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Analysis of Inter-industry Relations in Pakistan: Some Further Experiments with the 1975-76 Data

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INTRODUCTION

Input-Output (I-O) tables of Pakistan's economy for the year 1975-76 were published by the Pakistan Institute of Development Economics (PIDE) in 1983. They delineated the structure of production of 118 industries together with the disposition of their output by five categories of final demand: consumption expenditures; gross fixed capital formation; changes in stocks; exports; and re-exports. Imports have been shown to be absorbed as intermediate inputs as well as destined for final consumption. The present author presented an analytical paper [3], based on the said data-base, in which despite the useful industrial details captured, the predominant agrarian nature of Pakistan's economy was emphasized. Agricultural sector's contribution to the total gross domestic product (GDP) at factor cost amounted to 22.1 percent. Although the I-O tables identified some 81 manufacturing industries – both large-scale and small-scale – there were only seven industries whose contribution to the total GDP was of any significance. The manufacturing sector, as a whole, contributed only about 11.7 percent of the total GDP. Service industries, construction and the like still account for the rest of the GDP.

The present study, therefore, analyses the interdependence between the agricultural sector and the rest of the economy. Agriculture has been disaggregated into 8 subsectors whereas the rest of the economy has been compressed into 6 sectors: non-crops; mining and quarrying; large-scale manufacturing; small-scale manufacturing; construction; and services. Table A 6 provides a concordance of industries used in this study with those of PIDE's I-O classification of industries.

The plan of presentation is as follows. Section I describes the I-O structure of production in terms of 14 sectoral disaggregation of Pakistan's economy for 1975-76. Salient structural features of the economy are highlighted. In Section II, an open output-determination model of the Leontief type is formulated. It distinguishes between domestic transactions and those arising from imports. Some empirical applications of the formulated model are discussed in Section III. Finally, in Section IV some concluding remarks and suggestions for further research are presented.

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I. SALIENT FEATURES OF PAKISTAN'S ECONOMY: 1975-76

The basic table of the Input-Output system is known as Transactions Table in which are entered, in value terms, the various economic flows within the economy during some particular base year. Such a table for Pakistan's economy for the year 1975-76 appears in the Appendix as Table A 1. The economy has been divided into 14 sectors. Output of each sector is distributed along a row of the table while columns record the inputs of the sectors in question.

The first row of Table A 1, for example, shows how the output of the wheat sector was disposed of. The entry of 635,306 (in thousands of rupees) in the first column relates mainly to the seeds sold off to farms. The entries of 1,520,924 in Column (9), of 532,467 in Column (11), and of 7,518,850 in Column (12) refer to the animals sold for processing; wheat sold for milling, etc. In the columns of final demand the output of wheat, for example, appears as being used by final consumers directly, So, of the total wheat output of 12,396,121, some 82.3 percent goes for further processing and the rest ends up as being used by final consumers.

If we look at the first column of Table A1, we see the various items which were purchased by the wheat-growing sector in 1975-76. Apart from the 635,306 mentioned above for Row (1), these were animal feeds, fertilizers, agricultural machinery, services, etc., which were bought as farm inputs.

The other entries in the wheat-growing Column (1) are: imports; indirect taxes less subsidies; and value added. This sector imports 272,918 worth of agricultural machinery etc. as an input, pays no taxes, and is not subsidized, whereas the expenditures on wages and salaries amount to 6,972,335. The latter component is variously characterized as value added or gross domestic product at factor cost representing the remuneration paid to factors of production. The GDP is obtained by deducting imports from total primary inputs (7,245,253 – 272,918 = 6,972,335). This result derives from the national accounting definitions and so it can be seen that the input-output system is intimately associated with the national accounts.

In an input-output table, total value of the output of each productive sector, i.e. the row total, is always equal to its total expenditure on inputs, i.e. the column total. For the wheat-growing sector, this equality between the row total and column total can be readily ascertained from the Transactions Table A1. No such equality, however, is imposed on the Final Demand Sectors or on the Primary Input Sectors. It is sufficient that all the final sectors taken together should be equal to the total of the primary inputs. This would also be apparent from Table A1 – column total of final demand is equal to the row total of primary inputs.

The equality of inputs and output in a Transactions Table is, of course, an accounting identity. In preparing the accounts for each sector, total output is first determined. Expenses, including imported inputs, are deducted from this and the balance is defined as "income arising" in the sector. This latter item can be taken as being equivalent to wages, salaries, and profits. Hence, for each production sector, wages, salaries, and profits plus other expenses are equal to output.

An evaluation of the Transactions Table A 1 would show that the economy of Pakistan produced goods and services worth about Rs 243.3 billion in 1975-76. By far the largest producer was the services sector that was followed by large-scale manufacturing, non-crops sector, other crops sector, and wheat-growing sector. The economy earned a total of about Rs 8.76 billion from its exports – mostly from the manufactured goods (Rs 8.39 billion). Imports of goods, both for intermediate use and for final consumption, amounted to Rs 41.5 billion. The total output of Rs 243.3 billion resulted in the creation of Rs 116.8 billion of value added.

