GSID

Discussion Paper No.145

Production, Social Accounting and Financial Social Accounting Multiplier Analyses with the Financial Social Accounting Matrix of Pakistan

Abdul WAHEED and Mitsuo EZAKI*

September 2006

Graduate School

of

International Development

NAGOYA UNIVERSITY

NAGOYA 464-8601, JAPAN

〒464-8601　名古屋市千種区不老町

名古屋大学大学院国際開発研究科

Discussion Paper No.145

Production, Social Accounting and Financial Social Accounting Multiplier Analyses with the Financial Social Accounting Matrix of Pakistan

Abdul WAHEED and Mitsuo EZAKI*

September 2006

This paper is an outcome of the research work entitled, "Public Debt Burden and Slow Economic Growth: A Case Study of Severely Indebted Low Income Country" (Host Researcher: Prof. Mitsuo Ezaki, Research Fellow: Dr. Abdul Waheed) conducted at the Graduate School of International Development (GSID), Nagoya University under the Japan Society for the Promotion of Science (JSPS) postdoctoral fellowship program for foreign researchers.

* JSPS Research Fellow/Assistant Professor, Department of Economics, University of Karachi, Pakistan (Email: waheedku@yahoo.com) and Professor, Graduate School of International Development, Nagoya University, Japan, respectively.

ABSTRACT

This paper uses the production, social accounting and financial social accounting multiplier models to identify the key sectors and institutions of Pakistan economy that could accelerate the overall economic growth. The production multiplier model indicates that there exist strong macro-linkages among agriculture, manufacturing and electricity, gas and water supply sectors in Pakistan. It is also found that the impact of change in export on output is stronger than the impact of change in domestic demand. The results of the linkage analysis show that the manufacturing sector has strong backward linkages while construction has strong forward linkages in the economy. Thus, any injection in these sectors will have far reaching effects on economic growth in the country. The social accounting multipliers show that the effect of government transfer to the households is more than the effect of government transfer to the non financial firms. The financial social accounting multipliers show a strong impact of increase in government savings on resource availability, while the resource requirement is very high when there is an increase in physical investment by the government. For a sustainable growth in the country, there is a high need for increased physical investment by the non financial firms in the economy.

TABLE OF CONTENTS

LIST OF TABLES

Production, Social Accounting and Financial Social Accounting Multiplier Analyses with the Financial Social Accounting Matrix of Pakistan

1. Introduction

The multiplier model provides a framework, in which the influence of policy changes or any exogenous change can be traced through different sectors and different socioeconomic classes. The impact analysis by using a multiplier model can quantify the magnitude of the impact of different policies, while industry analysis would identify growth in certain sectors as a result of exogenous changes in variables. The financial social accounting matrix constructed for Pakistan in the companion paper (see Waheed and Ezaki 2006), shall be utilized in this paper for multiplier analyses to identify the key sectors and institutions that could accelerate the overall economic growth.

The traditional multiplier models look much more similar to the simple Keynesian model where unemployment is assumed and output is determined by demand. The multiplier model achieves macro equilibrium through induced changes in income and demand. There is no supply side, no price adjustment, no assets, no dynamics or treatment of time. This study tries to extend the traditional multiplier model from simple production multiplier model to social accounting multiplier model and further to financial social accounting multiplier model.

The paper is organized in the following way. Section 2 utilizes the production multiplier model to analyze the input needs, output multipliers and backward and forward linkages among different sectors. Section 3 analyzes the basic social accounting multipliers by extending the traditional production multiplier model to include the household account. It also discusses the extended social accounting multipliers, where institutions are extended to non financial firms. Section 4 analyzes the financial social accounting multipliers by making capital account of all institutions (households, non financial firms, government, central bank, banking system, and rest of the world) and flow of funds accounts as endogenous. Last section summarizes the results and discusses the limitations of the analysis.

2. Production Multiplier Model

From the stand point of national accounting, the matrix of transaction records the sales (revenues) and purchases (costs) of different sectors. Each sector of this matrix consists of an accounting identity, satisfying equilibrium between total supply and total demand. In the social accounting matrix since the activity and commodity accounts are separated (due to multi-commodity producing activities or multiple activities producing same commodity), the macro framework of the production multiplier model can be represented by Table 2.1.

Table 2.1: Simplified Framework of Production Multiplier Model

	Activities	Commodities	Final Demand	Total Output
Activities	0	T_{12}	f_e	x_a
Commodities	T_{21}	0	f_d	x_c
Gross Value Added	T_{31}	T_{32}		
Imports	0	T_{41}		
Total output	x'_a	x'_c		

Source: Authors' construction.

In the above table, x_a is the activity output vector, and x_c is the commodity output vector. T_{12} is the matrix that allocate the activity output to domestic market and f_e is the vector of exports demand. T_{21} is the matrix for intermediate demand and f_d is the domestic final demand vector. T_{31} is the matrix that allocate the gross value added to various factors of production. T_{32} consists of import tariff and T_{41} is the vector of import.

