
13 HOUSEHOLDS	.232714E-01	.271564E-01	.214725E-01
14 RES. MULT.	.828498E+00	.454714E+00	.516729E+00

Resource Multiplier Matrix for Self Employment Income and Savings With Households Endogenous (continued)

		7 COMMOD MFG	8 MACH MFG	9 SERVICES
1	FARM PROD	.780181E-01	.603973E-01	.388503E-01
2	AG PROCESS	.108378E-01	.844238E-02	.513645E-02
3	FARM INPUT	.607679E-03	.470386E-03	.304712E-03
4	COMMUNICAT	.655874E-02	.652099E-02	.931128E-02
5	ENERGY	.151843E-01	.747208E-02	.520522E-02
6	TRANSPORT	.301698E-01	.324691E-01	.988079E-02
7	COMMOD MFG	.223708E+00	.336044E-01	.540335E-02
8	MACH MFG	.236669E-02	.134428E+00	.810993E-03
9	SERVICES	.662176E-01	.649163E-01	.785018E+00
10	TRADE	.130336E+00	.600819E-01	.245600E-01
11	CONSTRUCT	.141349E-01	.113523E-01	.816135E-02
12	GOVT SERV	.118509E-01	.862674E-02	.812263E-02
13	HOUSEHOLDS	.283786E-01	.242762E-01	.174507E-01
14	RES. MULT.	.618370E+00	.453058E+00	.918216E+00

Resource Multiplier Matrix for Self Employment Income and Savings with Households Endogenous (continued)

		10 TRADE	11 CONSTRUCT	12 GOVT SERV
1	FARM PROD	.233948E-01	.938626E-01	.971309E-01
2	AG PROCESS	.299484E-02	.104022E-01	.137536E-01
3	FARM INPUT	.183655E-03	.727050E-03	.750205E-03
4	COMMUNICAT	.194762E-02	.355402E-02	.769442E-02
5	ENERGY	.154284E-02	.568452E-02	.613582E-02
6	TRANSPORT	.753430E-02	.153162E-01	.196623E-01
7	COMMOD MFG	.266191E-02	.569277E-01	.261917E-01
8	MACH MFG	.324381E-03	.293935E-02	.216333E-02
9	SERVICES	.313831E-01	.675237E-01	.161440E+00
10	TRADE	.864458E+00	.672623E-01	.583409E-01
11	CONSTRUCT	.602687E-02	.346624E+00	.132726E+00
12	GOVT SERV	.379770E-02	.150329E-01	.233377E+00
13	HOUSEHOLDS	.106382E-01	.347469E-01	.349256E-01
14	RES. MULT.	.956889E+00	.720604E+00	.794292E+00

Resource Multiplier Matrix for Self Employment Income and Savings with Households Endogenous (Continued)

		13 HOUSEHOLDS	TOTALS
1	FARM PROD	.225901E+00	.178599E+01
2	AG PROCESS	.289720E-01	.221243E+00
3	FARM INPUT	.177738E-02	.205998E+00
4	COMMUNICAT	.583934E-02	.567602E+00
5	ENERGY	.679786E-02	.283553E+00
6	TRANSPORT	.275967E-01	.496835E+00
7	COMMOD MFG	.190503E-01	.451649E+00
8	MACH MFG	.269268E-02	.167784E+00
9	SERVICES	.769877E-01	.158157E+01
10	TRADE	.127507E+00	.191351E+01
11	CONSTRUCT	.332384E-01	.624063E+00
12	GOVT SERV	.277830E-01	.372741E+00
13	HOUSEHOLDS	.105757E+00	.399465E+00
14	RES. MULT.	.689902E+00	.000000E+00

Table 3.7. Ranking of Resource Multipliers for Self Employment Income and Savings

NAME	(RANK)	MULTIPLIER
FARM PROD	(3)	.869773E+00
AG PROCESS	(8)	.689384E+00
FARM INPUT	(10)	.561587E+00
COMMUNICAT	(4)	.828498E+00
ENERGY	(12)	.454714E+00
TRANSPORT	(11)	.516729E+00
COMMOD MFG	(9)	.618370E+00
MACH MFG	(13)	.453058E+00
SERVICES	(2)	.918216E+00
TRADE	(1)	.956889E+00
CONSTRUCT	(6)	.720604E+00
GOVT SERV	(5)	.794292E+00
HOUSEHOLDS	(7)	.689900E+00

3.5 Measurement of Inflationary Impacts of Primary Inputs on the Pakistan Economy

The Pakistan total requirements table is used, in conjunction with the direct requirements coefficients for the primary inputs, to trace and quantify the inflationary impacts of changes in the prices or margins of the "primary" inputs on the intermediate processing part of the economy. The purpose of the analysis is to measure the amount of processing sector inflation, on an industry-by-industry basis, caused by cost changes of the" primary"

inputs. Primary inputs are all inputs that are not produced by local processors. Examples of primary input inflation include rising tax rates, changes in the terms of trade or duties which raise import costs, inflation in the costs of certain imports such as energy, or increases in the markup or profit rate in certain industries.

The goal of the primary input inflation analysis is to show the total effects or multiplier relationship between the price indices on each of the primary inputs (imports, indirect taxes minus subsidies, and self employment income plus profits) and the intermediate processing sector price indices ($P_1 \ldots P_{13}$) for the 13 industries of the condensed model of Pakistan, 1975. The prices or rates on the primary inputs are taken as exogenous. Changes in import prices, tax rates, profit margin rates etc. lead to direct and indirect cost effects on the 13 intermediate processing sectors. The relationship between the intermediate processing industry price indices and primary input prices or margins was derived in Chapter 1.

As noted in Chapter 1, two major differences exist between the I/O price analysis framework and the conventional I/O total requirements multiplier analysis. First, the conventional I/O analysis constructs balance equations which sum across rows of the transactions-among-sectors table. In contrast, the I/O price analysis constructs index number equations which sum down columns of the transactions among sectors table. Secondly, the conventional I/O multiplier analysis is demand driven---exogenous changes in final demand create the driving force for production by the economy. In contrast, the I/O price analysis is driven by exogenous changes in the price indices of primary inputs. The conventional I/O model focuses on Quadrants 1 and 2 of the transactions-among-sectors table while the I/O price analysis focuses on Quadrants 1 and 3 (see Table 1.1).

The total effects on costs in the intermediate processing sectors ($P_1 \ldots P_{13}$), is directly and indirectly related to the vector of index numbers on the primary input sectors ($R_1 \ldots R_3$), by the transpose of the Leontief inverse

$$[(I-A)^{-1}]^T$$

times the transpose of the technical coefficients on the primary inputs (B^T). The Leontief inverse, or total requirements table, and the primary input coefficients from the Pakistan I/O model provide the multiplier between any primary input price index (markup, tax increase, import duty etc.) and each of the price indices on the 13 intermediate processing industries of the economy.

3.6 Calculation of the Leontief Price Multipliers for the Pakistan Economy

The technical input coefficients for Pakistan are shown in Table 2.4. Only the coefficients for primary inputs are required. These coefficients are contained in rows 14, 15, and 16 of Table 2.4. Only coefficients for the intermediate processing sectors are required; thus columns 14 and 15 of the table are deleted. This leaves a 3 by 14 matrix which is transposed to a 14 by 3 matrix shown in the calculations which follow. The total requirements coefficients (Leontief inverse) for Pakistan are shown in Table 3.1. The transpose of the Leontief inverse (the transpose of Table 3.1) and the transpose of the primary inputs technical coefficients are multiplied times the vector of primary input price indices to calculate the Leontief price multipliers, as in the formula, $(P) = [(I-A)^{-1}]^T (B^T)(R)$.

Each row of the Leontief Price Matrix shows the effect of each of the primary input prices on a given intermediate processing industry. Intermediate processing sector prices are assumed to be totally dependent on prices of primary inputs in this formulation. Independent movement of the intermediate processing prices is impossible (such as might occur with monopolization of production or workers, crop failure, government rationing etc.). Thus, just as the intermediate processing sector sales are totally dependent on final demand values in the conventional Leontief I/O model, the intermediate processing sector prices are totally dependent in the Leontief price model. In the Leontief price multiplier however, it is primary input prices, not final demands, that drive the model.

The price matrix can be used to find the effects of any combination of inflation in the primary inputs prices on each of the intermediate processing sector prices. This estimate is based upon the direct and indirect cost components of the inputs (including intermediate processing sector production) to the 13 intermediate processing industries. Since the household sector is likely to be an instigator of price rises and also may not be forced to pass along cost increases like competitive industry must, it may be preferable to construct the Leontief price multipliers with households defined as a primary input rather than an intermediate processing sector. The households endogenous model shown here is more accurate in an economy with abundant labor and which is not dominated by powerful labor unions.

1.463113	0.100018	0.023207	0.003896	0.034974	0.084656
0.740817	1.322497	0.011828	0.006985	0.046610	0.101962
0.114298	0.081561	1.001945	0.010259	0.161378	0.193855
0.180293	0.204153	0.003002	1.041383	0.032684	0.077059
0.141834	0.102633	0.002425	0.004389	1.086555	0.070012
0.147044	0.084940	0.002467	0.004981	0.096119	1.038878
0.186118	0.146026	0.003156	0.013361	0.094016	0.133421
0.144082	0.113750	0.002443	0.013284	0.046264	0.143590
0.092680	0.069207	0.001582	0.018968	0.032228	0.043696
0.055810	0.040351	0.000953	0.003967	0.009552	0.033319
0.223916	0.140156	0.003776	0.007240	0.035196	0.067734
0.231713	0.185312	0.003896	0.015674	0.037990	0.086953
0.538905	0.390362	0.009231	0.011895	0.042090	0.122042

0.045932	0.008249	0.044934	0.151308	0.032096
0.064384	0.013743	0.067327	0.158968	0.041780
0.161535	0.092559	0.090602	0.113702	0.032165
0.056760	0.058458	0.076537	0.097833	0.041384
0.094603	0.007224	0.045558	0.114760	0.031287
0.113389	0.010558	0.112472	0.046306	0.042389
1.427349	0.020470	0.088288	0.153200	0.043528
0.214409	1.162713	0.086553	0.070621	0.034959
0.034475	0.007014	1.046666	0.028868	0.025132
0.016984	0.002805	0.041843	1.016103	0.018559
0.363222	0.025423	0.090029	0.079061	1.067419
0.167114	0.018711	0.215248	0.068575	0.408725
0.121548	0.023289	0.102647	0.149875	0.102356

0.050472	0.312449
0.044642	0.285854
0.042017	0.236043
0.051304	0.271972
0.044480	0.317375
0.086988	0.250948
0.059098	0.331659
0.043019	0.283715
0.040505	0.203945
0.018938	0.124328
0.074966	0.406085
1.163805	0.408174
0.138548	1.235979

$$
= \begin{bmatrix}
0.122158\ R_{IMP} + 0.008068\ R_{TAX} + 0.869773\ R_{SAV} \\
0.237539\ R_{IMP} + 0.073076\ R_{TAX} + 0.689384\ R_{SAV} \\
0.419602\ R_{IMP} + 0.018809\ R_{TAX} + 0.561587\ R_{SAV} \\
0.155967\ R_{IMP} + 0.015534\ R_{TAX} + 0.828497\ R_{SAV} \\
0.554008\ R_{IMP} - 0.008720\ R_{TAX} + 0.454714\ R_{SAV} \\
0.458107\ R_{IMP} + 0.025162\ R_{TAX} + 0.516729\ R_{SAV} \\
0.324980\ R_{IMP} + 0.056648\ R_{TAX} + 0.618370\ R_{SAV} \\
0.492064\ R_{IMP} + 0.054876\ R_{TAX} + 0.453058\ R_{SAV} \\
0.076541\ R_{IMP} + 0.005242\ R_{TAX} + 0.918216\ R_{SAV} \\
0.039906\ R_{IMP} + 0.003204\ R_{TAX} + 0.956889\ R_{SAV} \\
0.258464\ R_{IMP} + 0.020931\ R_{TAX} + 0.720604\ R_{SAV} \\
0.188879\ R_{IMP} + 0.016828\ R_{TAX} + 0.794292\ R_{SAV} \\
0.283295\ R_{IMP} + 0.026802\ R_{TAX} + 0.689902\ R_{SAV}
\end{bmatrix}
$$

$$
= \begin{bmatrix}
P_{FARM\ PROD,i} \\
P_{AG\ PROCESS,i} \\
P_{FARM\ INPUT,i} \\
P_{COMMUNICAT,i} \\
P_{ENERGY,i} \\
P_{TRANSPORT,i} \\
P_{COMMOD\ MFG,i} \\
P_{MACH\ MFG,i} \\
P_{SERVICES,i} \\
P_{TRADE,i} \\
P_{CONSTRUCT,i} \\
P_{GOVT\ SERV,i} \\
P_{HOUSEHOLDS,i}
\end{bmatrix}
$$

$i = 1 \ldots 3,$

where i stands for imports, indirect taxes minus subsidy, and self employment income plus savings, respectively.

Table 3.8 displays the Leontief price multipliers which can be used to find the effects of any combination of inflation in the primary inputs prices on each of the intermediate processing sector prices. Comparison of the coefficients reveals that, for many of the industries, increases in savings, profits or self employment income create the largest direct and indirect effect on industry costs. This result is due partly to the large direct cost component of many Pakistan industries that goes to self employment income, or profit and savings. The impact of import price rises is particularly strong on farm inputs costs, energy sector costs, transportation industry costs, commodity and machinery manufacturing costs. Import prices also have an

important impact on the construction sector and on household operating costs. Increases of indirect business taxes create little direct or indirect cost effects; the strongest impact is on agricultural processing, and commodity and machinery manufacturing. For farm producers, a 100 percent rise of import prices results in a production cost increase of 12.2 percent, while an indirect tax increase of 100 percent raises costs by only 0.8 of a percent, and a 100 percent increase of profits, saving or self employment income causes costs to rise by almost 87 percent. If the prices of all three primary inputs rose by 100 percent, then farm costs of production would also rise by 100 percent. This result is created by the design of the Leontief price multiplier model. Prices in the energy sector are more strongly affected by import price rises than any other Pakistan industry. Prices in the commodity manufacturing sector are more strongly affected by indirect tax increases than any other Pakistan industry. Prices in the trade sector are more strongly affected by increased rates of profit, saving or self employment income than any other Pakistan industry. In fact, prices in the trade sector are determined almost completely by prices paid to self employment income or profit and saving. A one percent rise of the prices on these primary inputs creates a 0.96 percent price rise in the trade sector.