We have calculated the direct value-added and import coefficients as a proportion of the output of various industries. These are shown in Table A 2. An examination of the value-added coefficients would reveal quite a variation in income-creating effects of production industries. Generalizing, one can say that, with the exception of large-scale manufacturing, small-scale manufacturing, and pulses, all other sectors of the economy have high income per rupee of final demand. That is to say, a large proportion of the production costs in these industries is in the form of direct payments to factors of production. The tobacco-growing sector has, by far, the highest value added of about 74 paisas on a rupee of expenditure. This is followed by the sugar-cane- growing sector with a coefficient of about 0.66. On the other hand, in goods-producing industries (both large-scale and small-scale manufacturing), in which the costs of purchased materials absorb a greater fraction of total outlays, the direct income created is relatively small – 0.18 for large-scale manufacturing and about 0.17 for small-scale manufacturing.

Looking at the direct import coefficients, it would be clear that the large-scale manufacturing and construction sectors have a higher proportion of imported inputs than are had by other industries. It should be borne in mind that these directly imported intermediate inputs utilized by the industries in question eventually lead to chain effects within the overall productive system, requiring additional indirect imports.

II. THE INPUT-OUTPUT MODEL

Input-Output tables for the economy of Pakistan in 1975-76 distinguish between the transactions that arise through imports and those arising through domestic production. However, imports are not given in the form of a matrix for industry-by-industry transactions. They are given as a row as shown in Transactions Table A 1.

The notation and model are outlined below.

X_{ij}^{d} = Domestic output of industry i as input in industry j ($i, j = 1, 2, \ldots n$);

X^m_{ij} = Total imports of industry j, used as an input in industry j ($j = 1,2, \ldots, n$ given as a row);

X^m_j = Level of importing activity or value of imports of industry j;

X^d_j = Level of domestic output of industry j;

X_j = $X^d_j + X^m_j$: Total supply of industry j;

Y^d_i = Final demand for industry i (consumption – investment – stock changes – exports);

Y^m_i - Final import demand in inudstry i;

D = $d_{ij} = X^d_{ij}/X^d$: Domestic output coefficient matrix (14x14); and

M = $M_{jj} = X^m_{jj}/X^d_j$: Diagonal import input coefficient matrix (14x14).

The balance equation is

$$X^d_i + X^m_i = \sum_{j=1}^{n} d_{ij}X^d_j + M_{ii}X^d_i + Y^d_i + Y^m_i \quad \ldots \quad \ldots \quad (1)$$

Equation (1) can be partitioned and written in matrix notation:

$$\left[\begin{array}{c|c} I - D & 0 \\ \hline -M & I \end{array}\right]\left[\begin{array}{c} X^d \\ \hline X^m \end{array}\right] \quad \left[\begin{array}{c} Y^d \\ \hline Y^m \end{array}\right] \quad \ldots \quad \ldots \quad (2)$$

where $(I - D)$ refers to (14X14) input-output domestic coefficients matrix, M refers to a 14X14 imports coefficients diagonal matrix, X^d refers to a 14x1 gross domestic output vector, X^m is a 14x1 vector of total imported output in each industry, and Y^d and Y^m are domestic and imported final demand vectors or order 14x1.

In this model, the intermediate import requirements are determined by the domestic output levels and domestic output structure is determined by the domestic input coefficients. The total final demand is decomposed into two components: domestic and imported.

If we rewrite Equation (2) in terms of $\left[\begin{array}{c} X^d \\ \hline X^m \end{array}\right]$, we obtain

$$\left[\begin{array}{c} X^d \\ \hline X^m \end{array}\right] = \left[\begin{array}{c|c} I - D & 0 \\ \hline -M & I \end{array}\right]^{-1}\left[\begin{array}{c} Y^d \\ \hline Y^m \end{array}\right] \quad \ldots \quad \ldots \quad (3)$$

The inverse of the partitioned matrix on the right-hand side of Equation (3) is

$$\left[\begin{array}{c|c} (I - D)^{-1} & 0 \\ \hline M(I - D)^{-1} & I \end{array}\right] \quad \ldots \quad \ldots \quad (4)$$

$(I - D)^{-1}$ can be interpreted as the total requirement of domestic output per unit of final demand in each of the industries in the economy.

The column sums of $(I - D)^{-1}$ indicate the total domestic output requirements of sector j per unit of final demand of that industry, while the off-diagonal elements of $(I - D)^{-1}$ are the direct output requirements emerging from that industry's output to meet the final demand originating in that industry.

