PIDE Working Papers
No. 162

Pakistan Input-Output Table 2010-11

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PAKISTAN INSTITUTE OF DEVELOPMENT ECONOMICS
ISLAMABAD
2019

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Designed, composed, and finished at the Publications Division, PIDE.

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ABSTRACT

This paper develops Pakistan's first Input-Output table (IOT) that follows the 2008 System of National Accounts. An IOT examines the structural changes in an economy. The present paper provides Pakistan's IOT 2010-11 in an industry-by-industry format (42*42). The analysis of backward and forward linkages reveals that manufacturing of food products, beverages, textiles, electricity, gas, steam, air-conditioning and accommodation sectors have strong backward linkages while mining and quarrying, wood products, chemicals and chemical products, electricity, gas, steam, air-conditioning, warehousing and support activities for transportation sectors have strong forward linkages. For national economic growth to be sustainable, the government should facilitate economic activities in these sectors.

JEL Classification: C67, D57, E01, L16, R15

Keywords: System of National Accounts, Supply and Use Tables, Input-Output Table, Backward and Forward Linkages, Pakistan

1. INTRODUCTION

The System of National Accounts (SNA) is a comprehensive accounting framework used for the compilation and reporting of economic statistics of a country for the purposes of economic evaluation and the subsequent policy decisions. It provides a great deal of information about the working of an economy. In addition to various flow accounts and balance sheets, a central feature of the SNA is the Supply and Use Tables (SUTs). The SUTs measure the productive structure of the economy. These tables examine the overall economic activities: the production of goods and services and their subsequent use, along with imports, as intermediate inputs or as final goods for consumption, investment, or exports. Consequently, this system can be used to calculate GDP by income, expenditure, or production approaches and they all must always give the same value. The SUTs can also be used to derive the Input-Output Tables (IOTs).

Many sectors of an economy are highly interdependent. Different industries employ various inputs, and these inputs are purchased from various other industries. Sometimes such inputs are imported from other countries. Other industries sell their products to domestic and foreign producers and consumers. The two types of economic flows are uniformly recorded in an IOT, which specify interdependencies between production and consumption at the national (or regional etc.) level. These are basically symmetric product-by-product or industry-by-industry tables which account for all kinds of transactions between products or industries, respectively.

In an input-output framework, production by a specific industry has two types of economic impacts on other industries in the economy. First, linkage of the industry with its suppliers is important. If the industry *k* increases its output, it will boost the demand of other industries whose products are used as inputs in the production process. This effect is also called backward linkage and demonstrates the track of causation in the demand side. Second, linkage of an industry with its clients is also important. Higher output in *k* industry specifies that additional products of the industry are available in market to be used by

Acknowledgements: We greatly acknowledge Jong-Hwan Ko and Vaqar Ahmed for their valuable guidance to develop this Input-Output table. We are also grateful to Ghulam Samad, Selim Raihan and the participants at the CEECC (PIDE) seminar for their valuable comments and feedback. The usual disclaimer applies. Corresponding author: Muhammad Zeshan, zeshan@pide.org.pk, muh.zeshan@gmail.com

other sectors in their production process. This effects is known as forward linkage, and it indicates the trend of causation in the supply side. The analysis of backward and forward linkages and their strengths for different industries in an economy identify the leading sectors in the country.

Since IOTs are primarily based on SUTs, changes in the SNA require updating the SUTs and IOTs accordingly. Based on the initiative taken by the United Nations Statistical Commission (UNSC) in 1947, the first SNA report was published in 1953. This SNA, consisting of 6 standard accounts and 12 standard tables representing the productive structure of the economy, was applicable to most countries including the developing ones. Nonetheless, two revisions were made in subsequent years to make it more inclusive: the first was made in 1960 to incorporate country experiences while the second, made in 1964, improved consistency with the IMF's manual on balance of payments.[1] The scope of national accounts was substantially extended in the 1968 SNA by incorporating the IOTs, improving the estimates at constant prices, and aligning the SNA with Material Product System (MPA). A major attempt at advancing the national accounting was made in the 1993 SNA where it was harmonised further with international statistical standards. The latest available SNA was released in 2008. This is an updated version of the 1993 SNA and takes into account the structural changes in the economic environment and methodical advancements in research.

After the release of the 2008 SNA, the countries were asked to construct their SUTs, and IOTs accordingly. Like many countries, however, Pakistan was also constrained in constructing these tables due to limited availability of financial and technical resources. The Asian Development Bank (ADB) initiated a capacity building project for Asian countries under the title "regional capacity development technical assistance project (R-CDTA) 8838: Updating and Constructing Supply and Use Tables for Selected Developing Member Economies (ADB 2017)." Pakistan was one of the nineteen countries that consented for participation in this capacity building project. Subsequently, the SUTs were published in 2017 using data from the year 2010-11; hence, these are called SUTs (2010-11). The Pakistan Standard Industrial Classification (PSIC) revision 4 (Pakistan Bureau of Statistics, 2010) was used to describe the industries (or activities) while the Central Product Classification (CPC) version 2 (United Nations, 2015) was used to outline commodities (or goods and services) in these SUTs.[2]

The SUTs are balanced manually or automatically. In manual balancing, a researcher needs to identify the discrepancies in estimates. If the estimated values are based on poor dataset, it can be verified with the help of other sources (such as survey reports). The above mentioned SUTs were balanced manually

[1] https://unstats.un.org/unsd/nationalaccount/hsna.asp

[2] https://data.adb.org/dataset/supply-and-use-tables-pakistan

initially, and the automatic procedures (the RAS[3]) were applied only when the SUTs diverged by 5 percent or less.