Table 3.8. Primary Input Leontief Price Multipliers

	Imports	Indirect Tax Less Subsidy	Self Employment Income and Savings
FARM PROD	0.122158	0.008068	0.869773
AG PROCESS	0.237539	0.073076	0.689384
FARM INPUT	0.419602	0.018809	0.561587
COMMUNICAT	0.155967	0.015534	0.828497
ENERGY	0.554008	0.008720	0.454714
TRANSPORT	0.458107	0.025162	0.516729
COMMOD MFG	0.324980	0.056648	0.618370
MACH MFG	0.492064	0.054876	0.453058
SERVICES	0.076541	0.005242	0.918216
TRADE	0.039906	0.003204	0.956889
CONSTRUCT	0.258464	0.020931	0.720604
GOVT SERV	0.188879	0.016828	0.794292
HOUSEHOLDS	0.283295	0.026802	0.689902

3.7 Constrained Optimization of the Pakistan Economy

An example of a combined linear programming and input-output model is formulated below. The objective function

uses the technical coefficients in the condensed I/O model for household income plus self employment income and saving to weight the outputs (X_1, ... $_{13}$) of the 13 intermediate processing sectors. The command MAX instructs Lindo to maximize national income defined by the objective function. Constraints are included for the 13 balance equations of the I/O model which ensures that outputs from each sector are sufficient to meet domestic requirements plus export demand. Other constraints are included to ensure that there are no negative sales values for any industry. Finally, exports are constrained to their current amounts for communications, energy, transport, services, trade, and construction. Realistically, these sectors are unlikely to be competitive on world markets nor do they have the resources to expand into world markets. Although numerous constraints have already been incorporated into the linear programming model, the I/O industry outputs are still free to expand indefinitely in certain sectors; thus an LP solution is not possible. The Pakistan transportation system could provide a constraint on economic growth as could energy, water, skilled labor, or a number of other sectors or resources. As an example, the transportation sector was constrained just below the 1975 output level.The transport constraint affects every industry in Pakistan either directly or indirectly since all sectors either use transportation inputs or buy from sectors that use transport inputs. It should be noted that the transport constraint is incorrect for the household sector since it describes transport costs for persons residing in Pakistan while household exports are created by persons working outside of Pakistan.

With the introduction of the transport constraint, the I/O model is no longer unbounded and an LP solution can be obtained. Two solutions at total transport sales of Rs.20,000,000 are contrasted with the unconstrained economy represented by the original condensed I/O model in Table 3.9.

Table 3.9. Linear Programming Solutions for the Constrained Condensed I/O Model of Pakistan

Sector	Original Uconstrained Equilibrium Values	Transport Output Limited to Rs.20x10^9	Added Constraints On Ag. Prod. & Govt.	Shadow Prices On Final Demands
		(x10^9 Rs.)		
1.	67.9	340.7	101.9	0.43
2.	53.7	23.9	22.8	0.00
3.	1.4	5.4	1.6	0.00
4.	1.4	1.0	1.8	0.52
5.	6.2	8.3	12.9	0.25
6.	20.5	20.0	20.0	0.45
7.	16.1	12.4	163.4	0.00
8.	3.7	2.0	2.9	0.00
9.	14.9	11.4	13.7	0.80
10.	18.8	36.3	26.6	0.84
11.	20.4	12.6	12.6	0.59
12.	27.6	12.1	12.1	0.54
13.	134.0	74.6	56.9	0.00

Table 3.9 shows the original I/O equilibrium output values for the 13 intermediate processing sectors in the first column. Note that, with the exception of Sector 6 (transport) all other sectors were free to expand their outputs although Sectors 4, 5, 6, 9, 10, and 11 were constrained from expanding their sales to final demand. Comparing column 1 with column2 shows that the conversion of the I/O to a constrained optimization model results in very large changes in the structure of the Pakistan economy. Given the constraints and given the technical coefficients of the I/O model, value added maximization results in great expansion of exports in the farm producer sector while other sectors reduce exports to zero. Evidently the direct and indirect transport requirements relative to the ability to create value added is relatively low for the farm producer sector. Other sectors reduce exports to zero in order to free up resources, allowing the farm sectors to expand to their maximum output level. The exceptions are the trade, services, construction, energy, and communications sectors which had constraints preventing them from expanding their exports beyond the 1975 level. Examination of the rightmost column reveals that these sectors had positive shadow prices on their final demand constraints indicating that they would have expanded exports if not for our linear programming constraints. The

largest shadow prices is on trade, followed by services and construction.

The results of this exercise demonstrate the importance of including all relevant constraints in order to produce a realistic result with the optimization model. Allowing trade or services etc. to expand exports would not have been realistic although there is no such constraint indicated in the I/O model. In principle, the equilibrium of a competitive economy should result in maximum value added, but the LP solution varied greatly from the actual equilibrium even though the transport constraint reduced transport output by a very small amount. One reason for this divergence was that our linear programming model was still incomplete. Additional constraints for inputs such as water, land, skilled labor, etc. are required in order to realistically portray the Pakistan economy. Farm production is constrained by water and/or available farmland and when this constraint is reached other sectors must then expand exports to maximize value added. Since data were not available to build in other resource constraints, farm output was arbitrarily limited to 150% of its actual 1975 value. When this added constraint was included in the Lindo program, the government sector exports increased. Since government exports may only be increased loans, an additional constraint on government exports was imposed, resulting in a shadow price of 0.54 as shown in Table 3.9. At this point, a huge expansion occurred in the commodity manufacturing sectors, exports, and output. Our tentative conclusion from this simulation is that the manufacturing sectors have a significant disadvantage relative to agricultural producers in creating additions to national income when faced with a transportation constraint. Many other sectors which have little promise of finding export markets, such as services and trade, have an advantage over the manufacturers when transport output is limited. Transition of the Pakistan economy toward manufacturing will occur as investment opportunities in agriculture are fully exploited. Industrialization may add relatively little to Pakistan's national income unless the bottleneck of direct and indirect transportation input requirements for manufacturing can be overcome. Increased output and efficiency in transportation and/or changes in technology away from transport dependence are required.

Household exports, which account for a significant share of foreign earnings for Pakistan, did not enter on any of the linear programming runs. This may have been due to the inappropriate transportation coefficient on the household sector as noted earlier. Given appropriate constraints on certain industry exports, our tentative conclusion is that exports of the commodity manufacturing sectors create the

most value added under conditions of limited transportation output. The transition from growth in agricultural production to other sectors as agricultural development opportunities are used up involves growth of transport intensive sectors directly and indirectly. This is borne out by the impact multipliers shown in Appendix A-3. A general expansion of the Pakistan economy creates the largest demands upon households, trade, livestock, and road transport, in that order. Road transport receives the fourth highest demand increase out of the 106 sectors in the I/O model.

3.8 Lindo Operating Commands To Maximize Value Added Subject to a Transport Production Constraint

LINDO (user command to start the Lindo program)

TAKE (user command to retrieve foreign file into Lindo)
(user selects file LIN9 from a Lindo menu display)

GO (user command to run Lindo using the file shown below)

LIN9 (a file containing Lindo commands created on a word processor)

(All the following statements were stored on the file LIN9)

```
MAX

        .5847x1+.1396x2+.2699x3+.6429x4
        +.3749x5+.3598x6+.2990x7
        +.2509x8+.8913x9+.5644x11
        +.9387x10+.3505x12+.0856x13


SUBJECT TO

         .7553x1-.3755x2 -.0000x3-.0000x4
        -.0000x5 -.0241x6-.0092x7-.0012x8
        -.0000x9 -.0000x10-.0261x11-.0065x12
        -.2045x13 -y1=0

        -.0000x1+.8130x2 -.0000x3-.0904x4
        -.0000x5 -.0000x6-.0226x7-.0120x8
        -.0012x9 -.0002x10-.0006x11-.0369x12
        -.2491x13 -y2=0
```

-.0157x1-.0000x2+1.0000x3-.0000x4
-.0000x5 -.0000x6-.0000x7-.0000x8
-.0000x9 -.0000x10-.0000x11-.0000x12
-.0006x13 -y3=0

-.0000x1-.0022x2 -.0048x3+.9645x4
-.0003x5 -.0000x6-.0059x7-.0067 x8
-.0156x9 -.0021x10-.0000x11-.0066x12
-.0055x13 -y4=0

-.0110x1-.0145x2 -.1210x3-.0117x4
+.9357x5 -.0736x6-.0479x7-.0126x8
-.0201x9 -.0024x10-.0000x11-.0067x12
-.0064x13 -y5=0

-.0345x1-.0350x2 -.1452x3-.0325x4
-.0298x5+1.0000x6-.0643x7-.0849x8
-.0196x9 -.0195x10-.0000x11-.0255x12
-.0554x13 -y6=0

-.0029x1-.0107x2 -.0724x3-.0061x4
-.0396x5 -.0540x6+.7276x7-.1077x8
-.0056x9 -.0000x10-.2227x11-.0020x12
-.0384x13 -y7=0

-.0000x1-.0044x2 -.0739x3-.0431x4
-.0002x5 -.0035x6-.0078x7+.8663x8
-.0015x9 -.0000x10-.0119x11-.0024x12
-.0114x13 -y8=0

-.0054x1-.0207x2 -.0422x3-.0362x4
-.0095x5 -.0750x6-.0303x7-.0370x8
+.9770x9 -.0278x10-.0355x11-.1372x12
-.0384x13 -y9=0

-.0823x1-.0548x2 -.0619x3-.0469x4
-.0661x5 -.0000x6-.0724x7-.0144x8
-.0000x9+1.0000x10-.0000x11-.0000x12
-.0574x13-y10=0

-.0000x1-.0100x2 -.0050x3-.0091x4
-.0009x5 -.0010x6-.0050x7-.0049x8
-.0018x9 -.0063x10+.9787x11-.3265x12
-.0395x13-y11=0

-.0077x1-.0008x2 -.0019x3-.0135x4
-.0046x5 -.0494x6-.0089x7-.0009x8
-.0137x9 -.0027x10-.0203x11+.9072x12
-.0887x13-y12=0

```
-.1655x1-.0653x2 -.0774x3-.1519x4
-.2133x5 -.1336x6-.1423x7-.1353x8
-.1412x9 -.0878x10-.2396x11-.1500x12
+1.0000x13-y13=0

y4<0
y5<319831
y6<5690006
y9<521214
y10<779356
y11<4851153

x1=>0
x2=>0
x3=>0
x4=>0
x5=>0
x6=>0
x7=>0
x8=>0
x9=>0
x10=>0
x11=>0
x12=>0
x13=>0

.0345x1+.035x2+.1452x3+.0325x4
+.0299x5+.0643x7+.0849x8+.0196x9
+.0196x10+.02554x12+.0554x13<20000000

x6<20000000

END
```

(end of file LIN9)

3.9 Business Multipliers for the 106 Processing Sector Pakistan I/O Model

Business multipliers which are column sums of the 106 sector square inverse matrix are shown in Appendix A-3. The interpretation of the multipliers is that, for a given industry expansion of sales to final demand (primarily exports), the multiplier shows the total sales increase among all sectors of the Pakistan economy. For example, if small textile manufacturers expand exports by 1 million rupees, total spending throughout Pakistan will rise by 4.204 million rupees.

The top ten business multipliers are for small textile manufacturers, non-metallic mineral products, small printing and publishing, small cotton textile

manufacturers, large cotton fabric manufacturers, large thread manufacturers, small rice mills, small carpet manufacturers, small edible oil processors and large cotton yarn manufacturers. As discussed in Chapter 2, the large amounts of undistributed value added in the agricultural producer, services, and trade sectors, and the fact of large numbers of small entrepreneurs in these sectors, suggests that exclusion of self employment income from the household row may create a significant understatement of the multiplier values in these sectors.

3.10 Industry Impact Multipliers for the 106 Processing Sector Pakistan I/O Model

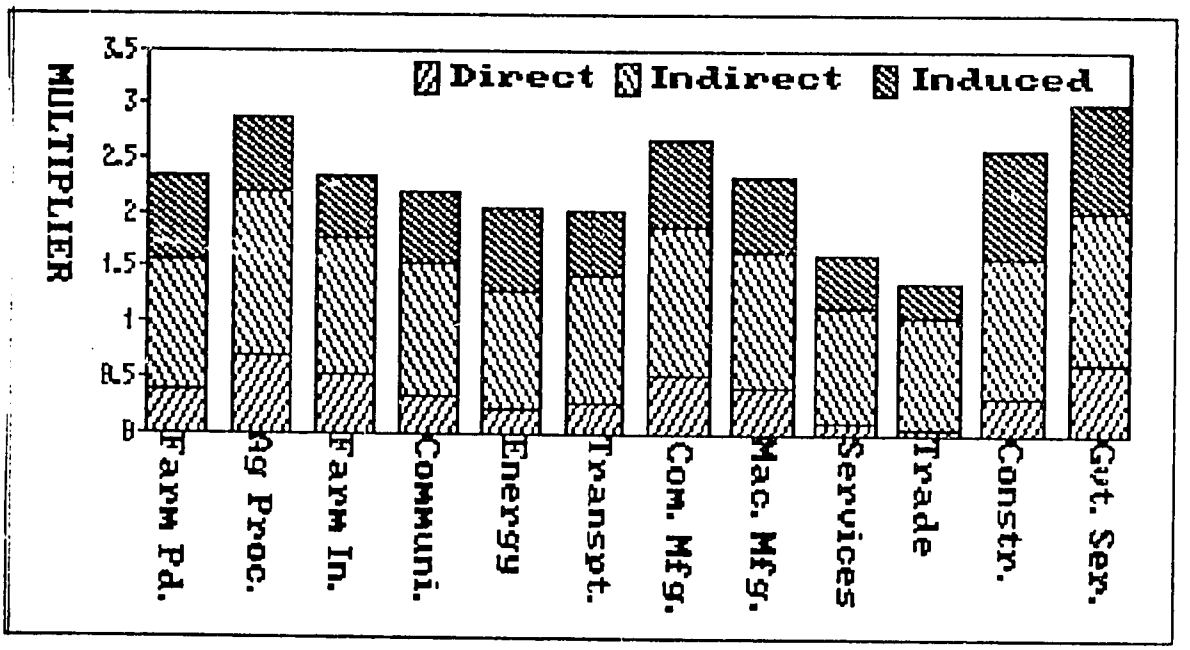
While the business multiplier measures the total spending impact throughout the economy when one sector expands, the industry impact multiplier shows the effect on any given industry if the whole economy expands. Thus, if every sector expanded exports by 1 million rupees, total income to households would rise by 33.2 million rupees. The largest industry impact multipliers are for households, trade, livestock, road transport, government services, crops not elsewhere included, other services, large iron works, cotton gins, and large petroleum refiners. These are the sectors most strongly impacted by a general growth of the economy. If these sectors are unable to expand, general growth of the Pakistan economy may be stymied. The industry impact multipliers are found by summing the rows of the Leontief inverse for the Pakistan economy.

3.11 Summary and Conclusions

Modifications were incorporated into the P.I.D.E. I/O data to build in a wage and salary household row. Exclusion of household income and spending in the measurement of the cumulative multiplier effects of the Pakistan economy would result in serious understatement of these effects. Figure 3.2 shows the extent to which direct, indirect, and induced spending contributed to the size of each industry multiplier. The dark shaded areas indicate the induced effect caused by household spending. It is clear from Figure 3.2 that household spending is very important in the estimation of the multipliers. Further sensitivity tests on the condensed version of the I/O model suggest that additional adjustment is required to include self employment income in the household row, especially for the agricultural sectors, for services, and for trade. Exclusion of self employment income from the interdependent spending interactions of the model may result in

significant understatement of the multiplier effects, especially for the sectors mentioned above.