The import dependence of an industry is not fully reflected in the imports it uses in the process of production. In so far as the industry uses some domestically produced inputs and the domestic supplies have, in turn, some import content, the total import content must incorporate this indirect content also. An illustration will make the interpretation of direct and indirect intermediate import requirements clear. The textiles sector may be using some imported synthetic fibres, directly and domestically produced chemicals, dyes, machinery and other inputs. The domestic production of these inputs involves the use of imported inputs and domestic inputs, which again have some import content. The matrix $M(I - D)^{-1}$ yields these direct and indirect import requirements. The column sums of this matrix indicate total intermediate import requirements per unit of final demand in industry j, while the diagonal elements of this matrix yield direct import requirements in that industry per unit of final demand.

III. SOME APPLICATIONS OF THE INPUT-OUTPUT MODEL OF PAKISTAN'S ECONOMY

The output-determination model of Pakistan's economy, as formulated in the preceding section, can be used for a variety of simulation purposes. We have used it to compute sectoral output and income multipliers. Additionally, we have utilized this model to measure below the impact of increased exports on the domestic output levels of Pakistan's economy.

The inverse matrix, variously called the 'impact' or 'multiplier' matrix, provides the total effects (both direct and indirect) as a result of a unit change in the bill of final demand. These computed total effects are shown in Table A 3. Let us examine this table.

Column (2) lists, for each of the industries, the total domestic requirements per unit of final demand in terms of gross domestic output. These are, in fact, the column sums of the inverse matrix indicating the results of the demands exerted on all industries for a unit increase in the final demand for respective industries. Column (3) reflects the total requirements supplied by the sector in question alone, whereas in Column (4) are listed the requirements supplied by other industries (indirectly). For example, a unit increase in the demand for wheat leads to a total increase of 1.652 in the output. The total contribution of the wheat sector itself is 1.069 and the remainder 0.583 is supplied by all other industries. In other words, a unit (Rupee) increase in final demand for wheat results in a total increase of 65

paisas. Wheat sector, itself, contributes about 7 paisas worth of output, whereas the remaining 58 paisas worth is supplied by other industries. A similar interpretation is applicable to other industries listed in Table A 3.

It is evident that the domestic production by industries requires imports. Columns (5) to (7) delineate these import requirements. These have been obtained by adjusting the inverse matrix for imports $-M(I-D)^{-1}$ in Equation (4) of the model. As an example, for the large-scale manufacturing sector, Column (5) would indicate that the total import requirements to fulfil a unit increase in its final demand required a total increase of about 50 paisas of imports. Almost half this increase in imports was required by the sector itself and the remaining half related to the other industries – Columns (6) and (7), respectively.

A perusal of this table would clearly indicate that the largest output increases, per unit of final demand change, are recorded for the small-scale manufacturing sector. The total import requirements (of .69) are rather small. This highest total increase is followed by the pulses sector (2.226) and large-scale manufacturing sector (1.915). The import content of the latter sector is, however, relatively high (0.498).

The largest indirect output requirements, per unit of final demand, are recorded for the small-scale manufacturing sector (1.253), followed by the pulses sector (1.151) and construction (0.777). The total import requirements of these sectors are relatively low.

Sectoral Multipliers for Pakistan's Economy: 1975-76

The relationship between the initial expenditure and the total effect triggered by this initial expenditure is known as the multiplier effect. Multiplier analysis assists in appraising the accumulated impacts in all industrial sectors of the economy that follow from exogenous changes in the final demands placed upon a given industry. Numerical estimates of the multiplier[1] provide answers to "what if" questions. For example, what happens to Pakistani incomes per 1 million rupees of expanded exports? Multipliers are, however, based on quite simplified assumptions concerning the behavioural response-patterns of industries and consumers to changes in demand and income. They should, therefore, be used with caution.

There are numerous multiplier concepts.[2] In this study, two forms of multipliers have been computed for Pakistan's economy. The *output multiplier*, for each

[1] These are obtained by dividing the value of total effect by their corresponding direct value.

[2] Since the inverse matrix of Pakistan's economy utilized in this study refers to the 'open' output-determination model, the calculated multipliers shown are technically known as Type-I multiplier coefficients. When the 'closed' version of the model is used, the resulting multipliers are called Type-II multipliers. For a detailed explanation of these various multipliers, see [1, pp. 79–94].

industry, measures the direct and indirect (i.e. total) output produced in all industries per unit of final demand for the industry. The *value-added (or income) multiplier* shows the total change in the gross domestic product (at factor cost) per Rupee change in final demand.[3]

Sectoral multiplier values, estimated on the basis of the 1975-76 I-O study of Pakistan's economy, are presented in Table A 4. Since imports enter the domestic production process, two sets of output multipliers are presented – one with import leakages and the other based on domestic outputs requiring no imports.