Table 2.1 shows an accounting identity, satisfying equilibrium between total supply and total demand for each sector. To move from the above identity to an economic model, a very simplified theory of production is assumed, according to which the amount of commodity *i* required for the production of activity *j* is assumed to be a constant proportion (a_{ij}) of activity *j*'s output (see Miller and Blair 1985:11). These a_{ij} are called input coefficients or technical coefficients, showing each sector's

production process or 'technology'. Similarly, the amount of commodity *j* domestically supplied by activity *i* is assumed to be a constant proportion (b_{ij}) of commodity *j's* total domestic availability. The relationship can now be written as:

(2.1)
$$\begin{bmatrix} x_a \\ x_c \end{bmatrix} = \begin{bmatrix} 0 & B \\ A & 0 \end{bmatrix} \begin{bmatrix} x_a \\ x_c \end{bmatrix} + \begin{bmatrix} f_e \\ f_d \end{bmatrix}$$

The matrix A and B are sub matrices for activity and commodity accounts' coefficients. The above relationship can be written in compact form as:

(2.2)
$$x = Cx + f$$

where *x* is a vector of total output, *C* is the matrix of coefficients and *f* is the final demand vector. The above equation is suitable to modeling analysis. If the values of the coefficient matrix and final demand are known, then it is possible to solve this set of simultaneous equations system in order to find the level of output of various sectors necessary to satisfy the given level of final demand. Mathematically, the vector of output in the system of equations (2.2) can be solved as follows:

(2.3)
$$x = (I - C)^{-1} f$$

where *I* is an identity matrix. Based on the formula for the inverse of the partitioned matrix, $(I - C)^{-1}$ can be defined as[1]:

$$(I - C)^{-1} = \begin{pmatrix} I & -B \\ -A & I \end{pmatrix}^{-1} = \begin{bmatrix} (I - BA)^{-1} & (I - BA)^{-1} B \\ A(I - BA)^{-1} & I + A(I - BA)^{-1} B \end{bmatrix}$$

This is the case where activities and commodities are differentiated and corresponds to the standard input output multipliers, where imports are assumed to be proportional to the domestic demand. For closure rule, it is clear that only the activity and commodity accounts are endogenous and all final demand accounts, including primary inputs are specified as exogenous.[2] The following sub sections discuss the input coefficients, output multipliers and backward and forward linkages using the production multiplier modeling framework.

[1] See Goldberger (1964), pp.27-28.

[2] Applied to the financial SAM of Pakistan, this would mean that the column of the other accounts would be shifted further to the right. The corresponding receipts of these exogenous accounts in the rows are shifted to the bottom of the matrix.

2.1. Input Coefficients and Output Multipliers

By looking to the input coefficients (Matrix A of Table 2.2) it is clear that agriculture and electricity, gas and water sectors are mostly relying on themselves for intermediate inputs. The reliance of manufacturing sector on electricity, gas and water is very high. A shortage of this input will badly affect the growth in the manufacturing sector. Construction sector is heavily relying on manufacturing sector. It is evident that almost all sectors are heavily relying on manufacturing sector and manufacturing in turns is highly relying on electricity, gas and water sectors. Therefore, as the economy will grow, there would be high need for electricity, gas and water. Development of this sector is very crucial for sustainable development of the country.[3]

Table 2.2: Input and Non-leakage Coefficients for Sectors 1999/2000

	Matrix of Input Coefficients (A)						**Matrix of Non-leakage Coefficients (B)**					
Production Sectors	AGR	MNQ	MAN	EGW	CON	OTS	AGR	MNQ	MAN	EGW	CON	OTS
	1	2	3	4	5	6	7	8	9	10	11	12
AGR: Agriculture	0.227	0.000	0.042	0.000	0.015	0.050	0.959	0.000	0.000	0.000	0.000	0.003
MNQ: Mining & Quarrying	0.000	0.022	0.004	0.339	0.099	0.005	0.000	0.281	0.000	0.000	0.000	0.002
MAN: Manufacturing	0.052	0.162	0.051	0.013	0.452	0.220	0.009	0.001	0.816	0.000	0.007	0.000
EGW: Electricity, Gas & Water	0.012	0.000	0.141	0.315	0.015	0.003	0.000	0.000	0.000	0.585	0.000	0.000
CON: Construction	0.002	0.015	0.001	0.000	0.099	0.036	0.000	0.000	0.000	0.000	0.993	0.000
OTS: Other Sectors	0.076	0.127	0.448	0.034	0.141	0.434	0.000	0.000	0.000	0.415	0.000	0.985
Column Sum	0.369	0.326	0.687	0.701	0.821	0.748	0.968	0.282	0.816	1.000	1.000	0.989

Source: Authors' calculations.

The input coefficients give valuable information about the input structure of a specific sector. However, due to interdependency among sectors, a change in final demand for a specific commodity causes spillover effects in the economy, which changes not only the output of a specific sector concerned but also the output of the other sectors in several rounds. In order to know the total effect

[3] Throughout the paper we will focus on first five sectors, ignoring the discussion on 'other sector'.

(direct and indirect, allowing for the leakages due to import), it is essential to estimate the multipliers, which are reported in Table 2.3.[4]

Table 2.3: Production Multipliers for Sectors 1999/2000

	AGR	MNQ	MAN	EGW	CON	OTS	AGR	MNQ	MAN	EGW	CON	OTS
	1	2	3	4	5	6	7	8	9	10	11	12
Agriculture	1.30	0.04	0.15	0.04	0.11	0.17	1.25	0.01	0.12	0.09	0.11	0.17
Mining & Quarrying	0.00	1.01	0.02	0.12	0.04	0.01	0.00	0.28	0.02	0.08	0.04	0.01
Manufacturing	0.12	0.24	1.30	0.14	0.62	0.46	0.13	0.07	1.06	0.27	0.62	0.46
Electricity, Gas & Water	0.02	0.03	0.14	1.24	0.08	0.05	0.02	0.01	0.11	0.75	0.08	0.05
Construction	0.02	0.03	0.05	0.02	1.14	0.09	0.02	0.01	0.04	0.05	1.14	0.09
Other Sectors	0.30	0.45	1.21	0.52	0.88	2.22	0.30	0.13	0.99	1.22	0.88	2.18

Source: Authors' calculations.