Figure 3.2. Multipliers By Industry: Pakistan 1975



Given the qualifications on the accuracy of the 1975 I/O data, several analyses were developed in Chapter 3. The total requirements coefficients shown in Table 3.1 reveal that government services, households, and agricultural processing tend to have higher multipliers than the other sectors. If self employment income was included in the households row it is possible that farm producers, services, trade, and households would have the highest multipliers as shown in Table 2.1. The main diagonal of the total requirements coefficients table shows that three sectors have considerable feedback of demand when they expand sales to final demand. For example, if farm producers expanded total output by 10 percent in order to increase exports, only about 7 percent of the increased farm output could be exported since the rest would be demanded inside Pakistan because of the stimulus to the economy provided by the initial expansion of the farm sector. A similar effect would occur for commodity manufacturing, and a slightly smaller effect in agricultural processing. Scanning across the energy row of the total requirements table, the farm input sector (fertilizer and farm machinery) creates the largest total energy requirements when it expands. The transportation sector, and the commodity manufacturing sectors are second

and third in direct plus indirect energy requirements. Scanning the transportation sector row, direct and indirect requirements for transportation services are much higher for the farm input sector than any other. Machinery and commodity manufacturers also have high cumulative transportation requirements.

Payroll multipliers indicate that government and construction tend to create the most added payroll as they expand. The import multipliers show that the energy sector would create a total import demand by the Pakistan economy that was over half the value of the exports produced, and machinery manufacturing would stimulate imports equal to half of the value of the exports produced. Transportation and farm input exports would also result in significant total import demand increases. The preferred export sectors from the standpoint of improving the balance of trade would be the trade, services, and farm production sectors whose expansion creates almost no increased demands for imports. Once again, the best industries to expand if the intent is to increase self employment income, rent, and savings, are the trade, services, and farm production sectors.

The Leontief primary input price multipliers show the effects on Pakistan industries when import price increases occur, when indirect taxes rise, or when profit and self employment income increase in Pakistan. Price rises of imports create large direct and indirect cost effects on the energy, machinery manufacturers, transport, and farm input sectors. Increased profit, self employment income rates or savings create cost rises of almost equal amount in the trade, services, and farm producer sectors. These sectors have very high direct spending for self employment, rent, or savings. Prices in all sectors are very strongly affected by price rises of these inputs. Indirect taxes have very little effect on industry costs, with the largest effect on the manufacturing sectors.

Development of a combined linear programming/input-output model revealed that a limitation in transportation services would favor agricultural production over the manufacturing sectors as viable sources of exports. Once the resource limits for expanding farm production were reached, the commodity manufacturing sector entered as a source of exports to increase national income. It was apparent that sectors that are unlikely to have large export demand, such as services and trade, were not susceptible to transport limitations while major export industries, such as food processing and manufacturing, were impacted heavily by transport scarcity. The impact multipliers shown in Appendix A-3 revealed that a general expansion of the Pakistan economy created the most demand growth in the

households, trade, livestock, and road transportation sectors.

APPENDIX A-1

The Production Relation Assumptions of Input/Output Models

I/O models are sometimes attacked as having limited realism due to the assumption of fixed coefficients in the linear balance equations. These fixed constants are often said to imply that physical inputs are used in fixed proportions (Miller and Blair). This would be true only if the I/O flows data were collected for physical input relationships rather than spending relationships. A less restrictive assumption is actually required in order to provide for fixed spending shares among inputs. The assumption required is that efficient production must result in constant spending shares to the inputs regardless of the ratios of the input prices. Virtually all I/O models deal with spending data, not with physical input data, and thus the fixed technical coefficients refer not to physical inputs but rather to the spending on inputs by the industries in the model. The technical coefficients are the share of the spending or income allotted to each input. The technical coefficients, which include an allocation to retained earnings, must sum to unity.

Another statement is often made concerning the effects of scale change within the I/O framework. It is usually stated that the I/O model assumes constant returns to scale. The usual definition of constant returns to scale states that if all physical inputs are increased proportionately then output must also increase by that same proportion. The I/O model in fact assumes that if spending on all locally supplied inputs, savings or profit, depreciation, taxes and imports, increase proportionately then total sales of output will increase by that same proportion. This is a long run adjustment which satisfies the definition of a change of scale but it refers to spending on inputs and sales revenue from outputs, not to physical units as in a production function. The I/O spending relationships are consistent with constant returns to scale but are not strictly limited to that assumption if the I/O flows are measured as spending rather than as physical output.

At least one production function satisfies the I/O requirement that the share of spending on each input must remain constant and that doubling the spending on each input doubles the sales revenue on output. The production function equation form first popularized by Cobb and Douglas embodies the assumptions inherent in an I/O model. The Cobb-Douglas production function is of the form:

$$X = k\ Z_{11}^{(a)}\ Z_{21}^{(1-a)}.$$

With the assumption of perfect competition, each input will be paid a price equal to the value of its marginal product which is the price of output P_X times marginal product. One can derive the amount which must be paid to all inputs by multiplying the quantity of each input times its value of marginal product and summing over all inputs. Total spending on inputs by the industry producing output X is,

$$(P_X)(MPP_{Z11})(Z_{11}) + (P_X)(MPP_{Z21})(Z_{21})$$

where P_X is the price of the industry output and the other terms refer to the marginal physical products and the amounts of the two inputs purchased to produce output of X.

The marginal physical products of Z_{11} and Z_{21} are:

$$MPP_{Z11} = (a)(k)Z_{11}^{(a-1)}\ Z_{21}^{(1-a)} \text{ and}$$
$$MPP_{Z21} = (1-a)(k)Z_{11}^{(a)}\ Z_{21}^{(-a)}.$$

Total input cost is:

$$COST = P_X\ (a)(k)Z_{11}^{(a-1)}Z_{21}^{(1-a)}\ Z_{11} + P_X\ (1-a)(k)Z_{11}^{(a)}Z_{21}^{(-a)}\ Z_{21}$$

which reduces to:

$$COST = P_X\ (a)(X) + P_X\ (1-a)(X)$$

by substitution of the production function to simplify the cost function. Since (a) and (1-a) sum to unity in the Cobb-Douglas production function, the cost is decomposed into revenue attributed to the input Z_{11} and revenue attributed to the input Z_{21}. Thus the total input cost just equals the revenue generated by the two inputs based upon their value of marginal products. The share of revenue (= cost) attributed to each input is given by the constants (a) and (1-a) which are the elasticities of output for the two inputs in the production function. Thus the fixed elasticities of output of the Cobb-Douglas production function are also the fixed spending share coefficients down a column in the technical coefficients matrix of the I/O model.

APPENDIX A-2

Pakistan Interindustry Transactions Table, 1974-75

Appendix A-2. Pakistan Interindustry Transactions Table, 1974-75

(Transactions in Rs. Millions)		Wheat S	Wheat L	Rice S	Rice L	Cotton S	Cotton L	Sugar S	Sugar L	Tobacco	Oil Seeds	Pulses	Crops NEC	Livestock
INDUSTRY	ROW/COL.	1	2	3	4	5	6	7	8	9	10	11	12	13
Wheat-S	1	251863	0	0	0	0	0	0	0	0	0	0	0	563642
Wheat-L	2	0	383443	0	0	0	0	0	0	0	0	0	0	957282
Rice-S	3	0	0	64129	0	0	0	0	0	0	0	0	0	151000
Rice-L	4	0	0	0	50559	0	0	0	0	0	0	0	0	80000
Cotton-S	5	0	0	0	0	44101	0	0	0	0	0	0	0	0
Cotton-L	6	0	0	0	0	0	76006	0	0	0	0	0	0	0
Sugar-S	7	0	0	0	0	0	0	74032	0	0	0	0	0	180000
Sugar-L	8	0	0	0	0	0	0	0	89762	0	0	0	0	271000
Tobacco	9	0	0	0	0	0	0	0	0	20900	0	0	0	0
Oil Seeds	10	0	0	0	0	0	0	0	0	0	11334	0	0	0
Pulses	11	0	0	0	0	0	0	0	0	0	0	81170	0	165000
Crops NEC	12	0	84	0	10	0	24	5	8	2	0	0	885700	5646800
Livestock	13	886912	1403351	293945	344398	243896	461049	110672	167763	17367	203447	551791	2144485	0
Fish	14	0	0	0	0	0	0	0	0	0	0	0	0	0
Forestry	15	0	0	0	0	0	0	0	0	0	0	0	0	0
Mines	16	31	4	1	25	31	87	2	27	4	1	0	27	100000
Grain Mills-S	17	0	0	0	0	0	0	0	0	0	0	0	0	0
Grain Mills-L	18	0	0	0	0	0	0	0	0	0	0	0	0	0
Rice Huskers-S	19	0	0	0	0	0	0	0	0	0	0	0	0	0
Rice Mills-L	20	0	0	0	0	0	0	0	0	0	0	0	0	0
Gur-Khan-S	21	0	0	0	0	0	0	0	0	0	0	0	0	0
Sugar Refin.-L	22	0	0	0	0	0	0	0	0	0	0	0	0	0
Edible Oils-S	23	0	0	0	0	0	0	0	0	0	0	0	0	0
Edible Oils-L	24	0	0	0	0	0	0	0	0	0	0	0	0	0
Tea Blending-L	25	0	0	0	0	0	0	0	0	0	0	0	0	0
Fish Product.-L	26	0	0	0	0	0	0	0	0	0	0	0	0	0
Bakery-L	27	0	0	0	0	0	0	0	0	0	0	0	0	0
Food NEC-S	28	0	0	0	0	0	0	0	0	0	0	0	0	0
Food NEC-L	29	0	0	0	0	0	0	0	0	0	0	0	0	0
Beverages	30	0	0	0	0	0	0	0	0	0	0	0	0	0

Appendix A-2. Pakistan Interindustry Transactions Table, 1974-75 (Continued)

(Transactions in Rs. Millions)	Wheat S	Wheat L	Rice S	Rice L	Cotton S	Cotton L	Sugar S	Sugar L	bacco	Oil Seeds	Pulses	Crops NEC	Livestock
INDUSTRY ROW/COL.	1	2	3	4	5	6	7	8	9	10	11	12	13
Tobacco Prod.-S 31	0	0	0	0	0	0	0	0	0	0	0	0	0
Tobacco Prod.-L 32	0	0	0	0	0	0	0	0	0	0	0	0	0
Cotton Text.-S 33	0	0	0	0	0	0	0	0	0	0	0	0	0
Cotton Yarn-L 34	0	0	0	0	0	0	0	0	0	0	0	0	0
Cotton Fabric-L 35	0	0	0	0	0	0	0	0	0	0	0	0	0
Silk Textiles-S 36	0	0	0	0	0	0	0	0	0	0	0	0	0
Silk Textiles-L 37	0	0	0	0	0	0	0	0	0	0	0	0	0
Textiles NEC-S 38	0	0	0	0	0	0	0	0	0	0	0	0	0
Wool Textiles-L 39	0	0	0	0	0	0	0	0	0	0	0	0	0
Thread-L 40	0	0	0	0	0	0	0	0	0	0	0	0	0
Carpets-S 41	0	0	0	0	0	0	0	0	0	0	0	0	0
Carpets-L 42	0	0	0	0	0	0	0	0	0	0	0	0	0
Textiles NEC-L 43	0	0	0	0	0	0	0	0	0	0	0	0	0
Footwear 44	0	0	0	0	0	0	0	0	0	0	0	0	0
Apparel-L 45	0	0	0	0	0	0	0	0	0	0	0	0	0
Wood Prod's.-S 46	0	0	0	0	0	0	0	0	0	0	0	0	0
Wood Furnit.-S 47	0	0	0	0	0	0	0	0	0	0	0	0	0
Wood Prod's-L 48	0	0	0	0	0	0	0	0	0	0	0	0	0
Paper-L 49	0	0	0	0	0	0	0	0	0	0	0	0	0
Print.& Pub.-S 50	0	0	0	0	0	0	0	0	0	0	0	0	0
Print.& Pub.-L 51	0	0	0	0	0	0	0	0	0	0	0	0	0
Leather-S 52	0	0	0	0	0	0	0	0	0	0	0	0	0
Leather-L 53	0	0	0	0	0	0	0	0	0	0	0	0	0
Rubber Prod. 54	0	0	0	0	0	0	0	0	0	0	0	0	0
Chemical-S 55	0	0	0	0	0	0	0	0	0	0	0	0	0
Medicine-L 56	0	0	0	0	0	0	0	0	0	0	0	0	50000
Fertilizer-L 57	46255	313183	31223	48616	46255	105681	28137	44936	12644	4036	1353	171778	0
Paints-L 58	0	0	0	0	0	0	0	0	0	0	0	0	0
Soaps-L 59	0	0	0	0	0	0	0	0	0	0	0	0	0
Chemicals NEC-L 60	380	213	1355	2464	4359	5821	4054	4054	1475	325	0	4933	0

Appendix A-2. Pakistan Interindustry Transactions Table, 1974-75 (Continued)

(Transactions in Rs. Millions)		Wheat S	Wheat L	Rice S	Rice L	Cotton S	Cotton L	Sugar S	Sugar L	Tobacco	Oil Seeds	Pulses	Crops NEC	Livestock
INDUSTRY	ROW/COL.	1	2	3	4	5	6	7	8	9	10	11	12	13
Plastics-S	61	0	0	0	0	0	0	0	0	0	0	0	0	0
Plastics-L	62	0	0	0	0	0	0	0	0	0	0	0	0	0
Petroleum-L	63	50699	80556	38873	44388	30122	57382	25190	38873	955	11667	31713	119907	0
Cement-L	64	0	0	0	0	0	0	0	0	0	0	0	0	0
Glass-L	65	0	0	0	0	0	0	0	0	0	0	0	0	0
Non-Metals-S	66	0	0	0	0	0	0	0	0	0	0	0	0	0
Non-Metals-L	67	0	0	0	0	0	0	0	0	0	0	0	0	0
Iron-S	68	0	0	0	0	0	0	0	0	0	0	0	0	0
Iron-L	69	0	0	0	0	0	0	0	0	0	0	0	0	0
Metal Prod's-S	70	0	0	0	0	0	0	0	0	0	0	0	0	0
Metal Prod'-L	71	0	0	0	0	0	0	0	0	0	0	0	0	0
Agri. Mach.-S	72	0	0	0	0	0	0	0	0	0	0	0	0	0
Agri.Mach.-L	73	17600	27964	13494	15409	10457	19919	8745	13494	331	4050	41643	41643	0
N. E. Mach.-S	74	0	0	0	0	0	0	0	0	0	0	0	0	0
N. E. Mach.-L	75	0	0	0	0	0	0	0	0	0	0	0	0	0
Elect. Mach.-S	76	0	0	0	0	0	0	0	0	0	0	0	0	0
Elect. Mach.-L	77	0	0	0	0	0	0	0	0	0	0	0	0	0
Transport.-S	78	0	0	0	0	0	0	0	0	0	0	0	0	0
Bicycles-L	79	0	0	0	0	0	0	0	0	0	0	0	0	0
Autos-L	80	0	0	0	0	0	0	0	0	0	0	0	0	0
Ships-L	81	0	0	0	0	0	0	0	0	0	0	0	0	0
Mfg. NEC-S	82	0	0	0	0	0	0	0	0	0	0	0	0	0
Cotton Gin.-L	83	0	0	0	0	0	0	0	0	0	0	0	0	0
Sport Equip.-L	84	0	0	0	0	0	0	0	0	0	0	0	0	0
Mfg. NEC-L	85	0	0	0	0	0	0	0	0	0	0	0	0	0
Dwellings	86	0	0	0	0	0	0	0	0	0	0	0	0	0
Elect. Dist.	87	21384	33977	16399	18722	12705	24202	10625	16395	403	4921	13376	50573	0
Gas Distribut.	88	0	0	0	0	0	0	0	0	0	0	0	0	0
Trade	89	205381	671205	168716	226741	312428	534778	316181	508719	45816	84625	118459	1424807	776372
Road Transport.	90	198584	316038	349945	135593	69914	113126	44649	59225	11112	8970	18070	345561	468948