A glance at this table would show quite clearly that the small-scale manufacturing sector is, by far, the largest producer of output (with import) per unit of final demand change. It is followed by the pulses and large-scale manufacturing sectors. If, however, imports are not allowed to be used, the values of output multipliers show a markedly different pattern. The small-scale manufacturing sector loses its preponderance. It is replaced by the large-scale manufacturing sector, which registers a high multiplier-value of about 2.67. This is a striking result that suggests that output increases, as a consequence of domestically processed inputs, have a significant potential. As an industrial strategy, this potential should be tapped.

The largest income increases are registered for the non-crops sector of the economy – a value of 2.87. This is followed by the large-scale manufacturing sector, which shows an income multiplier of 2.66. The income multiplier values in the agricultural subsectors either show lower values than their corresponding output multipliers (with import leakages) or show increases almost similar to those registered for outputs when imports are not taken into account.

The disaggregated summary measures of output and income estimated for Pakistan's economy are analytically quite useful in that they provide an analyst with a choice for policy-making purposes. Should one opt for an output-creation objective of an income-generation objective of an anticipated expenditure programme within an overall planning framework?

Impact of Changes in Exports on the Domestic Output Levels

The object of an economic activity is satisfaction of final demand. This fact has to be exploited by using the 'open' I-O model specified. That is, exports, gross fixed capital formation, consumption expenditure, changes in stocks and re-exports can be assumed to be related to other sectors of production. These various components of final demand are, however, autonomously determined by factors outside the system. As an illustrative exercise, we have assumed that exports of tobacco, oilseeds other than cotton, other crops, mining and quarrying, and large-scale manufacturing

[3] For exact formulation of output and income multipliers used in this study, see [3].

increase by 10 percent each. The impacts of these increases on the domestic output are measured. Results of this simulation exercise are presented in Table A 5.

The large-scale manufacturing sector shows, by far, the largest total increase in outputs. Although a 10-percent increase in the exports of this sector leads directly to a marked stimulation of this sector (of 49.3 percent), the spin-off effects are shared evenly by other sectors of the economy. Sectors like construction, small-scale manufacturing, pulses, etc., are cases in point. The impact of increased exports of tobacco, oilseeds other than cotton, non-crops, and mining and quarrying is, however, felt basically by these sectors' increased production. Other related industries do not show any significant increases in the production levels. The impact of exports of the 'other crops' sector appears rather uniform on the production level of other industries. The largest total increase in production is, of course, reflected in the sector in question.

The above simulation exercise is indicative of the fact that the I-O model can serve as an important analytical tool for consistency planning. It can assist the economic planners in formulating alternative objectives for the planned expenditure programmes.

IV. CONCLUDING REMARKS AND SOME SUGGESTIONS FOR FURTHER RESEARCH

Input-Output tables of Pakistan's economy for the year 1975-76 became available in 1983. The present author analysed these tables, and the results obtained [3] demonstrated that, although the industrial details captured by the tables were quite commendable – 118 industries and five categories of final demand – the predominantly agrarian nature of the economy was manifest. For the purposes of this study, the said I-O tables have been aggregated into 14 broad sectors encompassing the total economy.[4] The agrarian characteristics of the economy have been preserved by highlighting 8 agricultural subsectors. Manufacturing industries have been aggregated to form two broad sectors – large-scale and small-scale. A close scrutiny of Table A 1 would show that of the total output of the agricultural sector (of Rs 44.5 billion), approximately 66 percent (i.e. about Rs 29.4 billion) is slated for processing (inter-industry use). The output of the large-scale manufacturing sector is split roughly half and half between the intermediate use and final demand use. On the other hand, a higher proportion of the services sector's output goes to final use (about 60 percent) than for intermediate use (40 percent).

The treatment of imports also deserves mention. In the earlier study [3], imports were embedded in the domestic production and the possibility of having all the input requirements met domestically was distinctly recognized. Such a distinct

[4] The concordance between this 14-sector classification and the original 118 industries is given in Table A 6.

recognition has been made in this paper, and two separate sets of output multipliers – one with import leakages and the other without them – have been estimated. An interesting comparison is given in Table A 4. For example, if imports are not taken into account in the small-scale manufacturing sector, its output multiplier drops from 2.34 to 1.19. The situation is, however, reversed for the large-scale manufacturing sector, where the output multiplier value is higher (2.66) with no imports, as compared with the output multiplier with import leakages (1.91).

One can also find the income multipliers in Table A 4. It should be pointed out in this vein, however, that these multipliers refer to the total income (value added) originating in the sectors under study. They are deficient in that they do not refer to labour income or to the profitability of an industry. Analytically what needs to be done is the disaggregation of the value-added vector in terms of its various components: the labour's share, profit, net income of unincorporated business, etc.

The treatment of the public sector is quite inadequate. A clear distinction between the goods-producing activities and general administration must be maintained. The former entails splitting the production of large-scale manufacturing sector into public and private enterprises. The latter implies that the general administration of the government producing only wages and salaries should be ascribed to the final demand side of the I-O tables.