The column 1 to 6 of Table 2.3 shows the effect of a unit change in export and column 7 to 12 shows the effect of a unit change in other component of final demand (household consumption, government expenditure, and investment expenditures).[5] It is clear that a unit change in export of agriculture product will increase the output of agriculture activity by 1.3 units and total output by 1.77 units.[6] On the other hand, if household consumption for agricultural product increases by one unit, the output of agricultural activity increases by 1.25 units and total output increases by 1.73 units.[7]

Table 2.3 reveals that impact of change in exports is more than the impact of change in domestic demand in exporting sectors.[8] Thus, an important implication from the above analysis is that government should focus more on export promotion policies and search new markets for exports. Trade with the South Asian countries is the most suitable option for the government due to similarities in tastes, culture and environment. This will promote economic growth and efficiency in the economy.

[4] Since focus of discussion is sectoral multipliers, therefore, commodity multipliers are not reported in the paper but are available from authors.

[5] The general restriction on the production multipliers matrix is provided by the Hawkins-Simon condition, according to which the diagonal elements of the multipliers matrix should be strictly positive and all its principal minor must be positive (see Hawkins 1948, Hawkins and Simon 1949).

[6] It is the sum of the first column of Table 2.3.

[7] It is the sum of the seventh column of Table 2.3.

[8] This is due to the leakage effect in case of domestic demand, which can be seen in partition matrix $(I\text{-}C)^{-1}$, that is, *fe* is pre-multiplied by $(I\text{-}BA)^{-1}$ but *fd* by $(I\text{-}BA)^{-1}B$, where *B* indicates non-leakage part.

2.2. Backward and Forward Linkages

There has been a great debate in development literature about balanced and unbalanced growth strategies. However, the development experience of the industrialized countries shows that their growth process has been highly unbalanced. The concept of linkages provides the basis for selecting those sectors in which investment must be concentrated, under an unbalanced growth strategy. A sector basically has two types of linkages; backward linkage (showing the relationship between the activity in the sector and its purchases); and forward linkage (showing the relationship between the total output of a sector and the sale of its output as intermediate input to other sectors).[9] By concentrating investment on sectors with high backward and forward linkages (that is the key sectors), will have larger multiplier effect on output and can speed up the industrialization process in the country.

The measurement of linkages in an input output framework has been based on either the Leontief technology matrix or the Leontief inverse matrix. The use of demand led Leontief model for the measurement of backward linkage may be plausible but the same procedure for forward linkage has been criticized in the literature (see Cella 1984). In this paper the backward linkages were estimated using the demand led model, while the forward linkages were estimated by using the supply driven model of Jones (1976). Such supply driven model in current framework can be written as:

(2.4)
$$\begin{bmatrix} x_a' & x_c' \end{bmatrix} = \begin{bmatrix} x_a' & x_c' \end{bmatrix} \begin{bmatrix} 0 & P \\ R & 0 \end{bmatrix} + \begin{bmatrix} v_d' & v_m' \end{bmatrix}$$

where x_a' and x_c' are the transpose of commodity and activity output vector, v_d' and v_m' are the vector of primary input supply in activity and commodity accounts respectively. P and R are the sub matrices of supply coefficients in activity and commodity accounts respectively. In matrix algebra the above equation can be written as:

(2.5)
$$x' = x'H + v'$$

whose solution is as follows:

(2.6)
$$x' = v'(I - H)^{-1}$$

[9] The initial conceptual development may be traced in the work of Rasmussen (1956), Hirschman (1958) and Bharadwaj (1966).

where H is the supply coefficients matrix and the elements of this matrix s_{ij} are defined as: $s_{ij} = \frac{X_{ij}}{X_i}$.

Thus, the element of $(I-C)^{-1}$ shows the increase in the gross output of industry i required to support a unit increase in demand for industry j's output. On the other hand, the element of $(I-H)^{-1}$ represents the increase in the output of the j^{th} industry required to utilize the increased output brought about by a unit of primary input into the i^{th} industry. The key sectors in which investment is to be concentrated are those with high values of backward and forward linkage effects. The next desirable group of sectors in order of priority is that which has strong backward linkages but weak forward linkages. This is due to the fact that backward linkages are more powerful than forward linkages especially in developing countries.

The backward and forward linkages are reported in Table 2.4. The backward linkages due to change in export are denoted by subscript "x" and due to change in domestic demand are denoted by subscript "d". The forward linkages due to change in domestic supply of primary input are denoted by subscript "p" and due to change in foreign supply are denoted by subscript "m".

Table 2.4: Backward and Forward Linkages among Sectors 1999/2000

	Backward Linkages$_x$	Backward Linkages$_d$	Forward Linkages$_p$	Forward Linkages$_m$
Agriculture	1.77	1.73	2.29	2.21
Mining & Quarrying	1.81	0.51	3.17	3.00
Manufacturing	2.87	2.34	2.49	2.22
Electricity, Gas & Water	2.08	2.46	3.07	2.88
Construction	2.87	2.87	3.50	3.41
Other Sectors	3.00	2.96	2.93	2.81

Source: Authors' calculations.