After the construction of SUTs (2010-11), the country was supposed to construct the IOTs based on these SUTs so that these tables are in accordance with the new guidelines presented in 2008 SNA. It is important to mention here that several attempts were made to construct IOTs in Pakistan using the then available SNAs. The first comprehensive IOT was developed by Rasul (1965) for the year 1954. Some other studies include Ahmad (1964) for 1959-60, Norbye (1985) for 1960, Rasul (1966), and Pakistan Planning Commission (1965) for 1963-64. The Pakistan Institute of Development Economics (1985) also constructed an IOT for the year 1975-76. Later on, the Pakistan Bureau of Statistics also developed three inter-industry IOTs (for the years 1984-85, 1989-90 and 1990-91) under the adhoc developmental exercises.[4] The fact that the last official IOT was developed in 1990-91 reflects the sorry state of the country reliance on the 1968 SNA even in the presence of the 1993 and then the 2008 SNAs. Hence, the construction of new IOTs is important because, as mentioned earlier, the 2008 SNA has been updated significantly from the 1993 SNA, incorporating the structural changes in the economy. Relaying on IOTs based on the 1968 SNA for analytical purpose could lead to misguided results while comparing economic indicators with countries following the 2008 SNA.

Hence, the construction of new IOTs is of tremendous importance for policy decisions. Unfortunately, these IOTs have not been constructed leaving a gap for empirical work in this area in Pakistan. This paper tries to fill this gap by constructing the IOT for Pakistan for the year 2010-11. Further, it inspects the structure of production in the economy by examining the backward and forward linkages of the input-output framework.

Rest of the study proceeds as follows; Section 2 discusses valuation assessment in detail while Section 3 describes the conversion of Supply and Use Tables into Input-Output Tables. Section 4 talks about the backward and forward linkages, and Section 5 provides the analysis of overall demand and supply in the economy. Section 6 presents the primary input content of final demand, and finally Section 7 concludes the study.

2. VALUATION ASSESSMENT

In the 2008 SNA, basic prices are preferred over producers' prices and purchasers' prices for valuing output in the national accounts. The basic prices is equal to the amount receivable by the producer for a unit of goods (or services) from the purchaser, less taxes payable and adding subsidies received on products. The Producers' prices are the prices of goods and services at factory gate. It

[3]It is believed that the RAS method was developed by Richard Stone (1919–1991) and his colleagues.

[4]No further attempt was made by the institute later.

includes all the taxes and subsidies on different products. Producers' prices is related to the basic prices in the following manner:

Producers' prices = basic prices + plus taxes on products - subsidies on products

Purchasers' prices are the prices payable by purchaser. They include trade margins, taxes and transportation costs. Purchasers' price is also known as the market price. Purchasers' prices can be defined as follow:

Purchasers' prices = producers' prices + non-deductible value-added tax (VAT) or similar tax that is payable by purchaser + trade margins + transportation costs that are paid by purchaser (not included in producers' price)

Although wholesalers and retailers trade in goods, yet such purchased goods do not represent their intermediate consumption. Such goods are resold in the market with minimal processing (grading, cleaning, packaging, etc.). Wholesalers and retailers both are considered as supplying services, and their output is measured in terms of total value of trade margins received by reselling the goods. Reallocation of the trade (and transport) margins from a good's value to the wholesale and retail services is crucial. Therefore, the data on trade margins were calculated and relocated accordingly.

Similar to trade margins are the transport margins, which are related to the delivery chain of products from producer to final user. These margins are the freight transportation services when products are invoiced separately to consumers by the sellers. These margins are actually transport charges paid only by the purchasers after receiving the delivery of the products. Transport margins are also calculated and relocated from the products' value to the freight transport service industry value.

Taxes and subsidies also represent major valuation component while constructing an IOT. Taxes and subsidies may be calculated as ad-valorem (a specific percentage of actual price per unit) tax or in other forms. Net Taxes were calculated and relocated from the products' value to a separate row in the IOT.

The 2008 SNA evaluates the total imports of products at free on board (FOB) prices. In contrast, the same data is available at Cost, Insurance, and Freight (CIF) prices when retrieved from the foreign trade statistics following the International Merchandise Trade Statistics (United Nations, 2011). Hence, imports are adjusted from CIF prices to FOB prices. In addition, total imports were calculated and relocated from the products' value to a separate row.

In case of Pakistan, source data on margins, net taxes, and imports on products' use are not available. We calculated the values of these items as they are important for the above mentioned conversion process. These items were distributed according to the market share of output in Pakistan. The next section discusses the main features of an IOT and the conversion process of SUTs into the IOTs.

3. CONVERSION OF SUPPLY AND USE TABLES INTO INPUT-OUTPUT TABLES

Primarily, an IOT is based on the SUTs. The first step to generate the IOT requires to transform the SUTs from purchasers' prices to basic prices. Margins, taxes, subsidies and imports used in domestic production are adjusted in this process. It is an easy task in case of the Supply Table because these components are normally given in the columns to the right side of the table.

In case of the Use Table, the conversion task is relatively complicated. To form a consistent Use Table, each of its components should be adjusted. Other than the distributors' trade and transport margins, all the elements mentioned above are separately provided in the row form. An industry's total would remain unchanged if the conversion process is accurate. A graphical representation of standard SUTs is provided in Figure 1. The transition from purchasers' prices to the basic prices is provided in Figure 2. Finally, Figure 3 indicates the final outcome of such a transition.