Appendix A-2. Pakistan Interindustry Transactions Table, 1974-75 (Continued)

(Transactions in Rs. Millions)	Wheat S	Wheat L	Rice S	Rice L	Cotton S	Cotton L	Sugar S	Sugar L	Tobacco	Oil Seeds	Pulses	Crops NEC	Livestock
INDUSTRY ROW/COL.	1	2	3	4	5	6	7	8	9	10	11	12	13
Rail Transport. 91	8580	28032	36698	49354	1944	3320	0	4834	0	1719	6446	0	5586
Air Transport. 92	0	0	0	0	0	0	0	0	0	0	0	0	0
Water Trans. 93	0	0	0	0	0	0	0	0	0	0	0	0	0
Radio-TV 94	0	0	0	0	0	0	0	0	0	0	0	0	0
Telephone 95	0	0	0	0	0	0	0	0	0	0	0	0	0
Finance & Ins. 96	17278	29428	8462	4663	7542	12233	7099	10688	1767	3367	4653	82290	47383
Gov't Service 97	46137	76276	33265	37969	24984	46319	23876	36769	1228	6636	6949	89492	100000
Service NEC 98	13921	22119	2412	7525	729	3522	6917	10674	262	3203	28370	32924	0
Low Cost Resid. 99	0	0	0	0	0	0	0	0	0	0	0	0	0
Hi.Cost Resid. 100	0	0	0	0	0	0	0	0	0	0	0	0	0
Rural Bldg's. 101	10	10	10	10	10	10	10	10	10	10	10	10	10
Factory Bldg's. 102	0	0	0	0	0	0	0	0	0	0	0	0	0
Public Bldg's. 103	0	0	0	0	0	0	0	0	0	0	0	0	0
Roads 104	0	0	0	0	0	0	0	0	0	0	0	0	0
Infrastructure 105	0	0	0	0	0	0	0	0	0	0	0	0	0
Households 106	684225	1286444	513176	294657	398785	651998	400697	609114	56125	95281	138946	3095379	2952850
Imports 107	42029	230879	29321	42355	52411	84079	24411	38708	8851	5148	25410	142115	0
Tax-Subsidies 108	0	0	0	0	0	0	0	0	0	0	0	0	0
Sf.Emp.Rent&Sav 109	1977097	3024549	941590	136697	895150	1325131	943005	1429245	292676	437574	147616	6044544	9640480
TOTAL PURCHASES 110	4468366	7927755	2543014	1460155	2155823	3524687	2028307	3083298	471928	886314	1215975	14676168	22156353

Appendix A-2. Pakistan Interindustry Transactions Table, 1974-75 (Continued)

(Transactions in Rs. Millions)		Fish	Forestry	Mines	Grain Mills-S	Grain Mills-L	Rice Huskers-S	Rice Mills-L	Gur-Khan-S	Sugar Refin.-L	Edible Oils-S	Edible Oils-L	Tea Blend-L	Fish Prod.-L	Bakery L
INDUSTRY	ROW/COL.	14	15	16	17	18	19	20	21	22	23	24	25	26	27
Wheat-S	1	0	0	0	2769719	125032	0	0	0	0	0	0	0	0	0
Wheat-L	2	0	0	0	4702075	407331	0	0	0	0	0	0	0	0	0
Rice-S	3	0	0	0	0	0	911211	35488	0	0	0	0	0	0	0
Rice-L	4	0	0	0	0	0	1551976	47778	0	0	0	0	0	0	0
Cotton-S	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cotton-L	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sugar-S	7	0	0	0	0	0	0	0	327631	379896	0	0	0	0	0
Sugar-L	8	0	0	0	0	0	0	0	527082	611478	0	0	0	0	0
Tobacco	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Oil Seeds	10	0	0	0	0	0	0	0	0	0	609084	77394	0	0	0
Pulses	11	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crops NEC	12	0	0	0	216500	31726	0	0	0	0	0	0	0	0	0
Livestock	13	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fish	14	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Forestry	15	0	0	0	0	7	0	8	60425	108	1869	286	0	242480	0
Mines	16	0	0	0	0	1	0	44	0	6771	0	94	0	0	47
Grain Mills-S	17	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grain Mills-L	18	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rice Huskers-S	19	0	0	0	0	0	0	0	0	0	0	0	0	0	10391
Rice Mills-L	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gur-Khan-S	21	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sugar Refin.-L	22	0	0	0	0	0	0	0	0	38022	0	0	0	0	0
Edible Oils-S	23	0	0	0	0	0	0	0	0	0	0	0	0	91	17762
Edible Oils-L	24	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tea Blending-L	25	0	0	0	0	0	0	0	0	0	0	869534	0	0	7352
Fish Product.-L	26	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bakery-L	27	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Food NEC-S	28	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Food NEC-L	29	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Beverages	30	0	0	0	0	0	0	0	0	0	0	533	0	0	5402
												0	0	0	0

Appendix A-2. Pakistan Interindustry Transactions Table, 1974-75 (Continued)

(Transactions in Rs. Millions)	Fish	Forestry	Mines	Grain Mills-S	Grain Mills-L	Rice Huskers-S	Rice Mills-L	Gur-Khan-S	Sugar Refin.-L	Edible Oils-S	Edible Oils-L	Tea Blend-L	Fish Prod.-L	Bakery L
INDUSTRY ROW/COL.	14	15	16	17	18	19	20	21	22	23	24	25	26	27
Tobacco Prod.-S 31	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tobacco Prod.-L 32	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cotton Text.-S 33	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cotton Yarn-L 34	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cotton Fabric-L 35	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Silk Textiles-S 36	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Silk Textiles-L 37	0	0	0	0	0	0	0	0	0	0	0	173	0	0
Textiles NEC-S 38	0	0	0	38661	0	0	0	0	0	0	0	0	0	0
Wool Textiles-L 39	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Thread-L 40	0	0	0	0	0	0	0	0	0	0	0	96	0	0
Carpets-S 41	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carpets-L 42	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Textiles NEC-L 43	0	0	0	0	26055	0	0	0	88051	0	0	0	0	22
Footwear 44	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Apparel-L 45	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Wood Prod's.-S 46	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Wood Furnit.-S 47	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Wood Prod's-L 48	0	0	0	0	0	0	0	0	0	0	0	1076	0	0
Paper-L 49	0	0	0	0	0	0	0	0	0	0	0	51003	0	6030
Print.& Pub.-S 50	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Print.& Pub.-L 51	0	0	0	0	243	0	59	0	121	0	3321	607	2005	634
Leather-S 52	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Leather-L 53	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rubber Prod. 54	0	0	0	2209	0	0	0	0	0	0	0	0	0	0
Chemical-S 55	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Medicine-L 56	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fertilizer-L 57	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Paints-L 58	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Soaps-L 59	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chemicals NEC-L 60	0	0	0	0	2433	0	10332	0	5694	55	35696	569	50	1659

Appendix A-2. Pakistan Interindustry Transactions Table, 1974-75 (Continued)

(Transactions in Rs. Millions)		Fish	Forestry	Mines	Grain Mills-S	Grain Mills-L	Rice Huskers-S	Rice Mills-L	Gur-Khan-S	Sugar Refin.-L	Edible Oils-S	Edible Oils-L	Tea Blend-L	Fish Prod.-L	Bakery L
INDUSTRY	ROW/COL.	14	15	16	17	18	19	20	21	22	23	24	25	26	27
Plastics-S	61	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Plastics-L	62	6302	0	0	0	0	0	0	0	0	0	0	0	0	0
Petroleum-L	63	0	0	61158	43079	493	0	1279	0	1912	3156	3919	414	549	287
Cement-L	64	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Glass-L	65	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Non-Metals-S	66	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Non-Metals-L	67	0	0	0	0	2333	0	0	0	0	0	0	0	31	0
Iron-S	68	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Iron-L	69	0	0	0	0	0	0	0	0	0	12	0	0	0	0
Metal Prod's-S	70	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Metal Prod'-L	71	0	12828	17394	0	0	0	0	0	0	0	93388	176	4090	0
Agri. Mach.-S	72	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Agri.Mach.-L	73	0	0	0	0	0	0	0	0	0	0	0	0	0	0
N. E. Mach.-S	74	0	0	0	4418	0	0	0	0	0	0	0	0	0	0
N. E. Mach.-L	75	0	0	0	0	668	0	49	0	14483	0	5240	241	845	5
Elect. Mach.-S	76	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Elect. Mach.-L	77	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Transport.-S	78	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bicycles-L	79	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Autos-L	80	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ships-L	81	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mfg. NEC-S	82	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cotton Gin.-L	83	0	0	0	0	0	0	0	0	0	1166533	218220	0	0	0
Sport Equip.-L	84	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mfg. NEC-L	85	0	0	0	0	0	0	0	0	0	0	0	639	0	0
Dwellings	86	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Elect. Dist.	87	0	0	0	134209	10984	78678	1879	2454	3063	8922	2360	469	1775	491
Gas Distribut.	88	0	0	0	0	1240	0	0	0	1054	809	26307	26	166	1077
Trade	89	50006	150882	138183	1593	29286	101326	4185	116691	253088	213889	394375	35540	44330	23925
Road Transport.	90	37304	11221	17185	537085	9460	600797	17377	14562	23278	29853	52741	4045	11838	5590

Appendix A-2. Pakistan Interindustry Transactions Table, 1974-75 (Continued)

(Transactions in Rs. Millions)	Fish	Forestry	Mines	Grain Mills-S	Grain Mills-L	Rice Huskers-S	Rice Mills-L	Gur-Khan-S	Sugar Refin.-L	Edible Oils-S	Edible Oils-L	Tea Blend-L	Fish Prod.-L	Bakery L
INDUSTRY ROW/COL.	14	15	16	17	18	19	20	21	22	23	24	25	26	27
Rail Transport. 91	6157	4517	24242	0	2653	0	4196	0	4620	0	1397	1049	2892	1449
Air Transport. 92	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Water Trans. 93	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Radio-TV 94	0	0	0	0	0	0	0	0	0	0	0	5848	0	144
Telephone 95	0	0	0	0	743	0	156	0	2832	0	8794	6974	2801	500
Finance & Ins. 96	2278	1693	17170	138442	3791	4407	442	4521	11320	2053	16664	4840	1417	617
Gov't Service 97	0	0	119937	736	233	0	26	0	2143	127	1717	35	3503	832
Service NEC 98	0	0	128138	1473	800	0	184	0	20136	213	64808	3192	4187	715
Low Cost Resid. 99	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hi.Cost Resid. 100	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rural Bldg's. 101	10	10	10	10	10	10	10	10	10	10	10	10	10	10
Factory Bldg's. 102	0	0	10	10	10	10	10	10	10	10	10	10	10	10
Public Bldg's. 103	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Roads 104	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Infrastructure 105	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Households 106	52230	16565	631173	608502	21593	199823	9578	62866	152349	48923	130918	72048	16918	11990
Imports 107	0	0	102450	1447161	103193	0	121	0	4531	2363	1266590	527532	22680	20807
Tax-Subsidies 108	0	0	18873	0	1719	0	54	0	632850	0	690191	65000	0	7591
Sf.Emp.Rent&Sav 109	579454	666590	504109	139013	113735	154100	12629	37553	241294	154900	170317	77184	42191	13000
TOTAL PURCHASES 110	733741	864306	1780032	10784895	895772	3602338	145884	1153805	2499114	2242781	4134824	858796	404859	138639

Appendix A-2. Pakistan Interindustry Transactions Table, 1974-75 (Continued)

(Transactions in Rs. Millions)		Food NEC-S	Food NEC-L	Beverages	Tobacco Prod.-S	Tobacco Prod.-L	Cotton Text.-S	Cotton Yarn-L	Cotton Fabric-L	Silk Text.-S	Silk Text.-L	Textiles NEC-S	Wool Text.-L	Thread L	Carpets S
INDUSTRY	ROW/COL.	28	29	30	31	32	33	34	35	36	37	38	39	40	41
Wheat-S	1	11065	0	0	0	0	0	0	0	0	0	0	0	0	0
Wheat-L	2	35991	0	0	0	0	0	0	0	0	0	0	0	0	0
Rice-S	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rice-L	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cotton-S	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cotton-L	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sugar-S	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sugar-L	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tobacco	9	0	0	0	11586	305321	0	0	0	0	0	0	0	0	0
Oil Seeds	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pulses	11	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crops NEC	12	9146	173843	3	0	0	0	0	0	0	0	0	0	0	0
Livestock	13	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fish	14	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Forestry	15	15688	110	0	280	0	0	0	13	195	0	0	18	1	21
Mines	16	0	1197	387	0	6	0	29	169	0	0	7	3	3	0
Grain Mills-S	17	65826	0	0	0	0	281	0	0	13	0	0	0	0	0
Grain Mills-L	18	1814	0	0	0	0	0	0	0	0	0	0	0	0	0
Rice Huskers-S	19	130578	0	0	0	0	0	0	0	0	0	0	0	0	0
Rice Mills-L	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gur-Khan-S	21	1055	0	0	0	0	0	0	0	0	0	0	0	0	0
Sugar Refin.-L	22	43032	5686	76478	0	1	0	0	0	0	0	0	0	0	0
Edible Oils-S	23	18629	0	0	0	0	0	0	0	0	0	0	0	0	0
Edible Oils-L	24	0	681	0	0	0	0	0	0	0	0	0	0	0	0
Tea Blending-L	25	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fish Product.-L	26	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bakery-L	27	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Food NEC-S	28	0	0	0	0	0	0	0	0	0	0	15	0	0	0
Food NEC-L	29	17499	9932	50	675	0	281	0	0	0	0	0	0	0	0
Beverages	30	247	350	20952	0	0	0	0	0	0	0	0	0	0	0

Appendix A-2. Pakistan Interindustry Transactions Table, 1974-75 (Continued)