From Table 2.4 it is clear that manufacturing and construction have strong backward linkages, so they are the key sectors in the economy that need special attention by the policy maker in the country. On the other hand, mining and quarrying, construction, and electricity, gas and water sectors have strong forward linkages in the economy. The strong linkages among sectors show that any injection is likely to have far reaching effects on growth in the economy.

In the above analysis of forward and backward linkages, we have a rather small number of activities and commodities accounts, which has set limitations to the level of analysis. This means although we can identify linkages between sectors, there may be specific linkages at a more detailed level of disaggregations that could be of interest.[10]

3. Social Accounting Multiplier Model

Production multipliers capture only the inter-sectoral effects. The social accounting multipliers account not only for the direct and indirect effects but also for the induced effects on factors and household incomes and activity outputs due to income expenditure multipliers. To illustrate the social accounting multiplier model, the SAM accounts need to be partitioned into endogenous and exogenous accounts. The activities, commodities, factors and institutions (household and non-financial firms) accounts are considered as endogenous and all other accounts are considered as exogenous. The simplified framework of social accounting multiplier model is represented in Table 3.1.[11]

Table 3.1: Simplified Framework of Social Accounting Multiplier Model

	Endogenous Accounts				Exogenous Accounts	
	Activities	**Commodities**	**Factors**	**Institutions (HHD, FIRM)**	**Some of Other Accounts**	**Total**
Activities	0	T_{12}	0	0	f_1	y_1
Commodities	T_{21}	0	0	T_{24}	f_2	y_2
Factors	T_{31}	0	0	0	f_3	y_3
Institutions (HHD, FIRM)	0	0	T_{43}	T_{44}	f_4	y_4
Sum of Other Accounts	l_1'	l_2'	l_3'	l_4'	t	y_x
Total	y_1'	y_2'	y_3'	y_4'	y_x'	

Source: Authors' construction.

[10] See Bharadwaj 1966:318.
[11] For a slightly different structure, see Thorbecke and Jung 1996:282-284.

In Table 3.1, T_{31} is the matrix that allocates the value added generated by various production activities to various factors of production; T_{24} reflects the expenditure pattern of various institutions on the commodities; T_{43} represents the distribution of factor income to institutions (household and non-financial firms); T_{44} gives the institutions transfers, the $f^{'s}$ represent the injections and $l^{'s}$ represent the corresponding leakages, *t* represents the income received by the exogenous accounts and $y^{'s}$ are the income of each account.

For analytical purposes the endogenous part of the transaction matrix (Table 3.1) is converted into the corresponding matrix of average expenditure propensities. Thus, in the transaction matrix, each endogenous total income is given as:

(3.1)

$$\begin{bmatrix} y_1 \\ y_2 \\ y_3 \\ y_4 \end{bmatrix} = \begin{bmatrix} 0 & A_{12} & 0 & 0 \\ A_{21} & 0 & 0 & A_{24} \\ A_{31} & 0 & 0 & 0 \\ 0 & 0 & A_{43} & A_{44} \end{bmatrix} \begin{bmatrix} y_1 \\ y_2 \\ y_3 \\ y_4 \end{bmatrix} + \begin{bmatrix} f_1 \\ f_2 \\ f_3 \\ f_4 \end{bmatrix}$$

The sub matrices A's are the expenditure coefficients matrices for endogenous accounts. The above relationship can be written in compact form as:

(3.2) $$y = Sy + f$$

where *y* is the vector of endogenous account, *S* is the matrix of endogenous expenditure propensities, and f is the vector of exogenous accounts. Rewriting equation (3.2) will result:

(3.3) $$y = (I - S)^{-1} f$$

The equation (3.3) shows that exogenous changes (that is, the $f^{'s}$) determine through their interaction within the SAM matrix, the changes in the endogenous accounts (that is, the $y^{'s}$). The multiplier effects therefore not only embrace the familiar inter-industry, but also include further multiplier arising out of the payment of factor incomes to households, and their consequential use of this income for further expenditure on commodities (Hayden and Round 1982:461). Thus, these multipliers incorporate direct, indirect and induced effects. Direct effects are changes in the sector's

output associated with the direct changes in exogenous factors. Indirect effects are sales and income resulting from various rounds of the purchases the sector made to other backward-linked industries. Induced effects are the sales, and income resulting from household's spending either directly or indirectly.

3.1. Basic Social Accounting Multipliers

In the basic social accounting multiplier model, the activities, commodities, factors and households accounts are endogenous and all other accounts are exogenous. It has been customary to consider the government, rest of the world, and capital accounts as exogenous in the multiplier analysis. The justification for taking the government account as exogenous is that policy measures are under the control of the government. In the absence of a sound and robust theoretical explanation of private investment behavior, it is conventional to assume private investment to be exogenous. Finally, since it is assumed that exports and some other transaction depend on overseas factors, the rest of the world account is also taken as exogenous. The basic social accounting multipliers are shown in Table 3.2.