Fig. 1. SUTs at Purchasers' Prices

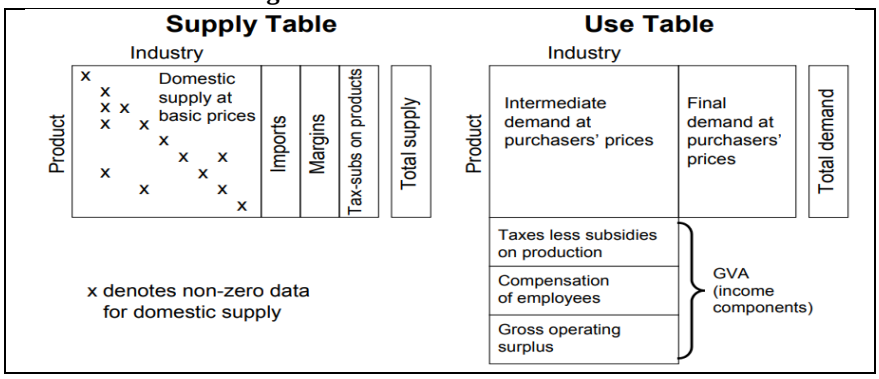


Fig. 2. SUTs Transformation from Purchasers' Prices to Basic Prices

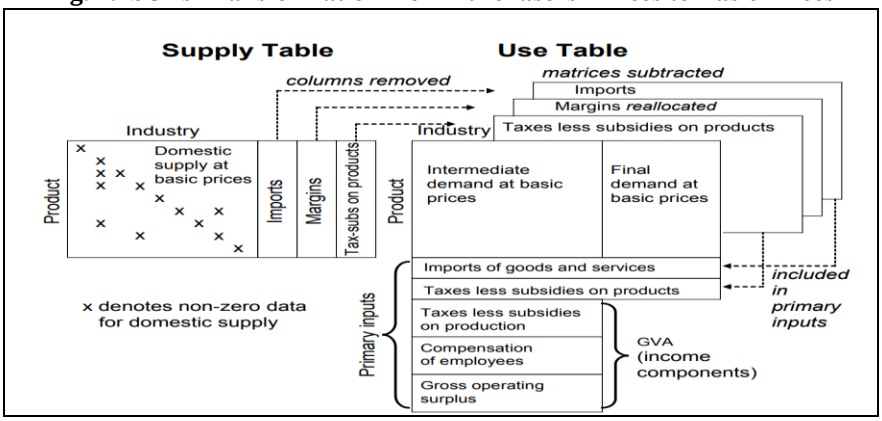
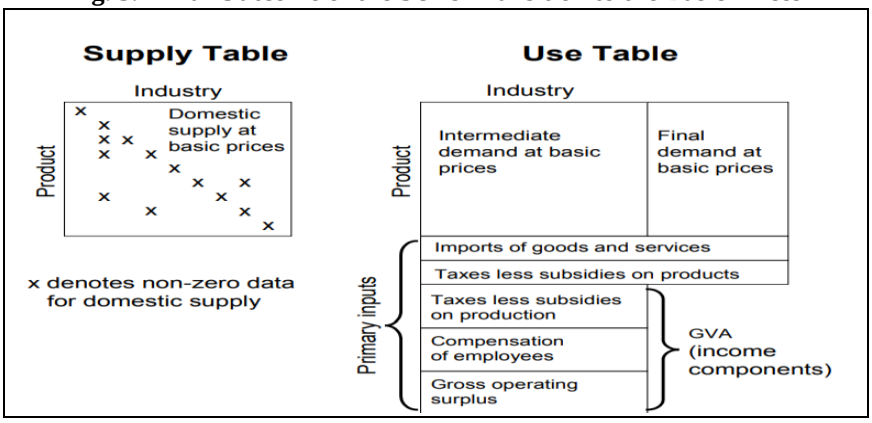


Fig. 3. Final Outcome of the SUTs Transition to the Basic Prices



Main features of an IOT are transparency, comparability, inputs, resources and timeliness, and analytical potential [Raa (2017)]. Transparency means industry-by-industry IOTs are more transparent than the product-by-product IOTs. The former category may use the fixed product sales structure assumption which does not produce any negative value in an IOT. In contrast, the latter category may use the product technology assumption which requires balancing of negative elements arising from this assumption. Hence, the latter results in lesser transparency than the former.

Comparability describes that industry-by-industry IOTs are comparable with national accounts data whereas the product-by-product IOTs are not. However, the latter assures better comparability between products across nations. Product-by-product IOTs specify a clear input structure in an economy whereas the industry-by-industry IOTs provide a mixed group of goods and services.

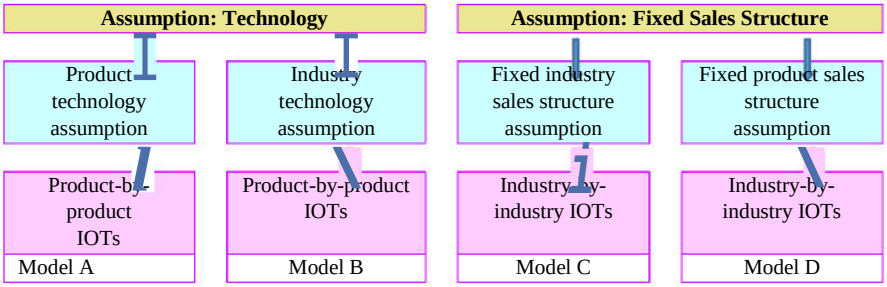
Resources and timeliness means that the IOT based on product technology assumption needs more time and resources as it requires balancing of the negative elements. However, the industry-by-industry IOTs do not need such treatment which saves time and resources. Finally, analytical potential explains that industry-by-industry IOTs are useful to analyse the impact of a policy change (such as tax reforms, monetary and fiscal policies) on industries. On the other hand, the product-by-product IOTs can be used to analyse the homogeneous production units (such as productivity, cost structures, and employment effects).