The I-O model has been used further in this study to measure the impact of exogenous changes – increased exports, in our case – on the domestic output levels of industries. It has been demonstrated that a 10-percent increase in the exports of the large-scale manufacturing sector stimulates the domestic production quite significantly – not only in this sector but also across the board. A similar increase in the other agrarian exports results in a stimulation of the domestic production of the sectors concerned. The spill-over effects for other sectors are, however, quite restricted. This exercise demonstrates the usefulness of an I-O model for varied policy-simulation purposes. It can be effectively used as a tool for preparing consistent economic plans for the country.

APPENDIX

LIST OF TABLES

Table A 1

Transactions Table: 1975-76

(Figures in Thousands)

Sectors	Wheat Growing (1)	Rice Growing (2)	Cotton Growing (3)	Sugar-cane Growing (4)	Tobacco (5)	Oilseeds other than Cotton Seeds (6)
1. Wheat	635,306	–	–	–	–	–
2. Rice	–	114,688	–	–	–	–
3. Cotton	–	–	120,107	–	–	–
4. Sugar-cane	–	–	–	163,794	–	–
5. Tobacco	–	–	–	–	20,900	–
6. Oilseeds other than Cotton Seeds	–	–	–	–	–	11,334
7. Pulses	–	–	–	–	–	–
8. Other Crops	84	10	24	13	2	–
9. Non-crops	2,220,263	638,343	704,945	278,435	17,367	203,447
10. Mining & Quarrying	35	26	118	29	4	1
11. Large-scale Manufacturing	536,850	195,822	279,996	167,483	15,405	20,078
12. Small-scale Manufacturing	–	–	–	–	–	–
13. Construction	–	–	–	–	–	–
14. Services	1,688,340	1,096,464	1,167,746	1,056,651	60,616	113,441
Total Inter-industry	5,150,878	2,045,353	2,272,936	1,666,405	114,294	348,301
Primary Inputs						
Imports	272,918	71,676	136,490	63,119	8,851	5,148
Indirect Taxes less Subsidies	–	–	–	–	–	–
Value Added	6,972,335	1,886,140	3,271,084	3,382,081	348,811	532,865
Total Primary	7,245,253	1,957,816	3,407,574	3,445,200	357,662	538,013
TOTAL INPUT	12,396,131	4,003,169	5,680,510	5,111,605	471,956	886,314

Continued

Table A1 – (*Continued*)

Sectors	Pulses (7)	Other Crops (8)	Non-crops (9)	Mining & Quarrying (10)	Large-scale Mfg. (11)	Small-scale Mfg. (12)
1. Wheat			1,520,924	–	532,467	7,518,850
2. Rice			231,000	–	83,266	2,463,187
3. Cotton			–	–	4,906,840	–
4. Sugar-cane			451,000	–	991,374	854,713
5. Tobacco			–	–	305,321	11,586
6. Oilseeds other than Cotton Seeds			–	–	77,394	609,084
7. Pulses	81,170		165,000	–	–	–
8. Other Crops	–	885,700	5,646,800	–	206,027	288,951
9. Non-crops	551,791	2,144,485	–	–	1,275,320	200,797
10. Mining & Quarrying	–	27	100,000	–	339,544	154,195
11. Large-scale Manufacturing	74,709	338,081	69,130	78,552	10,548,307	4,353,902
12. Small-scale Manufacturing	–	–	–	–	38,022	2,258,904
13. Construction	–	–	–	–	–	–
14. Services	196,993	2,025,647	1,662,347	444,855	7,981,012	3,442,346
Total Inter-industry	903,993	5,393,940	9,846,201	523,407	27,284,894	22,156,515
Primary Inputs						
Imports	25,410	142,115	–	102,450	9,158,279	1,654,145
Indirect Taxes less Subsidies	–	–	–	18,873	3,375,673	–
Value Added	286,572	9,139,933	13,908,199	1,135,302	9,056,307	4,755,627
Total Primary	311,982	9,282,048	13,908,199	1,256,625	21,590,259	6,409,627
TOTAL INPUT	1,215,975	14,675,988	23,754,400	1,780,032	48,875,153	28,566,142

Continued –

Table A 1 –(*Continued*)