Table 3.2: Basic Social Accounting Multipliers 1999/2000

	AGR	MNQ	MAN	ENG	CON	OTS	AGR	MNQ	MAN	ENG	CON	OTS	HHD
	1	2	3	4	5	6	7	8	9	10	11	12	13
Agriculture	1.94	0.56	0.71	0.47	0.61	0.73	1.86	0.16	0.58	0.58	0.61	0.73	0.81
Mining & Quarrying	0.03	1.04	0.05	0.14	0.07	0.04	0.03	0.29	0.04	0.10	0.07	0.04	0.04
Manufacturing	0.97	0.93	2.06	0.72	1.29	1.22	0.95	0.26	1.68	0.92	1.29	1.20	1.08
Electricity, Gas & Water	0.16	0.13	0.26	1.33	0.18	0.17	0.15	0.04	0.21	0.85	0.18	0.17	0.17
Construction	0.10	0.10	0.12	0.08	1.21	0.16	0.09	0.03	0.10	0.11	1.20	0.16	0.10
Other sectors	2.29	2.07	2.99	1.87	2.45	3.99	2.22	0.58	2.44	2.75	2.45	3.93	2.54
Compensation of Employees	0.34	0.21	0.32	0.21	0.42	0.35	0.33	0.06	0.26	0.27	0.42	0.35	0.27
Gross Operating Surplus	1.75	1.49	1.54	1.22	1.20	1.50	1.69	0.42	1.26	1.33	1.20	1.48	1.24
Households	1.79	1.46	1.61	1.22	1.42	1.60	1.73	0.41	1.31	1.38	1.42	1.58	2.29

Source: Authors' calculations.

The multipliers in the Table 3.2 have been called the 'accounting multipliers' because it is built up from average expenditure propensities, which can be calculated from the social accounting matrix. A more realistic approach would be to use marginal expenditure propensities, which

corresponds to the observed expenditure propensities. The multipliers obtained with this procedure are called 'fixed price multipliers' (see Pyatt and Round 1979:851).[12] The assumption of fixed average propensities may be plausible for most of the accounts of the SAM but may not be for the household account. By assuming unitary expenditure elasticity for household, the accounting multipliers underestimate the impact of an increase in household income on the demand for luxury goods and overestimate the impact on demand for necessities. Despite clear superiority of fixed price multipliers over the accounting multipliers, the latter continue to be used in much applied work due to the data limitations.[13]

A comparison of Table 2.3 and Table 3.2 shows that the basic social accounting multipliers are bigger in magnitude from the production multipliers. The reason is that, social accounting multipliers include the induced effects due to change in household expenditures. It is clear from Table 3.2 that one unit increase in export of manufacturing product will increase output of manufacturing activity by 2.06 units, agriculture by 0.71 units and electricity, gas and water by 0.26 units, with compensation of employees increased by 0.32 units, gross operating surplus increased by 1.54 units and household income increased by 1.61 units. On the other hand, one unit increase in domestic demand of manufacturing product will increase output of manufacturing sector by 1.68 units, agriculture by 0.58 units and electricity, gas and water by 0.21, with increase in compensation of employees by 0.26, gross operating surplus by 1.26 and household income by 1.31 units. Thus, the impact of increase in export is more than increase in domestic demand in all exporting sectors.

3.2. Extended Social Accounting Multipliers

Now the basic social accounting multipliers are further extended to include the non financial firms. Table 3.3 shows the extended social accounting multipliers. As expected, the inclusion of non financial firms in the model increased the magnitude of the multipliers due to increased induced effects.

[12] However, both sets of multipliers are derived in constant prices and are therefore 'fixed price' in a formal sense.

[13] Since η_y =MEP/AEP, where η_y is the income elasticity for household, MEP is the marginal expenditure propensity and AEP is the average expenditure propensity (see Thorbecke and Jung 1996:285). Due to the data limitation it is usually assumed that η_y =1, therefore, MEP=AEP.

Table 3.3 shows that one unit increase in transfer to the households (from government or rest of the world) will increase output of agricultural sector by 0.89 units, manufacturing by 1.19 units and electricity, gas and water by 0.19 units. On the other hand one unit increase in transfer to the non financial firms (from government) will increase output of agricultural commodity by 0.4 units, manufacturing by 0.54 units and aggregated other sectors by 1.27 units.

Table 3.3: Extended Social Accounting Multipliers 1999/2000

	AGR	MNQ	MAN	ENG	CON	OTS	AGR	MNQ	MAN	ENG	CON	OTS	HHD	FIRM
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Agriculture	2.05	0.65	0.81	0.55	0.69	0.83	1.97	0.18	0.66	0.67	0.69	0.82	0.89	0.40
Mining & Quarrying	0.04	1.04	0.05	0.15	0.07	0.04	0.04	0.29	0.04	0.10	0.07	0.05	0.04	0.02
Manufacturing	1.12	1.06	2.20	0.82	1.39	1.35	1.10	0.30	1.79	1.04	1.40	1.33	1.19	0.54
Electricity, Gas & Water	0.18	0.16	0.28	1.35	0.20	0.19	0.18	0.04	0.23	0.87	0.20	0.19	0.19	0.09
Construction	0.11	0.11	0.13	0.09	1.22	0.17	0.11	0.03	0.11	0.12	1.21	0.17	0.11	0.05
Other Sectors	2.64	2.37	3.31	2.12	2.69	4.29	2.56	0.67	2.70	3.02	2.70	4.24	2.79	1.27
Compensation of Employees	0.38	0.24	0.35	0.23	0.45	0.38	0.36	0.07	0.29	0.29	0.45	0.38	0.29	0.13
Gross Operating Surplus	1.92	1.64	1.70	1.34	1.32	1.64	1.86	0.46	1.38	1.47	1.32	1.63	1.36	0.62
Households	2.11	1.73	1.89	1.44	1.64	1.87	2.04	0.49	1.54	1.62	1.64	1.85	2.52	1.14
Non Financial Firms	0.31	0.26	0.27	0.21	0.21	0.26	0.30	0.07	0.22	0.23	0.21	0.26	0.22	1.10

Source: Authors' calculations.