Transformation of the SUTs into IOTs is based on certain set of assumptions [World Bank (2009)]. The transformation based on product technology assumption and fixed industry sales structure requires square SUTs. In reality, the SUTs form a rectangular order in most of the countries, comprising more products compared to industries. Further, the industry technology assumption does not require square matrices. Applying a direct transformation to the existing dimensions of the SUTs would form a square IOTs resulting in product-by-product dimensions.

The product technology assumption and the fixed product sales structure assumption are mainly used by National Statistical Offices (NSO). However, the remaining set of assumptions are less realistic [World Bank (2009)]. A technology assumption is considered a strong assumption as it depends on production theory. It is hard to underpin production theory just by observing statistical data. On the other hand, the sales structure assumptions are weaker assumptions as they follow the observed sales structures for a particular year.

Hence, the fixed product sale structure assumption serves our purpose in a better way than any other assumption. Therefore, the symmetric IOT provided here forms an industry-by-industry IOT. More precisely, sales structure indicates the proportion of output of a product sold to respective intermediate consumption and final uses. The rows of an industry-by-industry matrix define the spread of an industry's output in the economy, whereas the columns define the structure of inputs used by a particular industry in the production process.

Fig. 4. Transformation of the SUTs into IOTs



Under the fixed product sales structure assumption (Model D), each product comprises a specific sales structure, regardless of the industry associated with its production. These assumptions generate an industry-by-industry transformation matrix, such that:

$$T = Vx^{-1} \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \text{(i)}$$

Where V represents the domestic make matrix and x represents the diagonal matrix of product output. Further, the T converts the domestic use and final demand matrices into an industry-by-industry IOT and final demand matrices, respectively. Hence, the matrix of coefficients can be defined as:

$$\bar{A} = TUx^{-1} \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \text{(ii)}$$

Where U and $\bar{A}$ represent the domestic use matrix and the matrix of inputs required per unit of production, respectively. The latter matrix comprises of two parts where the top section is a square matrix of the domestic intermediate consumption required by different industries, and the bottom portion indicates

the matrix of primary inputs. Following this criteria, the Pakistan IOT 2010-11 is developed and provided in the Annex (Table A2).

4. ANALYSIS OF (DIRECT) BACKWARD AND (DIRECT) FORWARD LINKAGES

From Freytag and Fricke (2017), and Miller and Blair (2009);

$$x = (I - A)^{-1} f \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \text{(iii)}$$

Where:

x is a 1xn order column vector of gross output for each industry;
*f i*s a 1xn column vector for final demand;
*I i*s a nxn identity matrix;
A is a nxn matrix of the direct input coefficients such that:

$$A = [a_{ij}]$$

The Leontief inverse becomes:

$$L = (I - A)^{-1} \quad with\ L = [l_{ij}] \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \text{(iv)}$$

Further,

$$x' = (I - B)^{-1} v' \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \text{(v)}$$

Where:

x' represents the transpose of (nx1) output vector;
v' represents a transposed (nxm) matrix of primary inputs;

The matrix representing allocation coefficients becomes:

$$B = [b_{ij}]$$

The Gosh inverse becomes:

$$G = (I - B)^{-1} \quad with\ [G = g_{ij}] \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \text{(vi)}$$

Where:

	Direct	*Total*
Backward Linkages	$BL_j = \sum_{i=1}^{n} a_{ij}$	$BL_j = \sum_{i=1}^{n} l_{ij}$
Forward Linkages	$FL_i = \sum_{j=1}^{n} b_{ij}$	$FL_i = \sum_{j=1}^{n} g_{ij}$

The analysis of (direct) backward linkages reveals that EGSA (Electricity, Gas, Steam, and Air–Conditioning Supply), ACCO (Accommodations), and MANU (aggregated manufacturing) sectors have the strongest (direct) backward linkages compared to other sectors. Producing a unit of output in the EGSA sector requires most of the inputs from the same sector (0.44 units) while rest of the inputs come from MANU, MINI (Mining and Quarrying), TRAN (aggregated transport sectors), and WSAL (Wholesale and Retail Trade, and Repair of Motor Vehicles and Motorcycles) sectors. On the other hand, a unit increase in the production of MANU sector requires 0.30 units of inputs from AGRI (aggregated agriculture) sector, while the remaining inputs come from MANU, EGSA, WSAL and TRAN sectors. Table 1 provides a detailed snapshot of backward linkages and input shares used in production.