(Transactions in Rs. Millions)	Food NEC-S	Food NEC-L	Beverages	Tobacco Prod.-S	Tobacco Prod.-L	Cotton Text.-S	Cotton Yarn-L	Cotton Fabric-L	Silk Text.-S	Silk Text.-L	Textiles NEC-S	Wool Text.-L	Thread L	Carpets S
INDUSTRY ROW/COL.	28	29	30	31	32	33	34	35	36	37	38	39	40	41
Tobacco Prod.-S 31	0	0	0	27793	0	0	0	0	0	0	0	0	0	0
Tobacco Prod.-L 32	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cotton Text.-S 33	0	0	0	0	0	343909	0	0	0	0	10050	0	0	0
Cotton Yarn-L 34	0	0	0	0	0	1126690	0	448237	3689	187023	30218	9391	55689	10110
Cotton Fabric-L 35	241	0	0	0	0	0	27655	0	0	11412	0	0	0	0
Silk Textiles-S 36	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Silk Textiles-L 37	0	0	0	0	0	42070	9765	94493	191415	146451	32370	0	0	0
Textiles NEC-S 38	0	0	0	564	0	30540	0	0	0	0	100810	0	0	20506
Wool Textiles-L 39	0	0	0	0	0	0	0	0	0	0	94	0	0	0
Thread-L 40	0	0	0	0	0	0	0	28	0	0	0	0	0	0
Carpets-S 41	0	0	0	0	0	0	0	0	8415	0	0	0	0	0
Carpets-L 42	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Textiles NEC-L 43	0	27	0	0	0	0	0	3359	0	8	0	7168	221	0
Footwear 44	0	0	0	0	0	0	0	0	4	0	0	0	0	0
Apparel-L 45	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Wood Prod's.-S 46	24	0	35	6	0	3929	0	0	0	0	0	0	0	0
Wood Furnit.-S 47	0	0	0	0	0	0	0	0	4371	0	0	0	0	0
Wood Prod's-L 48	0	344	0	0	0	0	0	25185	0	0	0	0	0	0
Paper-L 49	203	115	468	379	40361	0	42869	1857	0	16310	54	513	4877	0
Print.& Pub.-S 50	0	0	10	41	0	198	0	0	24	0	203	0	0	0
Print.& Pub.-L 51	855	729	2326	0	1555	0	3322	2608	0	3289	0	109	302	0
Leather-S 52	0	0	0	0	0	0	0	0	0	0	1111	0	0	0
Leather-L 53	0	0	0	0	0	0	0	0	0	0	0	69934	0	0
Rubber Prod. 54	0	0	0	0	0	0	0	0	0	0	52	0	0	0
Chemical-S 55	0	0	0	0	0	0	0	0	0	0	0	0	0	429
Medicine-L 56	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fertilizer-L 57	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Paints-L 58	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Soaps-L 59	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chemicals NEC-L 60	653	375	8840	31	1174	2288	7226	57835	7	42612	2298	1278	3375	0

Appendix A-2. Pakistan Interindustry Transactions Table, 1974-75 (Continued)

(Transactions in Rs. Millions)		Food NEC-S	Food NEC-L	Beverages	Tobacco Prod.-S	Tobacco Prod.-L	Cotton Text.-S	Cotton Yarn-L	Cotton Fabric-L	Silk Text.-S	Silk Text.-L	Textiles NEC-S	Wool Text.-L	Thread L	Carpets S
INDUSTRY	ROW/COL.	28	29	30	31	32	33	34	35	36	37	38	39	40	41
Plastics-S	61	0	0	0	0	0	0	0	0	0	0	1371	0	0	0
Plastics-L	62	37	93	0	0	0	0	15485	1421	0	5687	0	181	0	0
Petroleum-L	63	8459	2856	4389	1050	1853	4819	4826	20205	1060	3036	234	737	206	57
Cement-L	64	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Glass-L	65	0	4257	8300	34	0	0	0	0	0	0	50	0	0	0
Non-Metals-S	66	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Non-Metals-L	67	150	0	0	0	0	0	0	0	0	0	0	0	0	0
Iron-S	68	0	0	0	0	0	0	0	0	0	0	1425	0	0	0
Iron-L	69	0	0	1	101	0	0	0	0	0	142	0	0	0	0
Metal Prod's-S	70	0	0	0	0	0	1793	0	0	0	0	8	0	0	0
Metal Prod'-L	71	0	8884	3259	0	654	0	0	0	0	33	0	0	0	0
Agri. Mach.-S	72	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Agri.Mach.-L	73	0	0	0	0	0	0	0	0	0	0	0	0	0	0
N. E. Mach.-S	74	0	0	0	0	0	0	0	0	196	0	474	0	0	0
N. E. Mach.-L	75	0	893	1000	0	1887	0	64077	47064	0	6767	0	54965	154	0
Elect. Mach.-S	76	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Elect. Mach.-L	77	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Transport.-S	78	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bicycles-L	79	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Autos-L	80	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ships-L	81	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mfg. NEC-S	82	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cotton Gin.-L	83	0	12257	0	0	0	0	1566788	663848	0	0	0	0	0	0
Sport Equip.-L	84	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mfg. NEC-L	85	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dwellings	86	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Elect. Dist.	87	4878	4531	2928	100	2178	23808	67695	58569	2323	16039	878	2876	394	72
Gas Distribut.	88	1895	766	2907	0	2420	24	20321	25932	3	13785	32	2147	350	0
Trade	89	168820	94127	106311	7513	153477	276522	16130	16130	43025	157049	41445	61117	15519	11066
Road Transport.	90	56356	26804	24945	2072	38594	22987	22006	18862	6552	16742	6313	8064	1422	1685

Appendix A-2. Pakistan Interindustry Transactions Table, 1974-75 (Continued)

(Transactions in Rs. Millions)	Food NEC-S	Food NEC-L	Beverages	Tobacco Prod.-S	Tobacco Prod.-L	Cotton Text.-S	Cotton Yarn-L	Cotton Fabric-L	Silk Text.-S	Silk Text.-L	Textiles NEC-S	Wool Text.-L	Thread L	Carpets S
INDUSTRY ROW/COL.	28	29	30	31	32	33	34	35	36	37	38	39	40	41
Rail Transport. 91	0	2793	6371	0	2256	0	5702	7603	0	4339	0	752	369	0
Air Transport. 92	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Water Trans. 93	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Radio-TV 94	0	472	2959	0	582	0	0	4141	0	671	0	673	180	0
Telephone 95	0	1179	3267	0	641	0	4084	3205	10	3642	320	481	440	60
Finance & Ins. 96	186	2293	5768	975	8772	7700	109483	69905	3292	32259	3743	10610	3319	451
Gov't Service 97	400	1768	1941	80	419	140	12390	9724	38	2177	480	618	14	90
Service NEC 98	414	1496	3416	120	2046	260	38433	39750	48	19771	800	4496	2212	151
Low Cost Resid. 99	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hi.Cost Resid. 100	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rural Bldg's. 101	0	0	0	10	10	0	0	0	0	0	0	0	0	0
Factory Bldg's. 102	10	10	10	10	10	10	10	10	10	10	10	10	10	10
Public Bldg's. 103	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Roads 104	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Infrastructure 105	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Households 106	56397	38501	35433	17339	70595	132705	376152	366724	20104	167288	19436	54662	12186	21305
Imports 107	5255	42268	21061	845	34830	2626	138823	126744	731	226486	96	16300	3736	0
Tax-Subsidies 108	0	1794	96719	0	824698	0	58377	108957	0	87374	0	9500	161	0
Sf.Emp.Rent&Sav 109	329150	105917	175551	9322	157406	424216	370022	125629	34126	-6446	-481	36972	9583	16198
TOTAL PURCHASES 110	984953	547348	616085	80926	1651746	2447796	2981670	2348207	319651	1163956	253916	353575	114723	82211

Appendix A-2. Pakistan Interindustry Transactions Table, 1974-75 (Continued)

(Transactions in Rs. Millions)		Carpets L	Textiles NEC-L	Footwear	Apparel L	Wood Prod's-S	Wood Furn.-S	Wood Prod's	Paper L	Print. & Pub.-S	Print. & Pub.-L	Leather S	Leather L	Rubber Prod.	Chemical S
INDUSTRY	ROW/COL.	42	43	44	45	46	47	48	49	50	51	52	53	54	55
Wheat-S	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Wheat-L	2	0	0	0	0	0	0	0	104	0	0	0	0	0	0
Rice-S	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rice-L	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cotton-S	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cotton-L	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sugar-S	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sugar-L	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tobacco	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Oil Seeds	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pulses	11	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crops NEC	12	0	0	0	0	0	26	0	458	0	0	0	0	0	0
Livestock	13	0	0	0	0	0	0	0	0	0	0	0	965007	0	0
Fish	14	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Forestry	15	7	56	192	6	58406	10685	15544	14571	0	22	250	47	23	876
Mines	16	22	28	94	3	0	0	5	0	0	16	0	0	80	1395
Grain Mills-S	17	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grain Mills-L	18	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rice Huskers-S	19	0	0	0	0	0	0	0	0	1690	0	0	0	0	0
Rice Mills-L	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gur-Khan-S	21	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sugar Refin.-L	22	0	0	0	0	0	0	0	9657	0	0	0	0	0	0
Edible Oils-S	23	0	0	24	0	0	0	0	0	0	0	0	0	118	0
Edible Oils-L	24	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tea Blending-L	25	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fish Product.-L	26	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bakery-L	27	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Food NEC-S	28	0	0	3269	0	0	0	0	0	0	0	0	0	0	0
Food NEC-L	29	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Beverages	30	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Appendix A-2. Pakistan Interindustry Transactions Table, 1974-75 (Continued)

(Transactions in Rs. Millions)	Carpets L	Textiles NEC-L	Footwear	Apparel L	Wood Prod's-S	Wood Furn.-S	Wood Prod's	Paper L	Print. & Pub.-S	Print. & Pub.-L	Leather S	Leather L	Rubber Prod.	Chemical S
INDUSTRY ROW/COL.	42	43	44	45	46	47	48	49	50	51	52	53	54	55
Tobacco Prod.-S 31	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tobacco Prod.-L 32	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cotton Text.-S 33	0	0	3	0	0	0	0	0	25	0	3524	0	7	0
Cotton Yarn-L 34	58445	360561	0	45643	0	5	0	0	0	0	0	0	762	0
Cotton Fabric-L 35	0	0	0	139871	0	0	0	0	0	0	0	0	0	0
Silk Textiles-S 36	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Silk Textiles-L 37	0	6499	367	4092	0	207	0	0	0	0	0	0	0	0
Textiles NEC-S 38	0	0	1052	0	17870	14921	0	0	3397	0	160	0	10	0
Wool Textiles-L 39	301435	0	0	15748	0	0	0	0	0	0	0	0	0	0
Thread-L 40	525	0	0	1315	0	0	0	0	0	0	320	0	0	0
Carpets-S 41	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carpets-L 42	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Textiles NEC-L 43	0	120256	6095	0	0	0	62	0	0	120	0	0	2826	0
Footwear 44	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Apparel-L 45	0	0	0	157	0	0	0	0	0	0	0	0	0	0
Wood Prod's.-S 46	0	0	3788	0	0	1612	0	0	25	0	0	0	23	0
Wood Furnit.-S 47	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Wood Prod's-L 48	0	0	0	0	0	0	3357	39	0	0	0	0	0	0
Paper-L 49	2324	588	179	13357	154	1135	5201	145358	8910	113544	32	0	942	109
Print.& Pub.-S 50	0	0	456	0	209	0	0	0	0	0	0	0	0	0
Print.& Pub.-L 51	3141	232	113	1420	0	0	432	1353	0	532	0	1660	462	0
Leather-S 52	0	0	33058	0	0	0	0	0	0	0	0	0	94	0
Leather-L 53	0	0	67610	0	12	0	353	0	0	0	2027	8638	0	0
Rubber Prod. 54	0	0	11566	561	0	0	9	0	23	24	0	0	2346	0
Chemical-S 55	0	0	0	0	0	0	0	0	0	0	89	0	0	40473
Medicine-L 56	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fertilizer-L 57	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Paints-L 58	0	0	203	0	1530	753	157	0	0	31	0	0	0	0
Soaps-L 59	0	0	38	0	0	0	0	0	0	0	0	0	0	0
Chemicals NEC-L 60	12580	34230	3543	3209	151	120	277	10290	0	0	0	64884	11394	0

Appendix A-2. Pakistan Interindustry Transactions Table, 1974-75 (Continued)

(Transactions in Rs. Millions)		Carpets L	Textiles NEC-L	Footwear	Apparel L	Wood Prod's-S	Wood Furn.-S	Wood Prod's	Paper L	Print. & Pub.-S	Print. & Pub.-L	Leather S	Leather L	Rubber Prod.	Chemical S
INDUSTRY	ROW/COL.	42	43	44	45	46	47	48	49	50	51	52	53	54	55
Plastics-S	61	0	0	355	0	4054	3016	0	0	8	0	2261	0	1156	0
Plastics-L	62	817	76	299	6060	0	0	143	650	0	0	0	0	1656	0
Petroleum-L	63	1348	2618	167	876	5	533	1077	6302	0	593	551	3023	6122	10617
Cement-L	64	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Glass-L	65	0	0	0	0	365	1641	37	27	0	0	0	0	0	0
Non-Metals-S	66	0	0	0	0	0	226	0	0	0	0	0	0	3	0
Non-Metals-L	67	0	0	0	0	0	0	0	0	0	0	0	0	268	0
Iron-S	68	0	0	69	0	0	4753	0	0	0	0	0	0	440	0
Iron-L	69	0	0	113	0	10307	0	148	927	0	0	327	0	49	0
Metal Prod's-S	70	0	0	3112	0	0	5307	0	0	434	0	659	0	0	0
Metal Prod'-L	71	0	153	934	7	0	0	176	31	0	1623	0	0	20883	0
Agri. Mach.-S	72	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Agri.Mach.-L	73	0	0	0	0	0	0	0	0	0	0	0	0	0	0
N. E. Mach.-S	74	0	0	0	0	33	0	0	0	0	0	0	0	0	0
N. E. Mach.-L	75	160	9028	305	2152	0	0	579	7962	0	14859	0	2356	371	0
Elect. Mach.-S	76	0	0	0	0	947	361	0	0	0	0	0	0	0	0
Elect. Mach.-L	77	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Transport.-S	78	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bicycles-L	79	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Autos-L	80	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ships-L	81	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mfg. NEC-S	82	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cotton Gin.-L	83	0	0	0	0	23	140	0	0	0	0	0	0	0	0
Sport Equip.-L	84	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mfg. NEC-L	85	0	0	0	0	0	0	0	0	0	0	0	0	0	2284
Dwellings	86	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Elect. Dist.	87	2132	12346	661	1575	72	61	1222	12091	0	1208	81	5227	5046	410
Gas Distribut.	88	2550	24331	156	1103	1	0	1318	16004	0	52	0	1438	3443	84
Trade	89	21493	148510	14466	29716	0	0	0	106081	4542	61928	1846	26171	107355	9441
Road Transport.	90	2291	21803	5084	3167	0	0	671	6137	566	7088	671	7489	14730	2147

Appendix A-2. Pakistan Interindustry Transactions Table, 1974-75 (Continued)

(Transactions in Rs. Millions)	Carpets L	Textiles NEC-L	Footwear	Apparel L	Wood Prod's-S	Wood Furn.-S	Wood Prod's	Paper L	Print. & Pub.-S	Print. & Pub.-L	Leather S	Leather L	Rubber Prod.	Chemical S
INDUSTRY ROW/COL.	42	43	44	45	46	47	48	49	50	51	52	53	54	55
Rail Transport. 91	4328	493	107	3713	0	0	174	1591	0	1837	0	4531	3766	0
Air Transport. 92	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Water Trans. 93	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Radio-TV 94	3960	42	50	1803	0	0	52	0	0	234	0	0	2761	0
Telephone 95	4685	243	362	4749	200	0	1168	1571	0	1922	100	3831	1029	0
Finance & Ins. 96	33314	33690	1888	31100	79	79	889	10557	1128	11327	825	20849	13217	2054
Gov't Service 97	1239	364	1076	1025	400	0	30	1182	0	492	300	1333	265	0
Service NEC 98	13450	970	2126	17479	697	0	3390	7918	0	8954	666	40023	4765	0
Low Cost Resid. 99	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hi.Cost Resid. 100	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rural Bldg's. 101	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Factory Bldg's.102	10	10	10	10	10	10	1	10	10	10	10	10	10	10
Public Bldg's. 103	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Roads 104	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Infrastructure 105	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Households 106	182395	151373	31152	98434	19847	8115	12819	73355	4376	56026	2308	50098	83100	3927
Imports 107	240746	23374	55088	313061	1759	1400	27818	30269	557	31508	12710	85585	338252	320
Tax-Subsidies 108	80601	-3247	0	3073	0	0	4314	41414	0	154	0	63319	20213	0
Sf.Emp.Rent&Sav109	168922	154399	95587	237227	43753	36410	11336	99755	470	43826	14256	267256	-2485	16078
TOTAL PURCHASES110	1142920	1103026	344817	981712	160884	91516	92759	605664	26161	357930	43973	1622775	645502	90225