An important conclusion derived from the social accounting multiplier analysis is that government transfer to the household has greater affect on economy compared to the government transfer to the non financial firms. However, it is worth noting that the production and social accounting multiplier models share together the common feature that they are basically demand driven and do not consider the supply side. It is assumed that supply adjusts to demand, that is, there are no capacity restrictions that will obstruct the realization of the potential multiplier effects.

4. Financial Social Accounting Multiplier Model

In the standard real SAM, the 'activity' accounts represent producers and 'commodity' accounts keep track of absorption which equals the value of domestic market and imports. The rest of the SAM maps income flows from valued added to the major institutions which in turn, complete the circular flow by demanding goods in the product market. The aggregated capital account handles

savings and investment (see Robinson 1991, Waheed and Ezaki 2006). The capital account of the real SAM basically represents the 'loanable funds' market, and elaboration of this account is the major focus of financial SAM. In the earlier work (see Waheed and Ezaki 2006) we elaborated this account and flow of funds account in detail and here by utilizing that financial SAM, we present the framework of the financial social accounting multiplier model in Table 4.1.

To perform the financial social accounting multiplier analysis in a meaningful way, the capital account of all institutions and all flow of funds are considered as endogenous and remaining accounts are considered as exogenous. The flow of funds accounts is condensed into five assets (currency, deposits, bonds, loans, and other financial flows); while the capital account of institutions remained the same as in the original financial social accounting matrix.[14] The rows of capital account show the resource available to each institution in the form of savings and financial liabilities. The columns show the use of the available resources by the institutions on different physical and financial assets.

Table 4.1: Simplified Framework of Financial Social Accounting Multiplier Model

		Endogenous Accounts		Exogenous Accounts		
		Capital Account	Flow of Funds Account	Current Account	Some of Other Accounts	Total
Endoge. Accounts	Capital Account	0	T_{12}	S_1	0	Z_1
	Flow of Funds Account	T_{21}	D	0	0	Z_2
Exoge. Accounts	Current Account	0	0	S_3	t_1	Z_3
	Sum of Other Accounts	k'	0	S_4	t_2	Z_4
	Total	Z_1'	Z_2'	Z_3'	Z_4'	

Source: Authors' construction.

In Table 4.1, T_{21} is the matrix for the financial assets and T_{12} is the matrix for the financial liabilities of the institutions; S_1 is the vector of savings and k' is the vector of physical

[14] The macro financial SAM for Pakistan for the year 1999/2000 is reported in appendix-A.

investment by institutions; z_1 is the total resource available and z_1' is the total resource use of the institutions. The rest of the notations are self explanatory. Two types of multiplier analysis shall be carried out in the following subsections, following the framework described in Table 4.1. In the first case the impact of changes in savings on resource availability to each institution and changes in financial assets shall be analyzed. In the second case the impact of changes in physical investment on resource requirement and financial assets shall be analyzed.[15]

4.1. Impact of Savings

For analytical purposes the endogenous part of the transaction matrix (Table 4.1) is converted into the corresponding matrices of average expenditure propensities (that is, *M* and *N*).[16] The equilibrium condition for the endogenous accounts can be stated as:

(4.1)
$$\begin{bmatrix} z_1 \\ z_2 \end{bmatrix} = \begin{bmatrix} 0 & N \\ M & D \end{bmatrix} \begin{bmatrix} z_1 \\ z_2 \end{bmatrix} + \begin{bmatrix} s_1 \\ 0 \end{bmatrix}$$

The above equation can be written in compact form as follows:

(4.2)
$$z = Fz + s$$

where *F* is the matrix of ratios of flow of funds. The solution of equation (4.2) is:

(4.3)
$$z = (I - F)^{-1} s = M_s s$$

where M_s (matrix of the financial social accounting multipliers), captures the impact of exogenous changes in savings on endogenous accounts. By using the macro financial social accounting matrix of Pakistan (reported in appendix A), we derived financial social accounting multipliers that are reported in Table 4.2.

[15] The resources are available to the institutions in the form of savings and other liabilities, while resources are required when there is an increase in the investment by the institutions.
[16] The matrix D is the ratios for statistical discrepancies in the flow of funds account.

Table 4.2: Financial Social Accounting Multipliers (due to changes in savings)

	HHD	FIRM	GOVT	CENB	BANS	ROW
HHD: Households	1.01	0.01	0.01	0.01	0.05	0.05
FIRM: Non Financial Firms	0.12	1.00	0.05	0.17	-0.06	-0.02
GOVT: Government	0.79	0.26	1.34	1.17	0.94	1.57
CENB: Central Bank	0.45	0.04	0.22	1.23	1.16	-0.37
BANS: Banking System	0.18	0.01	0.12	0.16	1.19	-0.25
ROW: Rest of the World	0.01	0.04	0.02	0.00	0.22	1.16
CUC: Currency	0.17	0.00	0.03	0.04	0.29	-0.06
DEP: Deposits	0.44	0.04	0.31	0.31	1.11	-0.67
BON: Bonds	0.36	0.13	0.02	0.84	0.15	1.80
LON: Loans	0.22	0.27	0.14	0.27	1.25	1.44
OFF: Other Flows	0.36	-0.08	0.26	0.28	-0.32	-1.37

Source: Authors' calculations.