Table 1

Input Shares and (Direct) Backward Linkages (Aggregated Sectors)

Sector/ Sector	AGRI	MINI	MANU	EGSA	CONS	WSAL	TRAN	ACCO	FINA	INFO	PUBL	OSER
AGRI	0.20	0.00	0.30	0.00	0.01	0.00	0.08	0.12	0.00	0.00	0.00	0.00
MINI	0.00	0.00	0.03	0.07	0.03	0.00	0.01	0.01	0.00	0.00	0.00	0.00
MANU	0.02	0.02	0.11	0.08	0.23	0.06	0.15	0.17	0.03	0.06	0.13	0.01
EGSA	0.00	0.01	0.03	0.44	0.01	0.00	0.00	0.11	0.00	0.01	0.04	0.01
CONS	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
WSAL	0.03	0.01	0.09	0.05	0.10	0.02	0.08	0.07	0.01	0.02	0.04	0.00
TRAN	0.00	0.01	0.03	0.07	0.09	0.03	0.05	0.02	0.00	0.00	0.04	0.00
ACCO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00
FINA	0.00	0.01	0.00	0.00	0.02	0.02	0.00	0.02	0.03	0.06	0.02	0.02
INFO	0.00	0.02	0.00	0.00	0.00	0.00	0.01	0.02	0.02	0.04	0.01	0.01
PUBL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01	0.00
OSER	0.00	0.07	0.02	0.00	0.04	0.03	0.03	0.08	0.09	0.23	0.06	0.05
Backward Linkages	0.27	0.16	0.61	0.72	0.56	0.17	0.41	0.62	0.18	0.43	0.35	0.12

Source: Authors' Own Calculations (Based on Table A2 in Annex).

Analysis of forward linkages indicates that MINI, EGSA and AGRI sectors have strong forward linkages. The output of MINI sector is mainly distributed to MANU (0.38 percent) and EGSA (0.33 percent) sectors, whereas the output of AGRI sector is mainly distributed to the MANU (42 percent), and AGRI (20 percent) sectors. A detailed description of the distribution of sectoral output has been provided in Table 2. A disaggregated analysis of top 5 sectors with the strong backward and forward linkages is provided in Figure 5.

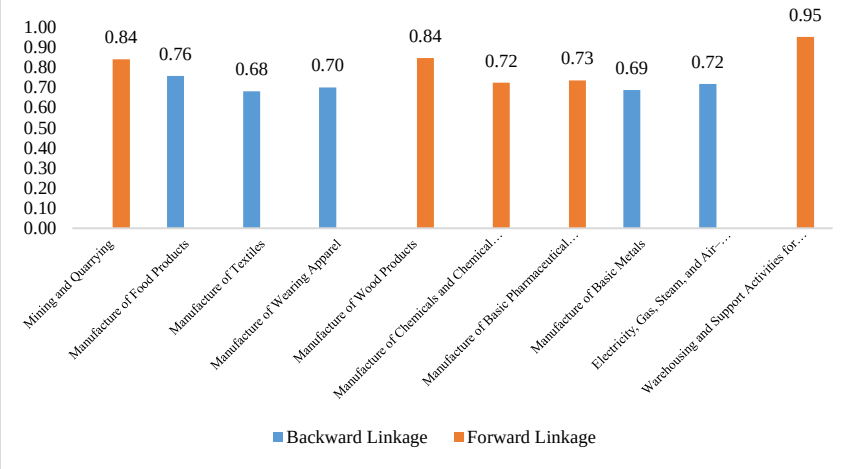
Table 2

Output Shares & (Direct) Forward Linkages (Aggregated Sectors)

Sector/ Sector	AGRI	MINI	MANU	EGSA	CONS	WSAL	TRAN	ACCO	FINA	INFO	PUBL	OSER	Forward Linkages
AGRI	0.20	0.00	0.42	0.00	0.00	0.00	0.04	0.02	0.00	0.00	0.00	0.00	0.68
MINI	0.00	0.00	0.38	0.33	0.05	0.00	0.05	0.01	0.00	0.00	0.01	0.00	0.84
MANU	0.02	0.00	0.11	0.02	0.02	0.03	0.06	0.02	0.00	0.00	0.03	0.00	0.31
EGSA	0.01	0.00	0.11	0.44	0.00	0.00	0.00	0.03	0.00	0.00	0.03	0.01	0.65
CONS	0.00	0.00	0.00	0.00	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.04
WSAL	0.04	0.00	0.18	0.03	0.02	0.02	0.06	0.01	0.00	0.00	0.02	0.00	0.40
TRAN	0.00	0.00	0.07	0.05	0.02	0.04	0.05	0.00	0.00	0.00	0.03	0.00	0.27
ACCO	0.02	0.00	0.01	0.01	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.06
FINA	0.01	0.01	0.06	0.01	0.03	0.13	0.02	0.03	0.03	0.04	0.06	0.09	0.51
INFO	0.01	0.03	0.11	0.00	0.00	0.01	0.09	0.03	0.03	0.04	0.04	0.04	0.44
PUBL	0.00	0.00	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.03
OSER	0.01	0.02	0.08	0.01	0.01	0.06	0.05	0.03	0.03	0.04	0.05	0.05	0.43

Source: Authors' Own Calculations (Based on Table A2 in Annex).

Fig. 5. (Direct) Backward and (Direct) Forward Linkages (Dis-aggregated Sectors)



Source: Authors' Own Calculations.