Sectors	Construction (13)	Services (14)	Total Inter-industry	Final Demand: Exports	Final Demand: Other Final Demand	Final Demand: Total Final Demand	Total Output
1. Wheat	–	–	10,207,547	–	2,188,574	2,188,574	12,396,121
2. Rice	–	–	2,892,141	–	1,111,028	1,111,028	4,003,169
3. Cotton	–	–	5,026,947	–	653,563	653,563	5,680,510
4. Sugar-cane	–	–	2,460,881	–	2,650,724	2,650,724	5,111,605
5. Tobacco	–	–	337,807	99,556	34,565	134,121	471,928
6. Oilseeds other than Cotton Seeds	–	–	697,812	54,825	133,677	188,502	886,314
7. Pulses	–	–	246,170	–	969,805	969,805	1,215,975
8. Other Crops	–	622,437	7,650,048	121,757	6,904,363	7,026,120	14,676,168
9. Non-crops	534,848	52,800	8,892,841	1,450	14,860,109	14,861,559	23,754,400
10. Mining & Quarrying	811,178	195,107	1,600,264	85,542	94,226	179,768	1,780,032
11. Large-scale Manufacturing	2,664,483	4,792,473	24,135,271	8,392,389	16,226,614	24,619,003	48,754,274
12. Small-scale Manufacturing	1,310,084	–	3,607,010	–	24,959,132	24,959,132	28,566,142
13. Construction	–	475,125	475,125	–	14,569,951	14,569,951	15,045,076
14. Services	1,134,870	11,576,397	33,647,055	–	47,230,509	47,230,509	80,877,564
Total Inter-industry	6,455,463	17,714,339	101,876,919	8,755,519	132,586,840	141,342,359	243,219,278
Primary Inputs							
Imports	2,070,890	7,181,867	20,893,358	–	–	20,654,874	41,548,232
Indirect Taxes less Subsidies	–	359,073	3,753,619	–	–	–	–
Value Added	6,518,727	55,622,255	116,816,093	–	–	–	–
Total Primary	8,589,617	63,163,195	141,463,070	–	–	–	–
TOTAL INPUT	15,045,080	80,877,534	243,339,989	–	–	–	–

Table A1 – (*Continued*)

Sectors	Pulses (7)	Other Crops (8)	Non-crops (9)	Mining & Quarrying (10)	Large-scale Mfg. (11)	Small-scale Mfg. (12)
1. Wheat			1,520,924	–	532,467	7,518,850
2. Rice			231,000	–	83,266	2,463,187
3. Cotton			–	–	4,906,840	–
4. Sugar-cane			451,000	–	991,374	854,713
5. Tobacco			–	–	305,321	11,586
6. Oilseeds other than Cotton Seeds			–	–	77,394	609,084
7. Pulses	81,170		165,000	–	–	–
8. Other Crops	–	885,700	5,646,800	–	206,027	288,951
9. Non-crops	551,791	2,144,485	–	–	1,275,320	200,797
10. Mining & Quarrying	–	27	100,000	–	339,544	154,195
11. Large-scale Manufacturing	74,709	338,081	69,130	78,552	10,548,307	4,353,902
12. Small-scale Manufacturing	–	–	–	–	38,022	2,258,904
13. Construction	–	–	–	–	–	–
14. Services	196,993	2,025,647	1,662,347	444,855	7,981,012	3,442,346
Total Inter-industry	903,993	5,393,940	9,846,201	523,407	27,284,894	22,156,515
Primary Inputs						
Imports	25,410	142,115	–	102,450	9,158,279	1,654,145
Indirect Taxes less Subsidies	–	–	–	18,873	3,375,673	–
Value Added	286,572	9,139,933	13,908,199	1,135,302	9,056,307	4,755,627
Total Primary	311,982	9,282,048	13,908,199	1,256,625	21,590,259	6,409,627
TOTAL INPUT	1,215,975	14,675,988	23,754,400	1,780,032	48,875,153	28,566,142

Continued –

Table A 1 –(*Continued*)

Sectors	Construction (13)	Services (14)	Total Inter-industry	Final Demand: Exports	Final Demand: Other Final Demand	Final Demand: Total Final Demand	Total Output
1. Wheat	–	–	10,207,547	–	2,188,574	2,188,574	12,396,121
2. Rice	–	–	2,892,141	–	1,111,028	1,111,028	4,003,169
3. Cotton	–	–	5,026,947	–	653,563	653,563	5,680,510
4. Sugar-cane	–	–	2,460,881	–	2,650,724	2,650,724	5,111,605
5. Tobacco	–	–	337,807	99,556	34,565	134,121	471,928
6. Oilseeds other than Cotton Seeds	–	–	697,812	54,825	133,677	188,502	886,314
7. Pulses	–	–	246,170	–	969,805	969,805	1,215,975
8. Other Crops	–	622,437	7,650,048	121,757	6,904,363	7,026,120	14,676,168
9. Non-crops	534,848	52,800	8,892,841	1,450	14,860,109	14,861,559	23,754,400
10. Mining & Quarrying	811,178	195,107	1,600,264	85,542	94,226	179,768	1,780,032
11. Large-scale Manufacturing	2,664,483	4,792,473	24,135,271	8,392,389	16,226,614	24,619,003	48,754,274
12. Small-scale Manufacturing	1,310,084	–	3,607,010	–	24,959,132	24,959,132	28,566,142
13. Construction	–	475,125	475,125	–	14,569,951	14,569,951	15,045,076
14. Services	1,134,870	11,576,397	33,647,055	–	47,230,509	47,230,509	80,877,564
Total Inter-industry	6,455,463	17,714,339	101,876,919	8,755,519	132,586,840	141,342,359	243,219,278
Primary Inputs							
Imports	2,070,890	7,181,867	20,893,358	–	–	20,654,874	41,548,232
Indirect Taxes less Subsidies	–	359,073	3,753,619	–	–	–	–
Value Added	6,518,727	55,622,255	116,816,093	–	–	–	–
Total Primary	8,589,617	63,163,195	141,463,070	–	–	–	–
TOTAL INPUT	15,045,080	80,877,534	243,339,989	–	–	–	–