Appendix A-2. Pakistan Interindustry Transactions Table, 1974-75 (Continued)

(Transactions in Rs. Millions)		Medicine L	Fertil-izer-L	Paints L	Soaps L	Chemicals NEC-L	Plast-ics-S	Plast-ics-L	Petrol-eum-L	Cement L	Glass L	Non-Metals-S	Non-Metal-L	Iron S	Iron L
INDUSTRY	ROW/COL.	56	57	58	59	60	61	62	63	64	65	66	67	68	69
Wheat-S	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Wheat-L	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rice-S	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rice-L	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cotton-S	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cotton-L	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sugar-S	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sugar-L	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tobacco	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Oil Seeds	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pulses	11	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crops NEC	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Livestock	13	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fish	14	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Forestry	15	26	0	13	282	1273	856	3660	0	96	4	0	220	0	156
Mines	16	672	61564	1	0	65741	0	0	105832	39854	2794	146323	29698	0	13136
Grain Mills-S	17	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grain Mills-L	18	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rice Huskers-S	19	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rice Mills-L	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gur-Khan-S	21	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sugar Refin.-L	22	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Edible Oils-S	23	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Edible Oils-L	24	0	0	0	121363	0	0	0	0	0	0	0	0	0	0
Tea Blending-L	25	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fish Product.-L	26	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bakery-L	27	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Food NEC-S	28	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Food NEC-L	29	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Beverages	30	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Appendix A-2. Pakistan Interindustry Transactions Table, 1974-75 (Continued)

(Transactions in Rs. Millions)	Medicine L	Fertil-izer-L	Paints L	Soaps L	Chemicals NEC-L	Plast-ics-S	Plast-ics-L	Petrol-eum-L	Cement L	Glass L	Non-Metals-S	Non-Metal-L	Iron S	Iron L
INDUSTRY ROW/COL.	56	57	58	59	60	61	62	63	64	65	66	67	68	69
Tobacco Prod.-S 31	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tobacco Prod.-L 32	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cotton Text.-S 33	0	0	0	0	0	767	0	0	0	0	0	0	0	0
Cotton Yarn-L 34	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cotton Fabric-L 35	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Silk Textiles-S 36	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Silk Textiles-L 37	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Textiles NEC-S 38	0	0	0	0	0	139	0	0	0	0	0	0	0	0
Wool Textiles-L 39	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Thread-L 40	0	0	0	0	38	0	0	0	0	0	0	0	0	0
Carpets-S 41	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carpets-L 42	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Textiles NEC-L 43	0	0	0	0	2134	0	114	0	126880	0	0	1698	0	0
Footwear 44	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Apparel-L 45	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Wood Prod's.-S 46	0	0	0	0	0	899	0	0	0	0	22187	0	0	0
Wood Furnit.-S 47	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Wood Prod's-L 48	0	0	0	0	0	0	0	0	0	1963	0	0	0	1868
Paper-L 49	11891	0	0	6622	10551	378	856	0	7527	782	0	61	0	2392
Print.& Pub.-S 50	0	0	0	0	0	104	0	0	0	0	0	0	5	0
Print.& Pub.-L 51	11144	1019	235	803	1264	0	428	754	5186	338	0	181	0	1756
Leather-S 52	0	0	0	0	0	275	0	0	0	0	0	0	0	0
Leather-L 53	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rubber Prod. 54	3	0	0	0	0	0	2746	0	0	19	905	0	0	0
Chemical-S 55	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Medicine-L 56	11731	0	0	0	0	0	0	0	0	0	0	0	0	0
Fertilizer-L 57	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Paints-L 58	0	0	10519	0	0	2	0	0	0	0	175	0	0	0
Soaps-L 59	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chemicals NEC-L 60	53299	6811	29539	22441	116640	479	5081	0	1035	6674	9145	0	0	248

Appendix A-2. Pakistan Interindustry Transactions Table, 1974-75 (Continued)

(Transactions in Rs. Millions)		Medicine L	Fertil-izer-L	Paints L	Soaps L	Chemicals NEC-L	Plast-ics-S	Plast-ics-L	Petrol-eum-L	Cement L	Glass L	Non-Metals-S	Non-Metal-L	Iron S	Iron L
INDUSTRY	ROW/COL.	56	57	58	59	60	61	62	63	64	65	66	67	68	69
Plastics-S	61	0	0	0	0	0	23783	0	0	0	0	0	0	0	0
Plastics-L	62	0	1520	0	0	698	0	1192	0	0	282	0	173	0	0
Petroleum-L	63	1670	16420	1932	372	1484	8	294	55030	7493	3657	186964	2858	184	7564
Cement-L	64	0	0	0	0	0	0	0	0	0	0	0	6056	0	0
Glass-L	65	55933	0	0	0	34723	0	0	0	3330	8079	27977	0	0	0
Non-Metals-S	66	0	0	0	0	0	0	0	0	0	0	1097103	0	27	0
Non-Metals-L	67	0	0	22	12405	1180	0	0	0	0	0	0	0	0	23
Iron-S	68	0	0	0	0	0	6052	0	0	0	0	25240	0	4574	0
Iron-L	69	71	0	0	0	4430	0	0	0	0	105	0	3375	0	1082206
Metal Prod's-S	70	0	0	0	0	0	4052	0	0	0	0	15560	0	0	0
Metal Prod'-L	71	0	0	2125	0	0	81	1292	12514	3882	0	0	7741	0	9
Agri. Mach.-S	72	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Agri.Mach.-L	73	0	0	0	0	0	0	0	0	0	0	0	0	0	300
N. E. Mach.-S	74	0	0	0	0	0	0	0	0	0	0	0	0	0	0
N. E. Mach.-L	75	0	101512	0	25	72855	0	0	1482	36221	1480	0	2807	0	3030
Elect. Mach.-S	76	0	0	0	0	0	0	0	0	0	0	135	0	0	0
Elect. Mach.-L	77	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Transport.-S	78	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bicycles-L	79	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Autos-L	80	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ships-L	81	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mfg. NEC-S	82	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cotton Gin.-L	83	0	0	0	0	0	404	0	0	0	0	0	0	0	0
Sport Equip.-L	84	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mfg. NEC-L	85	9021	0	0	0	0	0	0	0	0	0	0	0	0	0
Dwellings	86	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Elect. Dist.	87	3900	22586	271	1486	48876	32	1061	12214	52807	2038	8243	1866	100	45236
Gas Distribut.	88	2972	127116	31	2805	35726	0	149	0	177019	8477	1130	3039	527	30374
Trade	89	109412	81225	21506	52222	121687	6302	5413	407464	18546	7248	23735	1400	3460	312895
Road Transport.	90	17418	107026	2934	7126	16608	2611	1571	179549	106788	2104	341068	9135	3218	277781

Appendix A-2. Pakistan Interindustry Transactions Table, 1974-75 (Continued)

(Transactions in Rs. Millions)	Medicine L	Fertil-izer-L	Paints L	Soaps L	Chemicals NEC-L	Plast-ics-S	Plast-ics-L	Petrol-eum-L	Cement L	Glass L	Non-Metals-S	Non-Metal-L	Iron S	Iron L
INDUSTRY ROW/COL.	56	57	58	59	60	61	62	63	64	65	66	67	68	69
Rail Transport. 91	4514	61987	1183	2873	6694	0	407	1740	43046	545	0	3831	0	8057
Air Transport. 92	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Water Trans. 93	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Radio-TV 94	6485	0	1024	483	2598	0	81	0	0	94	0	0	0	0
Telephone 95	3206	4809	333	1765	5964	75	561	1403	9797	448	0	204	10	3794
Finance & Ins. 96	18511	17912	3424	8067	24112	181	2119	4459	26230	2016	4975	2832	1444	14014
Gov't Service 97	405	1418	62	187	1758	100	336	28456	4078	114	0	228	20	899
Service NEC 98	22292	28982	442	4990	2937	125	1125	40649	10250	982	0	8216	30	82159
Low Cost Resid. 99	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hi.Cost Resid. 100	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rural Bldg's. 101	0	1	0	0	0	0	0	0	10	0	0	0	10	10
Factory Bldg's. 102	10	10	10	10	10	10	10	10	10	10	10	10	10	10
Public Bldg's. 103	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Roads 104	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Infrastructure 105	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Households 106	120939	92229	10675	32412	119743	10142	9937	186728	114694	22047	521322	22339	2945	255714
Imports 107	565035	69984	79568	141313	78089	958	7836	2627842	19564	18797	34050	5093	0	244453
Tax-Subsidies 108	23101	7236	41166	44687	111809	0	8729	-106266	173086	13881	0	8833	0	69213
Sf.Emp.Rent&Sav 109	-10980	256087	-2262	32461	268945	23080	15084	411419	115687	-11137	190830	22458	13159	225487
TOTAL PURCHASES 110	1042681	1067454	204753	497200	1158567	81895	70082	3971279	1103116	93841	2657077	144352	29723	2682784

Appendix A-2. Pakistan Interindustry Transactions Table, 1974-75 (Continued)

(Transactions in Rs. Millions)		Metal Prod's-S	Metal Prod's-L	Agri. Mach.-S	Agri. Mach.-L	N.E. Mach.-S	N.E. Mach.-L	Elect. Mach.-S	Elect. Mach.-L	Trans. S	Bicycles L	Autos L	Ships L	Mfg. NEC-S	Cotton Gen.-L
INDUSTRY	ROW/COL.	70	71	72	73	74	75	76	77	78	79	80	81	82	83
Wheat-S	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Wheat-L	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rice-S	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rice-L	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cotton-S	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cotton-L	6	0	0	0	0	0	0	0	0	0	0	0	0	0	2073211
Sugar-S	7	0	0	0	0	0	0	0	0	0	0	0	0	0	2833629
Sugar-L	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tobacco	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Oil Seeds	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pulses	11	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crops NEC	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Livestock	13	0	0	0	0	0	0	0	0	0	0	0	0	63276	0
Fish	14	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Forestry	15	4955	139	1	34	599	905	28	2845	0	4	11	200	45475	273
Mines	16	80	1248	44	3226	26	5413	9	188	0	19	197	14	5920	0
Grain Mills-S	17	0	0	0	0	0	0	0	0	0	0	0	0	681	0
Grain Mills-L	18	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rice Huskers-S	19	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rice Mills-L	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gur-Khan-S	21	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sugar Refin.-L	22	0	0	0	0	0	0	0	0	0	0	0	0	928	0
Edible Oils-S	23	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Edible Oils-L	24	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tea Blending-L	25	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fish Product.-L	26	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bakery-L	27	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Food NEC-S	28	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Food NEC-L	29	0	0	0	0	0	0	0	0	0	0	0	20	0	0
Beverages	30	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Appendix A-2. Pakistan Interindustry Transactions Table, 1974-75 (Continued)

(Transactions in Rs. Millions)	Metal Prod's-S	Metal Prod's-L	Agri. Mach.-S	Agri. Mach.-L	N.E. Mach.-S	N.E. Mach.-L	Elect. Mach.-S	Elect. Mach.-L	Trans. S	Bicycles L	Autos L	Ships L	Mfg. NEC-S	Cotton Gen.-L
INDUSTRY ROW/COL.	70	71	72	73	74	75	76	77	78	79	80	81	82	83
Tobacco Prod.-S 31	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tobacco Prod.-L 32	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cotton Text.-S 33	16	0	0	0	0	0	0	0	387	0	0	0	581	0
Cotton Yarn-L 34	0	0	0	0	0	0	0	0	0	0	0	0	8900	0
Cotton Fabric-L 35	0	0	0	0	0	0	0	0	0	0	10	0	0	0
Silk Textiles-S 36	0	0	0	0	0	0	0	0	0	0	3	0	0	0
Silk Textiles-L 37	0	0	0	0	0	57	0	73	0	0	0	0	2265	0
Textiles NEC-S 38	0	0	0	0	0	0	0	0	596	0	0	0	9787	0
Wool Textiles-L 39	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Thread-L 40	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carpets-S 41	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carpets-L 42	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Textiles NEC-L 43	0	0	0	0	0	0	0	0	0	0	0	0	0	137271
Footwear 44	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Apparel-L 45	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Wood Prod's.-S 46	915	0	110	0	0	0	0	0	23304	0	0	0	0	0
Wood Furnit.-S 47	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Wood Prod's-L 48	0	0	0	0	0	148	0	5716	0	160	64	0	0	0
Paper-L 49	197	7475	0	0	161	0	1	2437	0	8234	388	0	44190	0
Print.& Pub.-S 50	153	0	11	0	71	0	115	0	52	0	0	0	9410	0
Print.& Pub.-L 51	0	5819	0	132	0	1704	0	3913	380	436	2042	55	99	1207
Leather-S 52	0	0	0	0	0	0	19	0	2642	0	0	0	6370	0
Leather-L 53	0	0	0	13	0	0	0	0	0	0	0	0	2060	0
Rubber Prod. 54	137	0	0	438	0	0	0	119	0	16934	12759	0	0	0
Chemical-S 55	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Medicine-L 56	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fertilizer-L 57	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Paints-L 58	0	300	38	13	0	875	37	4327	0	0	800	158	735	0
Soaps-L 59	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chemicals NEC-L 60	594	0	26	0	0	10271	78	2640	0	0	789	96	30406	0

Appendix A-2. Pakistan Interindustry Transactions Table, 1974-75 (Continued)

(Transactions in Rs. Millions)		Metal Prod's-S	Metal Prod's-L	Agri. Mach.-S	Agri. Mach.-L	N.E. Mach.-S	N.E. Mach.-L	Elect. Mach.-S	Elect. Mach.-L	Trans. S	Bicycles L	Autos L	Ships L	Mfg. NEC-S	Cotton Gen.-L
INDUSTRY	ROW/COL.	70	71	72	73	74	75	76	77	78	79	80	81	82	83
Plastics-S	61	6132	0	0	0	0	0	47	0	96	0	0	0	346	0
Plastics-L	62	0	0	0	0	0	0	0	1134	0	0	0	0	0	0
Petroleum-L	63	439	5463	37	180	11261	1634	11	4523	5	1952	2374	172	21582	15421
Cement-L	64	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Glass-L	65	0	0	0	0	0	0	320	0	0	0	0	0	319053	0
Non-Metals-S	66	0	0	12	0	0	0	518	0	0	0	0	0	328	0
Non-Metals-L	67	0	0	0	0	0	3	0	0	0	0	0	0	0	0
Iron-S	68	0	0	0	0	0	0	0	0	0	0	0	0	2716	0
Iron-L	69	0	0	2986	21559	6312	180018	8885	36560	6889	24	1029	350	815105	0
Metal Prod's-S	70	1000	0	361	0	2979	0	2946	0	594	0	0	0	5148	0
Metal Prod'-L	71	0	394	0	1259	0	77532	0	0	0	40	1855	13296	0	0
Agri. Mach.-S	72	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Agri.Mach.-L	73	0	0	0	0	0	0	0	0	0	0	0	0	0	0
N. E. Mach.-S	74	0	0	0	0	251	0	226	0	0	0	0	0	0	0
N. E. Mach.-L	75	0	8361	0	295	0	16091	0	8629	0	112938	27638	25	0	11068
Elect. Mach.-S	76	0	0	0	0	0	0	1553	0	0	0	0	0	171	0
Elect. Mach.-L	77	0	0	0	65	0	251	0	92053	0	0	120998	421	0	0
Transport.-S	78	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bicycles-L	79	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Autos-L	80	0	0	0	0	0	0	0	0	0	0	111515	0	0	0
Ships-L	81	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mfg. NEC-S	82	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cotton Gin.-L	83	0	0	0	0	0	0	0	0	0	0	0	0	3098	0
Sport Equip.-L	84	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mfg. NEC-L	85	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dwellings	86	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Elect. Dist.	87	254	999	38	370	51	7772	209	469	6	525	1371	3277	1427	14670
Gas Distribut.	88	33	3766	4	121	0	5405	3	2926	0	726	1213	670	0	3978
Trade	89	36382	55373	201	3913	993	11775	443	12305	1714	3489	19853	2814	134647	158950
Road Transport.	90	20772	22553	1445	24695	7077	76462	3159	52622	607	17408	56598	14036	49874	186908