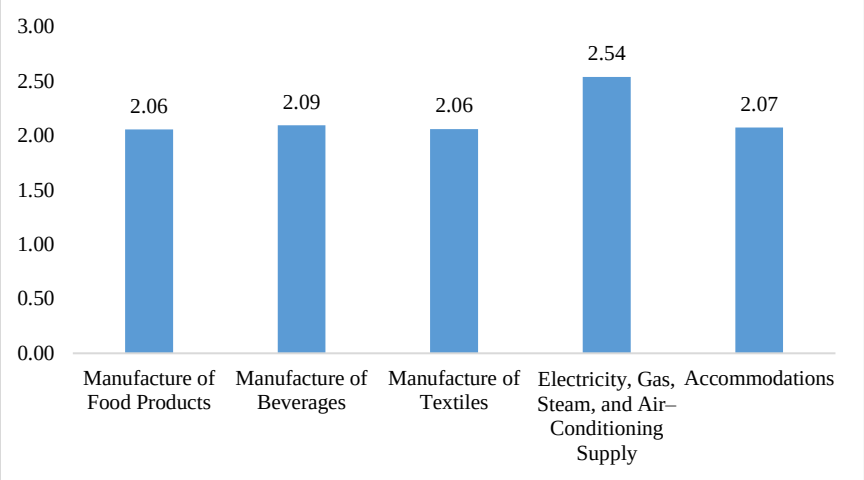
5. ANALYSIS OF TOTAL DEMAND AND SUPPLY

From the Leontief inverse, we can calculate the increase in total demand for a given increase in the final demand of a sector. In the present case, EGSA sector has the maximum output multiplier (2.54), (see Figure 6). Hence, PKR 1 million increase in final demand of EGSA would raise the overall demand in the economy by 2.54 million. Figure 6 represents the top 5 sectors with strong backward linkages.

Further, the Ghosh inverse matrix gives us the overall increase in output supply for a given increase in primary inputs in a sector. A sector with the largest total forward linkage has more significance than others because a unit

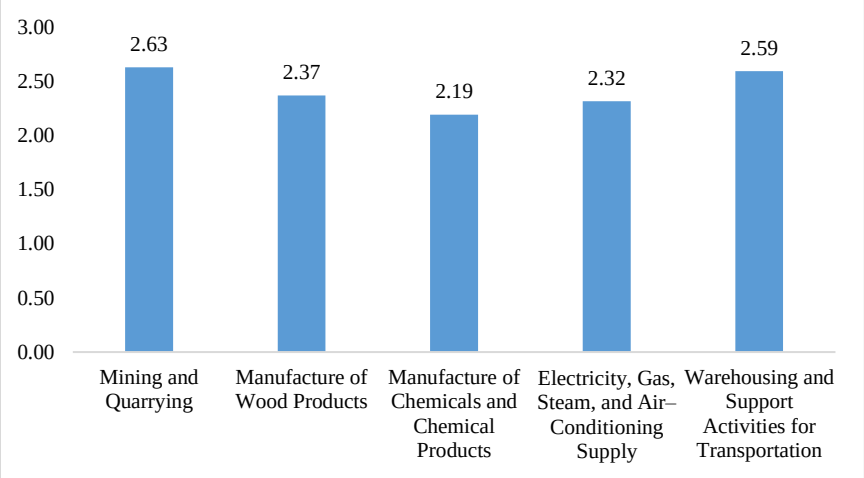
increase in primary inputs in that sector will result in the largest supply-push effects. Figure 7 provides the top 5 sectors with the largest total forward linkages. For instance, if primary inputs in mining and quarrying sector increases by PKR 1 million, the total output supply in Pakistan would increase by PKR 2.63 million. Finally, the overall economic analysis of Pakistan reveals that the (demand) pull effect is stronger than the (supply) push effect in Pakistan (Figure 8) as the number of sectors with stronger total backward linkages are more than the total forward linkages.

Fig. 6. Total Increase in Demand (PKR Million)



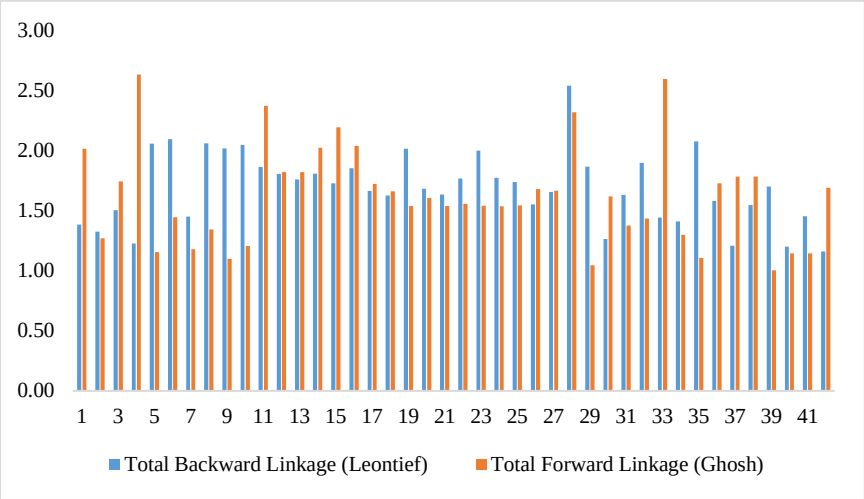
Source: Authors' Own Calculations.

Fig. 7. Total Increase in Supply (PKR Million)



Source: Authors' Own Calculations.

Fig. 8. Pull and Push Effects (All 42 Sectors)



Source: Authors' Own Calculations.

6. PRIMARY INPUT CONTENT OF FINAL DEMAND

The analysis of primary input content of final demand is specified in Equation (vii) below. Compensation of employees, consumption of fixed capital and operating surplus are the main components of primary inputs to the production. In an indirect way, the final demand is fulfilled by these primary inputs. Hence, the total of all these primary inputs equals the total of all the components in final demand.

$$Z = V(I - A)^{-1} f \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \text{(vii)}$$

Where:

V = Matrix of primary input coefficients
I = Unit matrix
A = Matrix of intermediate input coefficients
f = Matrix of final demand
Z = Resulting matrix

Table 3 below indicates the final demand in terms of primary inputs in absolute as well as in percentage terms. Two elements have the highest share among all the primary inputs: operating surplus (net) and compensation of employees. We see that operating surplus has the highest share in all the categories of final demand. Further, its share is the highest in the household final demand. On the other hand, compensation of employees constitute the highest share of 37 percent in government final demand, whereas its share in household final demand is 23 percent.