Table A 2

Direct Value-added and Import Coefficients, 1975-76

Sectors	Value Added	Import
Wheat	0.562	0.022
Rice	0.471	0.018
Cotton	0.576	0.024
Sugar-cane	0.662	0.012
Tobacco	0.739	0.019
Oilseeds other than Cotton	0.601	0.006
Pulses	0.236	0.021
Other Crops	0.623	0.010
Non-crops	0.585	–
Mining & Quarrying	0.638	0.058
Large-scale Manufacturing	0.185	0.187
Small-scale Manufacturing	0.166	0.058
Constructior	0.433	0.138
Services	0.688	0.009
Total Economy	**0.480**	**0.086**

Table A 3

Total (Direct Plus Indirect) Output Requirements per Unit of Final Demand: 1975-76

(1)	(2)	(3)	(4)	(5)	(6)	(7)
Wheat	1.652	1.069	0.583	0.035	0.023	0.012
Rice	1.771	1.031	0.740	0.021	0.018	0.003
Cotton	1.606	1.031	0.575	0.031	0.025	0.006
Sugar-cane	1.474	1.036	0.438	0.015	0.013	0.002
Tobacco	1.354	1.047	0.307	0.020	0.019	0.001
Oilseeds other than Cotton	1.611	1.013	0.598	0.006	0.005	0.001
Pulses	2.226	1.075	1.151	0.023	0.022	0.001
Other crops	1.562	1.108	0.454	0.018	0.011	0.007
Non-crops	1.642	1.060	0.582	–	–	–
Mining and Quarrying	1.417	1.001	0.461	0.063	0.058	0.005
Large-scale Manufacturing	1.915	1.312	0.603	0.498	0.246	0.252
Small-scale Manufacturing	2.339	1.086	1.253	0.069	0.063	0.003
Construction	1.778	1.001	0.777	0.141	0.138	0.003
Services	1.331	1.192	0.139	0.402	0.106	0.296

Column (2) Total direct and indirect domestic requirements per unit of final demand in terms of gross outputs: $(I - D)^{-1}$.

Column (3) Total direct domestic requirements per unit of final demand: diagonal elements of $(I - D)^{-1}$.

Column (4) Column (2) minus column (3): Total indirect domestic requirements per unit of final demand.

Column (5) Total direct and indirect import requirements per unit of final demand: $M(I - D)^{-1}$.

Column (6) Total direct import requirements per unit of final demand: diagonal elements of $M(I - D)^{-1}$.

Column (7) Column (5) minus column (6): total indirect import requirements per unit of final demand.

Table A 4

Sectoral Multipliers: 1975-76

Sectors	Output Multipliers		Income Multipliers
	With Import Leakages	Without Import Leakages	
Wheat	1.652	1.591	1.607
Rice	1.771	1.167	1.168
Cotton	1.606	1.292	1.294
Sugar-cane	1.474	1.250	1.182
Tobacco	1.354	1.053	1.064
Oilseeds other than Cotton	1.611	1.000	1.043
Pulses	2.226	1.095	1.093
Other Crops	1.562	1.800	1.852
Non-crops	1.642	–	2.870
Mining and Quarrying	1.417	1.086	1.103
Large-scale Manufacturing	1.915	2.663	2.659
Small-scale Manufacturing	2.339	1.190	1.185
Construction	1.778	1.022	1.034
Services	1.331	44.667	4.531

Table A 5

Impact of 10 percent Increase in Exports on the Domestic Output Levels of Industries: 1975-76

(In Thousands of Rupees)

Sectors	Tobacco	Oilseeds other than Cotton	Other Crops	Non-crops	Mining & Quarrying	Large-scale Manufacturing
Wheat	57	8	7,413	335	191	731,896
Rice	70	10	6,544	286	233	899,459
Cotton	64	9	5,079	222	189	826,815
Sugar-cane	47	7	2,484	101	139	609,887
Tobacco	114,628	6	1,716	70	102	540,334
Oilseeds other than Cotton	35	61,094	8,681	397	182	455,726
Pulses	84	12	18,055	831	361	1,084,692
Other Crops	36	5	148,467	267	153	467,662
Non-crops	22	3	36,127	1,692	481	284,554
Mining and Quarrying	58	8	542	7	94,231	749,676
Large-scale Manufacturing	939	129	3,207	98	962	12,111,693
Small-scale Manufacturing	241	1,441	5,664	169	850	2,452,889
Construction	196	150	2,495	93	5,370	2,474,058
Services	67	10	1,601	11	370	861,066
Total	**116,545**	**62,890**	**248,076**	**4,578**	**103,816**	**24,550,406**