It is clear from Table 4.2 that a unit increase in household savings will increase the resources available to household by 1.01 units, to non financial firms by 0.12 units, and to government by 0.79 units. Such an increase in household savings will increase deposit accounts by 0.44 units, bonds by 0.36 units. The impact of increase in government savings is largest in the economy. The results show that a unit increase in government savings will increase resources available to government by 1.34 units, to non financial firms by 0.05 units, to central bank by 0.22 units and to banking system by 0.12 units. The impact of increased government savings on financial variable is mostly on deposits, which increases by 0.31 units. The impact of a unit increase in banking system savings will increase the resources available to the government by 0.94 units, central bank by 1.16 units and banking system itself by 1.19 units. On the financial variables, the significant impact of one unit increase in banking system savings is on deposits and loans. Similarly, one unit increase in foreign savings (that is, one unit increase in current account deficit) will increase the loans by 1.44 units and bonds issuance by 1.8 units.

An important implication derived from the financial social accounting multipliers is that there is a strong impact of increase in government savings on resource availability in the economy. There is great need to focus on the government savings through increase in the efficiency of the government institutions by introducing high skills, efficient management and good governance.

4.2. Impact of Investment

To derive the multipliers that show the impact of changes in investment on resource requirement for different institutions, the equilibrium condition for the endogenous accounts (using Table 4.1) can be written as:

(4.4)
$$\begin{bmatrix} z_1' & z_2' \end{bmatrix} = \begin{bmatrix} z_1' & z_2' \end{bmatrix} \begin{bmatrix} 0 & Q \\ P & D \end{bmatrix} + \begin{bmatrix} k' & 0 \end{bmatrix}$$

where *P* and *Q* are the sub matrices for the flow of funds ratios.[17] The above equation can be written in compact form as follows:

(4.5)
$$z' = z'U + k'$$

where *U* is the matrix of the flow of funds ratios. Rewriting equation (4.5) will result:

(4.6)
$$z' = k'(I - U)^{-1} = k'M_k$$

where M_k (the matrix of the financial social accounting multipliers) captures the impact of exogenous changes in physical investment on endogenous accounts. By using the macro financial SAM of Pakistan, the financial multipliers due to unit change in investment are derived and reported in Table 4.3.

Table 4.3: Financial Social Accounting Multipliers (due to changes in investment)

	HHD	FIRM	GOVT	CENB	BANS	ROW	CUC	DEP	BON	LON	OFF
Households	1.01	0.00	0.01	0.01	0.01	0.00	0.00	0.01	0.00	0.02	0.01
Non Financial Firms	0.54	1.00	0.24	0.41	-0.06	-0.01	0.14	0.28	0.38	0.02	0.29
Government	0.71	0.05	1.34	0.56	0.18	0.08	0.19	0.52	0.46	0.41	0.33
Central Bank	0.85	0.02	0.47	1.23	0.48	-0.04	0.42	1.05	0.23	0.13	0.23
Banking System	0.81	0.01	0.58	0.39	1.19	-0.07	0.13	0.70	0.33	0.20	0.69
Rest of the World	0.24	0.15	0.40	-0.04	0.83	1.16	-0.01	0.40	-0.26	1.31	0.58

Source: Authors' calculations.

Table 4.3 shows that one unit increase of government investment in physical assets will increase the resources requirement of government by 1.34 units. Within 1.34 units, one unit is the direct resource requirement and 0.34 is the indirect resource requirement. This will also increase the resource requirement of households by 0.71, non financial firms by 0.05, central bank by 0.56, banking

[17] The elements of these matrices are derived by dividing each cell of endogenous accounts by its row total.

system by 0.18, and rest of the world by 0.08. This will results an equal corresponding increase in currency by 0.19 units, deposits by 0.52 units, bonds by 0.46 units, loans by 0.41 units and other aggregated flows by 0.33 units.

On the other hand, one unit increase in physical investment by the non financial firms will cause the same one unit increase in the resource requirement. This will increase the resource requirement of households by 0.54 units, government by 0.24 units, central bank by 0.41 units, while the resource requirement of banking system decreases by 0.06 units, and rest of the world by 0.01 units. This also results an equal corresponding increase in currency by 0.14 units, deposits by 0.28 units, bonds by 0.38 units, loans by 0.02 units and other aggregate financial flows by 0.29 units.

The above analysis shows that while resource requirement is very high when there is a unit increase in physical investment by the government, the resource requirement is one to one in case of physical investment by the non financial firms. Thus, there is a high need to facilitate for the greater physical investment by the non financial firms to boost industrial development and economic growth in the country.

5. Summary and Conclusion

This paper has studied the structure of Pakistan economy with the objective to identify the key sectors which could accelerate the overall economic growth. For this purpose, production, social accounting, and financial social accounting multiplier models were derived using the financial social accounting matrix of Pakistan for the year 1999/2000.

The results of the multiplier based models indicate that there exist strong macro-linkages among agriculture, manufacturing and electricity, gas and water sectors in Pakistan. It is also found that the impact of change in export on output is stronger than impact of change in domestic demand. The results also show that the manufacturing sector has strong backward linkages while construction has strong forward linkages in the economy. Thus, any injection in these sectors will have far reaching effects on growth in the country. The social accounting multiplier analysis shows that the effect of government transfer to the households is more than the government transfer to the non financial firms.

The financial social accounting multipliers show a strong impact of increase in government savings on resource availability, while the resource requirement is very high when there is a unit increase in physical investment by the government.

There are certain limitations of the multiplier analysis carried out in this paper. It is assumed that there exists excess capacity in the economy, which means supply constraint and consequent changes in prices are ignored. This may have following problems. First, if there are capacity constraints, the multipliers will over estimate the total effects and the final distribution effects will be uncertain. Second, since prices are assumed to be fixed, there is no room for substitution effects. Third, when prices are not fixed, they may be expected to change to offset demand-supply changes in the economy. Fourth, with different closure rules possible, naturally there is a limit to the endogenous responses that are captured in the multiplier model. Since, the exogenous account may be affected by the initial shock, so the multiplier effects are either under or over estimated.