Table 3

Primary Input Content of Final Demand by Category (PKR Million)

Inputs/Final Demand	Household	Government	Investment	Net Exports
Imports	1,284,604	145,686	214,625	212,118
Net Taxes	218,146	13,102	52,842	47,230
Compensation of Employees	3,237,620	631,330	523,127	562,266
Consumption of Fixed Capital	766,422	65,232	99,657	107,971
Operating Surplus, Net	8,299,469	844,172	1,115,527	1,394,756
Total	13,806,261	1,699,522	2,005,778	2,324,342
	Shares			
Imports	9%	9%	11%	9%
Net Taxes	2%	1%	3%	2%
Compensation of Employees	23%	37%	26%	24%
Consumption of Fixed Capital	6%	4%	5%	5%
Operating Surplus, Net	60%	50%	56%	60%

Source: Authors' Own Calculations.

7. CONCLUDING REMARKS

IOTs state the sale and purchase of goods and services between producers and consumers in an economy. These tables can provide the flows of final consumption and intermediate goods and services in an industry-by-industry or product-by-product format. The present paper provides Pakistan's first IOT (2010-11) that follows 2008 SNA, based on the industry-by-industry approach. It is denominated in million of Pakistani rupees. The fixed product sale structure assumption is used to convert the SUTs into the symmetric IOT table. This treatment allows us a better analysis of statistics compiled by the NSO. The IOT is a very useful tool to analyse the empirical economic issues and to examine the structural changes in an economy overtime as it provides inter-industrial relationships of all the sectors in the economy.

Our results show that manufacturing of food products, beverages, textiles, electricity, gas, steam, air-conditioning and accommodation sectors have strong total backward linkages. On the other hand, mining and quarrying, wood products, chemicals and chemical products, electricity, gas, steam, air-conditioning, warehousing and support activities for transportation sectors have strong total forward linkages. Economic growth in Pakistan would be sustainable if the government facilitates the economic activities in these sectors.

This study makes an important contribution in the sense that it provides insights to policy makers to focus the sectors generating more economic revenues compared to other sectors. The significance of this study also lies in the fact that it can be extended in several ways to provide the basis for other national policies. For instance, extensions for environmental IOT, energy IOT, and national water accounts will provide the basis for environmental, energy, and water policy at the national level. Moreover, it can facilitate the provincial government (empowered under the 18th constitutional amendment) if extended

for regional IOTs. Last but not the least, it can facilitate the CGE modeling as an IOT provide most of the data required to construct a Social Accounting Matrix (SAM).

The IOTs and multiplier analysis is not without limitations, and consequently, the study also suffers from these limitations. One of the main limitation is that this this method presumes unlimited labour supply and the availability of capital stock at fixed prices. Changing demand for factors of production has no impact on their costs. Secondly, there is no budget constraint, and the changes in final demand (household consumption, government consumption, investment, etc.) occur without falling demand elsewhere.

ANNEX

Table A1

Sector Aggregation Scheme, Pakistan IOT 2010-11

S. No.	Sector/Industry/Activity	12*12 Aggregation Scheme
1	Crop and Animal Production, Hunting, and Related Service Activities	1.AGRI
2	Forestry and Logging	1.AGRI
3	Fishing and Aquaculture	1.AGRI
4	Mining and Quarrying	2.MINI
5	Manufacture of Food Products	3.MANU
6	Manufacture of Beverages	3.MANU
7	Manufacture of Tobacco Products	3.MANU
8	Manufacture of Textiles	3.MANU
9	Manufacture of Wearing Apparel	3.MANU
10	Manufacture of Leather, and Related Products	3.MANU
11	Manufacture of Wood Products	3.MANU
12	Manufacture of Paper, and Paper Products	3.MANU
13	Manufacture of Printing	3.MANU
14	Manufacture of Coke, and Refined Petroleum Products	3.MANU
15	Manufacture of Chemicals, and Chemical Products	3.MANU
16	Manufacture of Basic Pharmaceutical Products, and Pharmaceutical Preparations	3.MANU
17	Manufacture of Rubber and Plastics Products	3.MANU
18	Manufacture of Other Nonmetallic Mineral Products	3.MANU
19	Manufacture of Basic Metals	3.MANU
20	Manufacture of Fabricated Metal Products, except Machinery and Equipment	3.MANU
21	Manufacture of Computer, Electronic, and Optical Products	3.MANU
22	Manufacture of Electronics	3.MANU
23	Manufacture of Machinery	3.MANU
24	Manufacture of Motor Vehicles	3.MANU
25	Manufacture of Other Transport Equipment	3.MANU
26	Manufacture of Furniture	3.MANU
27	Other Manufacturing	3.MANU
28	Electricity, Gas, Steam, and Air–Conditioning Supply	4.EGSA
29	Construction of Buildings	5.CONS
30	Wholesale and Retail Trade, and Repair of Motor Vehicles and Motorcycles	6.WSAL
31	Land Transport, and Transport via Pipelines	7.TRAN
32	Air Transport	7.TRAN
33	Warehousing, and Support Activities for Transportation	7.TRAN
34	Postal and Courier Activities	7.TRAN
35	Accommodations	8.ACCO
36	Financial Service Activities, except Insurance and Pension Funding	9.FINA
37	Insurance, Reinsurance, and Pension Funding, except Compulsory Social Security	9.FINA
38	Telecommunications	10.INFO
39	Public Administration and Defense; and Compulsory Social Security	11.PUBL
40	Education	11.PUBL
41	Human Health Activities	11.PUBL
42	Other Personal Service Activities	12.OSER

Source: Authors' Own Aggregation Scheme.