Table A 6

Concordance of Industries used in this Study with those of PIDE's Classification

	Industries	PIDE's Industrial Classification Numbers
1.	Wheat	001–002
2.	Rice	003–004
3.	Cotton	005–006
4.	Sugar-cane	007–008
5.	Tobacco	009
6.	Oilseeds other than Cotton	010
7.	Pulses	011
8.	Other Crops	012
9.	Non-crops	013–015
10.	Mining and Quarrying	016
11.	Large-scale Manufacturing	017–067
12.	Small-scale Manufacturing	068–097
13.	Construction	098–104
14.	Services	105–118

Note: For PIDE's classification, see [2].

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3. Syed, A. A. "Analysis of Inter-industry Relations in Pakistan for 1975-76". *Pakistan Development Review.* Vol. XXIV, Nos. 3 & 4. Autumn-Winter 1985.

Comments on "Analysis of Inter-industry Relations in Pakistan: Some Further Experiments with these 1975-76 Data"

The Study explores interdependence of agricultural and non-agricultural activities in Pakistan. Although quite useful, the study suffers from various shortcomings associated with sector classification and data. My comments are grouped into the following four main heads:

(i) Adequacy of the sectoral classification.
(ii) Data employed in the study.
(iii) Errors in the results reported.
(iv) Interpretation of the results.

I. SECTORAL CLASSIFICATION

The Input-Output table for 1975-76 (118 sectors) has been aggregated into fourteen sectors – eight relating to agriculture and six to non-agricultural activities. It is true that in order to focus on the agricultural sector, aggregation of non-agricultural activities is essential. However, the basic principle of sector classification is that the differences in classifications of economic activities should not affect the results in a very significant way. It is in this regard that the Sector Classification Scheme adopted in the study is inadequate at least on three counts:

(i) Since the demand of agriculture for manufacturing inputs, in general, relates to chemicals, it would have been more meaningful to analyse the inter-dependence if "Chemicals Sector" was separated from other manufacturing activities.
(ii) Similarly, separation of water availability from other services would have given more insights.
(iii) Agricultural processing has been included in manufacturing. For purposes of this study, however, it would have been more useful if either the agricultural processing was taken separately or was integrated with Agriculture. It may be noted that it is because of this sector classification that the study has reached the disturbing conclusion that almost all the exports of Pakistan are of manufactured goods.

II. DATA PROBLEMS

Input-Output tables and National Accounts are expected to give similar results. However, if significant differences do exist, they need to be explained, and it need be, should be corrected. Some of the discrepencies/errors are as follows:

(i) The study shows no subsidies to agriculture sector in 1975-76, while they amounted to Rupees 607 million on fertilizer, Rupees 381 million on pesticide and Rupees 24 million on tubewells.
(ii) As against Pakistan's actual exports of Rupees 11.25 billion, the study gives a very low figure of Rupees 8.70 billion. On the other hand, imports of Rupees 41.5 billion taken in the study are more than double the actual imports of Rupees 20.47 billion.
(iii) Indirect taxes minus subsidies given in the study are Rupees 3.75 billion, while National Accounts provide a figure of Rupees 10.63 billion.
(iv) Value-added is stated to be Rupees 141.5 billion on page 5, while in the appendix it is Rupees 116.8 billion.

Results

The study presents rather odd results. For example:

(i) When import leakages are plugged, the multipliers are expected to be higher, but except for large-scale manufacturing and the services sectors, the multipliers reported in the study are smaller when imports are substituted by local inputs.
(ii) In Table A 3, entries of imports requirements, specially relating to services sector, are incorrect. These errors are also carried into Table A 4.
(iii) Results relating to income multipliers seem to be suspect and need to be checked.

Interpretation of the Results

The results have been presented without drawing any implications. The section needs to be strengthened. For example:

(i) Value added to output ratios have been presented for various sectors. This information is innocuous unless these ratios are related to capital and labour used in the sector.

(ii) Income multipliers show the changes in total demand when final demand changes. The response of supply also needs to be analysed.

(iii) Export earnings have been analysed with a view to determine the effect on total demand. The analysis could have been extended to the net foreign exchange earnings if exports of different economic activities had change by one unit.

In sum, the paper is on an interesting theme. If data problems are resolved and sector classification is made more appropriate, it would yield very useful insights, despite the limitation of Input-Output Analysis such as constant returns and zero substitution between inputs.

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