Appendix A-2. Pakistan Interindustry Transactions Table, 1974-75 (Continued)

(Transactions in Rs. Millions)	Metal Prod's-S	Metal Prod's-L	Agri. Mach.-S	Agri. Mach.-L	N.E. Mach.-S	N.E. Mach.-L	Elect. Mach.-S	Elect. Mach.-L	Trans. S	Bicycles L	Autos L	Ships L	Mfg. NEC-S	Cotton Gen.-L
INDUSTRY ROW/COL.	70	71	72	73	74	75	76	77	78	79	80	81	82	83
Rail Transport. 91	0	5479	0	1934	0	4512	0	21211	0	4511	51334	3638	0	14110
Air Transport. 92	0	0	0	1813	0	0	0	0	0	0	0	0	0	0
Water Trans. 93	0	0	0	1209	0	0	0	0	0	0	0	0	0	0
Radio-TV 94	0	828	0	207	0	0	0	969	0	1110	4325	0	0	0
Telephone 95	100	10110	50	415	50	5414	100	2686	100	1034	482	29	5889	4278
Finance & Ins. 96	1560	12476	653	5878	1824	22801	1230	13789	543	9091	25752	5265	8556	159342
Gov't Service 97	100	337	100	1209	50	683	200	790	100	291	1364	10	9104	633
Service NEC 98	140	20852	150	4583	100	18485	300	10906	157	2959	22565	929	13698	63411
Low Cost Resid. 99	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hi.Cost Resid. 100	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rural Bldg's. 101	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Factory Bldg's. 102	10	10	10	10	10	10	10	10	10	10	10	10	10	10
Public Bldg's. 103	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Roads 104	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Infrastructure 105	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Households 106	32411	74816	901	13558	9990	129576	4069	130999	6264	23066	121258	73798	203594	125444
Imports 107	129	230107	980	199158	7719	137984	3289	403465	0	27184	408654	110721	103862	0
Tax-Subsidies 108	0	0	0	119	0	2479	0	94015	0	402	71863	-41826	0	0
Sf.Emp.Rent&Sav 109	214951	18776	7209	8906	25721	171106	5779	6311	18384	28927	165717	22660	706676	419826
TOTAL PURCHASES 110	321470	485681	15367	295312	75245	889366	33584	918630	62830	261474	1234831	210838	2635967	6223650

Appendix A-2. Pakistan Interindustry Transactions Table, 1974-75 (Continued)

(Transactions in Rs. Millions)		Sport Equip.-L	Mfg. NEC-L	Dwellings	Electric. Distr.	Gas Distr.	Trade	Road Trans.	Rail Trans.	Air Trans.	Water Trans.	Radio-TV	Tele-Phone	Finance Insurance	Gov't Service
INDUSTRY	ROW/COL.	84	85	86	87	88	89	90	91	92	93	94	95	96	97
Wheat-S	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Wheat-L	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rice-S	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rice-L	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cotton-S	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cotton-L	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sugar-S	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sugar-L	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tobacco	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Oil Seeds	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pulses	11	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crops NEC	12	0	0	0	0	0	0	442400	0	0	0	0	0	0	180037
Livestock	13	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fish	14	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Forestry	15	17369	9445	0	0	0	0	52800	0	0	0	0	0	0	0
Mines	16	34	1352	0	0	118935	0	0	76172	0	0	0	0	0	0
Grain Mills-S	17	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grain Mills-L	18	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rice Huskers-S	19	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rice Mills-L	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gur-Khan-S	21	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sugar Refin.-L	22	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Edible Oils-S	23	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Edible Oils-L	24	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tea Blending-L	25	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fish Product.-L	26	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bakery-L	27	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Food NEC-S	28	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Food NEC-L	29	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Beverages	30	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Appendix A-2. Pakistan Interindustry Transactions Table, 1974-75 (Continued)

(Transactions in Rs. Millions)	Sport Equip.-L	Mfg. NEC-L	Dwellings	Electric. Distr.	Gas Distr.	Trade	Road Trans.	Rail Trans.	Air Trans.	Water Trans.	Radio-TV	Tele-Phone	Finance Insurance	Gov't Service
INDUSTRY ROW/COL.	84	85	86	87	88	89	90	91	92	93	94	95	96	97
Tobacco Prod.-S 31	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tobacco Prod.-L 32	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cotton Text.-S 33	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cotton Yarn-L 34	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cotton Fabric-L 35	0	0	0	0	0	0	0	0	0	0	455	0	0	600122
Silk Textiles-S 36	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Silk Textiles-L 37	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Textiles NEC-S 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Wool Textiles-L 39	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Thread-L 40	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carpets-S 41	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carpets-L 42	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Textiles NEC-L 43	0	0	0	0	0	0	0	0	0	0	0	0	0	420086
Footwear 44	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Apparel-L 45	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Wood Prod's.-S 46	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Wood Furnit.-S 47	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Wood Prod's-L 48	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Paper-L 49	5785	22890	0	0	0	5389	0	0	0	0	0	0	0	0
Print.& Pub.-S 50	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Print.& Pub.-L 51	0	753	0	0	0	4837	0	0	0	0	1430	29203	91678	106249
Leather-S 52	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Leather-L 53	48447	0	0	0	0	0	0	0	0	0	0	0	0	0
Rubber Prod. 54	0	0	0	0	0	0	594056	0	0	0	0	0	0	0
Chemical-S 55	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Medicine-L 56	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fertilizer-L 57	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Paints-L 58	0	0	142812	0	0	0	0	0	0	0	0	0	0	0
Soaps-L 59	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chemicals NEC-L 60	3078	55327	0	0	0	0	0	0	0	0	0	0	0	22615

Appendix A-2. Pakistan Interindustry Transactions Table, 1974-75 (Continued)

(Transactions in Rs. Millions)		Sport Equip.-L	Mfg. NEC-L	Dwellings	Electric. Distr.	Gas Distr.	Trade	Road Trans.	Rail Trans.	Air Trans.	Water Trans.	Radio-TV	Tele-Phone	Finance Insurance	Gov't Service
INDUSTRY	ROW/COL.	84	85	86	87	88	89	90	91	92	93	94	95	96	97
Plastics-S	61	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Plastics-L	62	0	8218	0	0	0	0	0	0	0	0	0	0	0	0
Petroleum-L	63	1097	7546	0	241888	10160	0	803272	272656	433813	0	5057	0	135488	164726
Cement-L	64	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Glass-L	65	0	3824	0	0	0	0	0	0	0	0	0	0	0	0
Non-Metals-S	66	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Non-Metals-L	67	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Iron-S	68	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Iron-L	69	0	0	0	0	0	0	1431	314195	0	0	0	0	0	0
Metal Prod's-S	70	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Metal Prod'-L	71	0	41337	0	0	6666	0	0	0	0	0	0	0	55360	29812
Agri. Mach.-S	72	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Agri.Mach.-L	73	0	0	0	0	0	0	0	0	0	0	0	0	0	0
N. E. Mach.-S	74	0	0	0	0	0	0	0	0	0	0	0	0	0	0
N. E. Mach.-L	75	0	435	0	0	0	0	0	0	0	0	0	0	0	39139
Elect. Mach.-S	76	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Elect. Mach.-L	77	0	0	0	0	0	0	0	0	0	0	8343	36812	0	14780
Transport.-S	78	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bicycles-L	79	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Autos-L	80	0	0	0	0	0	0	0	0	0	0	1135	0	16808	15113
Ships-L	81	0	0	0	0	0	0	0	0	0	72800	0	0	0	0
Mfg. NEC-S	82	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cotton Gin.-L	83	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sport Equip.-L	84	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mfg. NEC-L	85	0	323	0	0	0	0	0	0	0	0	6569	0	21010	4322
Dwellings	86	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Elect. Dist.	87	950	1520	0	0	0	24361	0	0	0	0	5574	4156	64050	12838
Gas Distribut.	88	135	676	0	72112	4220	21735	0	0	0	0	0	0	76193	8181
Trade	89	3927	47633	0	0	0	0	0	0	0	0	0	0	0	0
Road Transport.	90	650	14580	0	0	2679	262401	0	0	0	0	4155	1340	64185	120060

Appendix A-2. Pakistan Interindustry Transactions Table, 1974-75 (Continued)

(Transactions in Rs. Millions)		Sport Equip.-L	Mfg. NEC-L	Dwellings	Electric. Distr.	Gas Distr.	Trade	Road Trans.	Rail Trans.	Air Trans.	Water Trans.	Radio-TV	Tele-Phone	Finance Insurance	Gov't Service
INDUSTRY	ROW/COL.	84	85	86	87	88	89	90	91	92	93	94	95	96	97
Rail Transport.	91	2857	5115	0	0	0	105774	0	0	0	0	1077	5210	25874	107031
Air Transport.	92	0	0	0	0	0	0	0	0	0	0	0	22490	0	0
Water Trans.	93	0	C	0	0	0	0	0	0	0	0	0	2300	0	0
Radio-TV	94	0	316	0	0	0	0	0	0	0	0	0	0	6069	9428
Telephone	95	0	1984	0	0	0	34775	0	0	0	0	4558	12359	79319	69148
Finance & Ins.	96	8020	12072	7989	7834	3596	349982	14036	1282	1608	397	308	800	95656	121775
Gov't Service	97	3147	3576	0	0	0	52163	804681	4015	196564	7121	181	18539	152386	2560936
Service NEC	98	851	14994	0	0	2124	173818	1207021	6023	294845	10682	4956	23919	187303	3668086
Low Cost Resid.	99	0	0	157977	0	0	0	0	0	0	0	0	0	0	0
Hi.Cost Resid.	100	0	0	52749	0	0	0	0	0	0	0	0	0	0	0
Rural Bldg's.	101	0	0	223490	10	10	0	10	10	0	10	0	10	0	10
Factory Bldg's.	102	0	10	0	10	10	0	0	0	0	0	4267	8628	28014	0
Public Bldg's.	103	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Roads	104	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Infrastructure	105	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Households	106	33569	13217	937925	711882	415348	1651869	2066877	208957	266651	65835	27126	127808	518914	4142714
Imports	107	51840	57544	0	0	0	0	6637263	58757	214878	0	12851	0	74238	166724
Tax-Subsidies	108	2757	43473	0	0	0	0	292289	0	66784	0	0	0	0	0
Sf.Emp.Rent&Sav	109	58273	231673	4310603	347877	242064	16111635	2938242	690771	570249	348155	92801	558476	2630734	5538232
TOTAL PURCHASES	110	242786	599833	5833545	1381613	805812	18798739	15854378	1632838	2045392	505000	180843	852050	4323279	18122164

Appendix A-2. Pakistan Interindustry Transactions Table, 1974-75 (Continued)

(Transactions in Rs. Millions)		Service NEC	Low Cost Resid.	High Cost Residence	Rural Bldg's.	Factory Bldg's.	Public Bldg's.	Roads	Infra-Structure	House-holds	Exports	Invest./ Discrep.	TOTAL SALES
INDUSTRY	ROW/COL.	98	99	100	101	102	103	104	105	106	107	108	109
Wheat-S	1	0	0	0	0	0	0	0	0	1319186	0	-572141	4468366
Wheat-L	2	0	0	0	0	0	0	0	0	2336704	0	-895175	7927755
Rice-S	3	0	0	0	0	0	0	0	0	351275	0	1029911	2543014
Rice-L	4	0	0	0	0	0	0	0	0	194100	0	-464258	1460155
Cotton-S	5	0	0	0	0	0	0	0	0	0	0	38511	2155823
Cotton-L	6	0	0	0	0	0	0	0	0	0	0	615052	3524687
Sugar-S	7	0	0	0	0	0	0	0	0	968714	0	98034	2028307
Sugar-L	8	0	0	0	0	0	0	0	0	1438409	0	145567	3083298
Tobacco	9	0	0	0	0	0	0	0	0	31388	99556	3177	471928
Oil Seeds	10	0	0	0	0	0	0	0	0	121392	54825	12285	886314
Pulses	11	0	0	0	0	0	0	0	0	880680	0	89125	1215975
Crops NEC	12	0	0	0	0	0	0	0	0	6269852	121757	634511	14676168
Livestock	13	0	0	0	0	0	0	0	0	13041060	1450	1319760	22156353
Fish	14	0	0	0	0	0	0	0	0	446114	0	45147	733741
Forestry	15	0	45550	17442	184596	128802	158458	0	0	7920	0	108	864306
Mines	16	0	66425	17302	276894	93869	168661	38806	149221	85557	85542	8669	1780032
Grain Mills-S	17	0	0	0	0	0	0	0	0	9733098	0	984994	10784893
Grain Mills-L	18	0	0	0	0	0	0	0	0	802367	0	81200	895772
Rice Huskers-S	19	0	0	0	0	0	0	0	0	3151171	0	318899	3602338
Rice Mills-L	20	0	0	0	0	0	0	0	0	132477	0	13407	145884
Gur-Khan-S	21	0	0	0	0	0	0	0	0	1012285	0	102443	1153805
Sugar Refin.-L	22	0	0	0	0	0	0	0	0	2084162	50399	210918	2499114
Edible Oils-S	23	0	0	0	0	0	0	0	0	2019623	0	204387	2242781
Edible Oils-L	24	0	0	0	0	0	0	0	0	2847426	308	288160	4134824
Tea Blending-L	25	0	0	0	0	0	0	0	0	779012	948	78836	858796
Fish Product.-L	26	0	0	0	0	0	0	0	0	114491	278782	11586	404859
Bakery-L	27	0	0	0	0	0	0	0	0	124925	1072	12642	138639
Food NEC-S	28	0	0	0	0	0	0	0	0	891454	0	90215	984953
Food NEC-L	29	0	0	0	0	0	0	0	0	84437	419974	8545	547348
Beverages	30	0	0	0	0	0	0	0	0	538652	1372	54512	616085

Appendix A-2. Pakistan Interindustry Transactions Table, 1974-75 (Continued)