Table A2

Aggregated Input-Output Table, Pakistan, FY2010-11 (Continued)
(million Pakistan rupees)

No.	Sector/Sector	1	2	3	4	5	6	7	8	9	10
1	AGRI	1,311,579	2,619	2,676,423	-	6,389	771	259,392	96,440	-	-
2	MINI	1,208	1,482	226,306	198,752	27,607	351	27,479	5,015	1,180	1,910
3	MANU	148,409	13,603	1,002,578	204,735	217,048	260,154	504,064	140,752	16,792	22,729
4	EGSA	27,280	6,377	303,370	1,179,555	9,538	2,583	3,506	92,320	1,599	4,464
5	CONS	-	-	-	-	19,380	13,782	-	-	-	-
6	WSAL	172,107	4,911	767,865	135,005	94,296	75,100	258,648	54,575	4,008	6,345
7	TRAN	7,637	5,211	244,168	176,240	85,030	121,260	179,059	14,940	346	632
8	ACCO	15,784	29	10,242	6,375	8	668	6,731	4,987	1,154	4
9	FINA	8,695	4,615	38,909	5,272	22,474	88,954	11,828	19,307	19,926	25,384
10	INFO	4,814	11,908	43,154	1,805	398	2,798	33,751	12,309	11,080	17,481
11	PUBL	-	150	10,979	65	-	19,174	1,648	919	3,702	31
12	OSER	26,670	42,488	198,291	12,887	34,413	141,596	119,323	64,514	62,723	88,280
13	Imports	94,354	4,647	770,790	325,719	72,589	108,669	312,612	25,948	8,364	11,213
14	Taxes Less Subsi-dies on Products	389	1,303	212,836	26,887	20,241	38,143	18,282	3,614	1,536	2,477
15	Sub-total	1,818,925	99,342	6,505,909	2,273,297	609,411	874,004	1,736,321	535,640	132,412	180,950
17	Compensation of Employees	1,646,018	11,629	747,146	53,449	153,450	654,944	522,858	65,001	77,153	37,786
18	Other Taxes Less Subsidies on Products	-	-	-	-	-	-	-	-	-	-
20	Consumption of Fixed Capital	211,188	22,510	170,776	41,962	27,896	15,903	172,320	-	22,700	21,357
21	Net Operating Surplus	2,735,519	460,593	1,608,385	311,290	137,105	2,615,919	1,008,573	216,443	436,493	152,019
22	Gross Operating Surplus	2,946,707	483,103	1,779,161	353,252	165,001	2,631,822	1,180,893	216,443	459,193	173,376
23	Gross Value-added	4,592,725	494,732	2,526,307	406,701	318,451	3,286,766	1,703,751	281,444	536,346	211,162
24	Total Input at Basic Prices	6,411,651	594,074	9,032,215	2,679,998	927,862	4,160,770	3,440,072	817,084	668,758	392,112

No.	Sector/Sector	11	12	Total Intermediate Demand	Household Final Consumption Expenditure	General Government Final Consumption Expenditures	Gross Capital Formation	Net Exports Of Goods and Services	Total Final Demand	Total Output at Basic Prices
1	AGRI	170	1,018	4,354,800	1,823,606	-	113,610	119,634	2,056,851	6,411,651
2	MINI	4,611	2,180	498,081	77,375	-	3,122	15,497	95,994	594,074
3	MANU	268,889	27,400	2,827,153	4,218,372	25,154	689,503	1,272,034	6,205,062	9,032,215
4	EGSA	79,064	19,985	1,729,640	948,850	198	1,022	288	950,358	2,679,998
5	CONS	-	-	33,162	-	-	890,820	3,879	894,700	927,862
6	WSAL	81,150	7,812	1,661,822	1,725,541	-	278,253	495,154	2,498,948	4,160,770
7	TRAN	87,635	6,373	928,530	2,361,016	-	1	150,524	2,511,542	3,440,072
8	ACCO	471	3,079	49,533	767,199	-	-	352	767,551	817,084
9	FINA	38,263	57,545	341,173	318,328	-	-	9,256	327,584	668,758
10	INFO	16,483	16,190	172,172	200,772	-	2,897	16,271	219,941	392,112
11	PUBL	21,694	2,939	61,300	223,561	1,598,425	-	128,218	1,950,203	2,011,503
12	OSER	111,888	130,408	1,033,481	1,141,639	75,746	26,550	113,234	1,357,169	2,390,650
13	Imports	106,155	15,973	1,857,033	869,298	77,726	477,718	185,857	1,610,600	3,467,633
14	Taxes Less Subsidies on Products	2,656	2,956	331,320	155,731	2,173	97,852	42,410	298,166	629,487
15	Sub-total	819,128	293,860	15,879,200						
17	Compensation of Employees	619,813	365,096	4,954,343						
18	Other Taxes Less Subsidies on Products	-	-	-						
20	Consumption of Fixed Capital	22,184	310,486	1,039,282						
21	Net Operating Surplus	550,379	1,421,208	11,653,925						
22	Gross Operating Surplus	572,563	1,731,694	12,693,207						
23	Gross Value-added	1,192,376	2,096,790	17,647,550						
24	Total Input at Basic Prices	2,011,503	2,390,650	33,526,749						

Source: Authors' Own Calculations.

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