(Transactions in Rs. Millions)		Service NEC	Low Cost Resid.	High Cost Residence	Rural Bldg's.	Factory Bldg's.	Public Bldg's.	Roads	Infra-Structure	House-holds	Exports	Invest./ Discrep.	TOTAL SALES
INDUSTRY	ROW/COL.	98	99	100	101	102	103	104	105	106	107	108	109
Tobacco Prod.-S	31	0	0	0	0	0	0	0	0	48250	0	4883	80926
Tobacco Prod.-L	32	0	0	0	0	0	0	0	0	1444885	60638	146223	1651746
Cotton Text.-S	33	0	0	0	0	0	0	0	0	1896591	0	191936	2447796
Cotton Yarn-L	34	0	0	0	0	0	0	0	0	0	1461787	-825180	2981670
Cotton Fabric-L	35	0	0	0	0	0	0	0	0	189788	1359446	19207	2348207
Silk Textiles-S	36	0	0	0	0	0	0	0	0	290275	0	29376	319654
Silk Textiles-L	37	0	0	0	0	0	0	0	0	573447	2176	58033	1163953
Textiles NEC-S	38	0	0	0	0	0	0	0	0	13533	0	1370	253916
Wool Textiles-L	39	0	0	0	0	0	0	0	0	32279	77852	-73833	353575
Thread-L	40	0	0	0	0	0	0	0	0	102071	0	10330	114723
Carpets-S	41	0	0	0	0	0	0	0	0	67014	0	6782	82211
Carpets-L	42	0	0	0	0	0	0	0	0	333089	776122	33709	1142920
Textiles NEC-L	43	0	0	0	0	0	0	0	0	217257	637150	-693834	1103026
Footwear	44	0	0	0	0	0	0	0	0	273003	43990	27628	344625
Apparel-L	45	0	0	0	0	0	0	0	0	534321	393161	54073	981712
Wood Prod's.-S	46	0	0	0	0	0	0	0	0	74493	0	29534	160884
Wood Furnit.-S	47	0	0	0	0	0	0	0	0	69619	0	17526	91516
Wood Prod's-L	48	0	0	0	0	0	0	0	13465	28358	7472	3544	92759
Paper-L	49	19308	0	0	0	0	0	0	0	346648	9244	-364615	605664
Print.& Pub.-S	50	0	0	0	0	0	0	0	0	13675	0	1414	26161
Print.& Pub.-L	51	28127	0	0	0	0	0	0	0	161926	14507	-151105	357930
Leather-S	52	0	0	0	0	0	0	0	0	369	0	32	43970
Leather-L	53	0	0	0	0	0	0	0	0	643877	714613	65191	1622775
Rubber Prod.	54	0	0	0	0	0	0	0	0	355232	17623	-372259	645502
Chemical-S	55	0	0	0	0	0	0	0	0	44709	0	4525	90225
Medicine-L	56	0	0	0	0	0	0	0	0	859654	34299	86997	1042681
Fertilizer-L	57	0	0	0	0	0	0	0	0	0	18089	195268	1067454
Paints-L	58	0	0	3215	0	29889	0	0	0	0	8184	0	204753
Soaps-L	59	0	0	0	0	0	0	0	0	439804	12850	44508	497200
Chemicals NEC-L	60	3948	0	0	0	0	0	0	0	408664	87436	-73384	1158567

Appendix A-2. Pakistan Interindustry Transactions Table, 1974-75 (Continued)

(Transactions in Rs. Millions)		Service NEC	Low Cost Resid.	High Cost Residence	Rural Bldg's.	Factory Bldg's.	Public Bldg's.	Roads	Infra-Structure	House-holds	Exports	Invest./ Discrep.	TOTAL SALES
INDUSTRY	ROW/COL.	98	99	100	101	102	103	104	105	106	107	108	109
Plastics-S	61	0	0	0	0	0	0	0	0	35668	0	3602	81895
Plastics-L	62	0	0	0	0	0	0	0	0	13540	3048	1370	70082
Petroleum-L	63	0	0	0	0	0	0	0	0	525125	192134	93143	3971279
Cement-L	64	0	182816	71705	93298	515261	552202	22416	736834	0	44258	-1120730	1103116
Glass-L	65	0	1728	644	0	9690	0	0	0	18127	5191	-409399	93841
Non-Metals-S	66	0	189705	8274	276894	53948	691069	59352	30842	225913	0	22863	2657077
Non-Metals-L	67	0	0	0	0	0	0	0	0	70930	49829	7178	144352
Iron-S	68	0	0	0	0	0	0	0	0	0	0	-15546	29723
Iron-L	69	0	16907	16861	0	139106	0	0	0	0	12253	0	2682784
Metal Prod's-S	70	0	0	0	0	0	0	0	0	145540	0	131977	321470
Metal Prod'-L	71	628	0	0	0	0	0	0	15556	162768	50938	-163917	485681
Agri. Mach.-S	72	0	0	0	0	0	0	0	0	13673	0	1694	15367
Agri.Mach.-L	73	0	0	0	0	0	0	0	0	67805	210	12248	295312
N. E. Mach.-S	74	0	0	0	0	0	0	0	0	57000	0	12647	75245
N. E. Mach.-L	75	6911	0	0	0	0	0	0	0	106181	55673	40460	889366
Elect. Mach.-S	76	0	0	0	0	0	0	0	0	26402	0	4015	33584
Elect. Mach.-L	77	0	0	0	0	0	0	0	243976	271743	22473	106715	918630
Transport.-S	78	0	0	0	0	0	0	0	0	52345	0	10485	62830
Bicycles-L	79	0	0	0	0	0	0	0	0	223196	119	38159	261474
Autos-L	80	0	0	0	0	0	0	0	0	711017	751	378492	1234831
Ships-L	81	0	0	0	0	0	0	0	0	83241	41747	13050	210838
Mfg. NEC-S	82	0	0	0	0	0	0	0	0	2393722	0	242245	2635967
Cotton Gin.-L	83	0	0	0	0	0	0	0	0	1452248	993123	146968	6223650
Sport Equip.-L	84	0	0	0	0	0	0	0	0	47327	190670	4789	242786
Mfg. NEC-L	85	3264	0	0	0	0	0	0	0	283739	240497	28165	599833
Dwellings	86	0	0	0	0	0	0	0	0	5297442	0	536103	5833545
Elect. Dist.	87	23757	0	0	0	0	0	0	0	284586	0	29300	1381613
Gas Distribut.	88	0	0	0	0	0	0	0	0	56855	0	5754	805812
Trade	89	0	0	0	0	0	0	0	0	7701129	0	779356	18798739
Road Transport.	90	121924	0	0	0	0	0	0	0	4944230	0	4871702	15854378

Appendix A-2. Pakistan Interindustry Transactions Table, 1974-75 (Continued)

(Transactions in Rs. Millions)	Service NEC	Low Cost Resid.	High Cost Residence	Rural Bldg's.	Factory Bldg's.	Public Bldg's.	Roads	Infra-Structure	House-holds	Exports	Invest./ Discrep.	TOTAL SALES
INDUSTRY ROW/COL.	98	99	100	101	102	103	104	105	106	107	108	109
Rail Transport. 91	79865	0	0	0	0	0	0	0	198918	0	609101	1632838
Air Transport. 92	0	0	0	0	0	0	0	0	1835351	0	185738	2045392
Water Trans. 93	0	0	0	0	0	0	0	0	455404	0	46087	505000
Radio-TV 94	0	0	0	0	0	0	0	0	111019	0	11235	180843
Telephone 95	27953	0	0	0	0	0	0	0	453014	0	45845	852050
Finance & Ins. 96	42390	1378	459	2528	3236	7002	651	8771	2148741	0	217452	4323279
Gov't Service 97	51912	7981	9040	35908	23010	112486	0	227517	11896840	9495916	1203958	27618083
Service NEC 98	14315	11971	13562	53862	34516	341479	0	239513	3001587	0	303761	10541877
Low Cost Resid. 99	0	0	0	0	0	0	0	0	0	0	847923	1005900
Hi.Cost Resid. 100	0	0	0	0	0	0	0	0	0	0	282551	335300
Rural Bldg's. 101	0	0	0	0	0	0	1	10	10	0	1622470	1846382
Factory Bldg's. 102	0	0	0	0	0	0	0	0	0	0	2321091	2362701
Public Bldg's. 103	0	0	0	0	0	0	0	0	0	0	5112600	5112600
Roads 104	0	0	0	0	0	0	0	0	0	0	478316	478316
Infrastructure 105	0	0	0	0	0	0	0	0	0	0	3905000	3905000
Households 106	1581262	273363	91121	501773	642088	1389400	129987	1061223	0	16440040	79767340	130917204
Imports 107	17156	42240	42780	0	377408	904046	91677	612739	15909340	167060	0	36969768
Tax-Subsidies 108	0	0	0	0	0	0	0	0	0	0	0	3741829
Sf.Emp.Rent&Sav 109	8519157	165836	42895	421207	311267	787797	135426	565333	11466820	0	0	93572168
TOTAL PURCHASES 110	10541877	1005900	335300	1845960	2362000	5112600	478316	3905000	1.4E+08	34858554	1.0E+08	518026644

APPENDIX A-3

Business Multipliers and Industry Impact Multipliers for the Disaggregated Pakistan I/O Model

SECTOR NAME (rank)	BUSINESS MULTIPLIER	IMPACT MULTIPLIER
WHEAT-S(70)	2.2549780	2.6830480
WHEAT-L(60)	2.3938900	4.3944970
RICE-S(58)	2.4489500	1.9677940
RICE-L(22)	3.0169560	2.3724310
COTTON-S(68)	2.2740030	2.7321260
COTTON-L(65)	2.3644390	3.3635950
SUGAR- S(74)	2.1780140	2.0549840
SUGAR- L(77)	2.1736530	2.6143860
TOBACCO-(96)	1.7960320	1.5480300
OILSEEDS(79)	2.1374850	1.5114970
PULSES (26)	2.9826780	1.3889110
CROPS NEC(61)	2.3820140	6.4352060
LIVESTOCK(63)	2.3775370	10.4688500
FISH(**)	1.4436020	1.7264650
FORESTRY(**)	1.3667780	2.6625660
MINES(51)	2.6141620	3.1278750
GRN MILL-S(23)	3.0149600	3.4948560
GRN MILL-L(42)	2.7990460	1.2783670
RICE HUS-S(7)	3.5018900	2.0103940
RICE MIL-L(14)	3.3492030	1.0328290
GUR-KHAN-S(21)	3.0195730	1.2812960
SUG REFI-L(59)	2.4288090	1.9146190
EDIB OIL-S(9)	3.4567790	1.5241230
EDIB OIL-L(85)	2.0110270	2.5736020
TEA BLND-L(**)	1.5302920	1.1930420
FISH PRD-L(67)	2.3303840	1.0283710
BAKERY-L(55)	2.5600140	1.0309570
FOOD NEC-S(52)	2.6016470	1.2312090
FOOD NEC-L(54)	2.5895260	1.1168570
BEVERAGES(81)	2.0789920	1.1744420
TOBAC PD-S(15)	3.3385800	1.5412940
TOBAC PD-L(98)	1.7293920	1.3580470
COTT TX-S(4)	3.5478560	1.9842500
COTT YN-L(10)	3.4059740	4.3872470
COTT FB-L(5)	3.5212770	1.4191960
SILK TX-S(12)	3.3781810	1.0719340
SILK TX-L(34)	2.9286010	2.6225260
TX NEC-S(1)	4.2042570	2.9925500
WOOL TX-L(25)	3.0052620	1.3127850
THREAD-L(6)	3.5030440	1.0360510
CARPETS-S(8)	3.4918730	1.0448250
CARPETS-L(49)	2.6254210	1.0825400

SECTOR NAME (rank)	BUSINESS MULTIPLIER	IMPACT MULTIPLIER
TX NEC-L(11)	3.3921340	1.9319600
FOOTWEAR(62)	2.3819820	1.0676640
APPAREL-L(69)	2.2597540	1.1325870
WOOD PRD-S(45)	2.6606370	1.4857740
WOOD FRN-S(53)	2.5918630	1.0319090
WOOD PRD-L(78)	2.1543430	1.1208720
PAPER-L(48)	2.6371810	3.3929900
PRNT-PUB-S(3)	3.5647020	1.0251400
PRNT-PUB-L(41)	2.8373990	1.3984830
LEATHER-S(87)	2.0048780	1.1685220
LEATHER-L(43)	2.7470530	1.9002460
RUBBER PRD(89)	1.9390090	1.6117440
CHEMICAL-S(24)	3.0109020	1.8477640
MEDICINE-L(84)	2.0222070	1.2507210
FERTILIZ-L(47)	2.6373200	1.6574950
PAINTS-L(93)	1.8851930	1.1835530
SOAPS-L(76)	2.1743740	1.1091020
CHEM NEC-L(56)	2.4740500	2.7084430
PLASTICS-S(44)	2.6945350	1.6786530
PLASTICS-L(73)	2.2097140	1.1213540
PETROL-L(**)	1.5139580	4.6476630
CEMENT-L(32)	2.9433380	2.3969320
GLASS-L(29)	2.9559180	1.5995070
NON-MET-S(2)	3.7260800	3.3055410
NON-MET-L(40)	2.8651680	1.0524590
IRON-S(88)	1.9666940	1.2287880
IRON-L(20)	3.0388020	5.9454610
MET PRD-S(**)	1.6848220	1.4193890
MET PRD-L(83)	2.0607480	1.8635000
AG MACH-S(75)	2.1754400	1.0033880
AC MACH-L(99)	1.6992030	1.2060250
N E MACH-S(72)	2.2168450	1.0327440
N E MACH L(46)	2.6600330	2.5906410
ELE MACH-S(38)	2.8933000	1.0690660
ELE MACH-L(80)	2.0885740	1.6046230
TRANSPT-S(39)	2.8847120	1.0129710
BICYCLES-L(33)	2.9380770	1.0553090
AUTOS-L(82)	2.0705000	1.3224520
SHIPS-L(57)	2.4717190	1.1823850
MFG NEC-S(37)	2.8955790	1.5931710
CTTN GIN-L(16)	3.1494900	5.0319810
SPORT EQ-L(66)	2.3324500	1.0117280
MFG NEC-L(90)	1.9265560	1.1931170
DWELLINGS(97)	1.7617180	2.3127210
ELECT DIST(30)	2.9493990	2.4821970
GAS DIST(28)	2.9745020	2.5331490
TRADE(**)	1.3693450	16.9665400
ROAD TRANS(94)	1.8826360	9.3126870
RAIL TRANS(64)	2.3765780	2.1206640

SECTOR NAME (rank)	BUSINESS MULTIPLIER	IMPACT MULTIPLIER
AIR TRANS(71)	2.2297860	1.5042260
WAT TRANS(95)	1.8186040	1.1220850
RADIO-TV(86)	2.0094960	1.1137300
TELE-P O(92)	1.8958240	1.5918380
FIN-INS(91)	1.9200620	4.1894730
GOVT SERV(18)	3.1432650	6.5018660
SERV NEC(**)	1.5342790	5.9777440
LC RESID	3.3744900	1.0626290
HC RESID	3.0537240	1.0209180
RURAL BLD	3.1434620	1.0899230
FACT BLD	2.9761080	1.0747130
PUBLIC BLD	2.9247690	2.2036140
ROADS	2.6153420	1.1126020
INFRASTRUCT	2.9127390	1.9193140
HOUSEHOLDS	2.9450520	33.2085200

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