Although, these assumptions upon which the multiplier model is based may be restrictive in some analyses, they are not problematic for our analysis. First, we have been dealing with the case of a developing economy that has sufficient excess capacity in terms of labor and land. Second, since we are considering the short run, so prices are unlikely to change due to small demand shocks, in the presence of excess capacity. However, to overcome some of the above difficulties, the possible next step would be to utilize the current financial SAM for Pakistan to construct a financial CGE model for the economy that will at least overcome the most obvious weaknesses of the multiplier analysis.

References

Bharadwaj, K. R. 1966. A Note on Structural Interdependence and the Concept of Key Sector. *Kyklos*. 19(2):315-319.

Bouwer, G. 2002. The Role of Supply and Use Tables in South Africa: A Tool for Economic Analysis. *The Fourteenth International Conference on Input Output Techniques*. Montreal: Canada.

Cella, G.1984. The Input-Output Measurement of Interindustry Linkages. *Oxford Bulletin of Economics and Statistics*. 46 (1): 73-84.

Cohen, S. I. 1989. Analysis of Social Accounting Multipliers over Time: The Case of the Netherlands. *Socio-Economic Planning Sciences*. 23 (5): 291-302.

Cohen, S. I. 1996. Urban Growth and Circular Flow in a SAM framework: The Case of the Netherlands. *Socio-Economic Planning Sciences*. 30 (1): 1-14.

Dhawan, S. and K. K. Saxena. 1992. Sectoral Linkages and Key Sectors of the Indian Economy. *Indian Economic Review*. 27(2): 195-210.

Goldberger, A. S. eds. 1964. *Econometric Theory*. New York: John Wiley & Sons, Inc.

Hayden, C. and J. I. Round. 1982. Developments in Social Accounting Methods as Applied to the Analysis of Income Distribution and Employment Issues. *World Development*. 10 (6): 451-465.

Hawkins, D. 1948. Some Conditions of Macroeconomic Stability. *Econometrica*. 16(4): 309-322.

Hawkins, D. and H. A. Simon. 1949. Note: Some Conditions of Macroeconomic Stability. *Econometrica.* 17(3/4): 245-248.

Hirschman, A. O. eds. 1958. *The Strategy of Economic Development.* New Haven: Yale University Press.

Jones, L. P. 1976. The Measurement of Hirschmanian Linkages. *Quarterly Journal of Economics*. 90 (2): 323-333.

Khan, H. A. 1999. Sectoral Growth and Poverty Alleviation: A Multiplier Decomposition Technique Applied to South Africa. *World Development*. 23 (3): 521-530.

Miller, R. E. and P. D. Blair, eds. 1985. Input-Output Analysis: Foundations and Extensions. N.J.: Prentice Hall.

Pyatt, G. and J.I. Round. 1979. Accounting and Fixed Price Multipliers in a Social Accounting Matrix Framework. *Economic Journal*. 89 (356): 850-873.

Rasmussen, P.N. (eds). 1956. *Studies in Intersectoral Relations*. Amsterdam: North Holland Publishing Company.

Robinson S. 1989. Multisectoral Models. In *Hadnbook of Development Economics*, H.B. Chenery, and T.N. Srinivasan (eds.) Tokyo: Elsevier: 885-947.

Robinson, S. 1991. Macroeconomics, Financial Variables, and Computable General Equilibrium Models. *World Development*. 19 (11): 1509-1525.

Thorbecke, E. and H.-S. Jung. 1996. A Multiplier Decomposition Method to Analyze Poverty Alleviation. *Journal of Development Economics*. 48 (2): 279-300.

Thorbecke, E. 2001. Poverty Analysis and Measurement within a General Equilibrium Framework. Paper presented at the Asia and Pacific Forum on Poverty: Reforming Policies and Institutions for Poverty Reduction. Manila: Asian Developemnt Bank, 2-9 February.

Waheed, A. and M. Ezaki. 2006. A Financial Social Accounting Matrix for Pakistan. *Discussion Paper No.141*. Graduate School of International Development, Nagoya University, Japan.

Appendix-A: Macro Finanical Social Accounting Matrix for Pakistan 1999/2000

		Activities						Comodities						Factors	
		AGR	MNQ	MAN	ENG	CON	OTS	AGR	MNQ	MAN	ENG	CON	OTS	Labour	Capital
		1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	AGR: Agriculture							1245972	0	0	0	0	13140		
2	MNQ: Mining & Quarrying							0	67793	0	0	0	8300		
3	MAN: Manufacturing							11731	203	1869989	92	1696	2450		
4	EGW: Electricity, Gas & Water							0	0	0	356542	0	0		
5	CON: Construction							0	0	0	0	256192	0		
6	OTS: Other Sectors							0	0	0	253198	0	4945905		
7	AGR: Agriculture	289751	0	99233	0	3820	261492								
8	MNQ: Mining & Quarrying	8	1796	9609	120779	25335	25064								
9	MAN: Manufacturing	66667	12950	120139	4535	115742	1144528								
10	ENG: Electricity & Gas	14852	0	333207	112366	3825	13514								
11	CON: Construction	3123	1178	1649	0	25267	185383								
12	OTS: Other Sectors	97035	10192	1055606	12193	36028	2255130								
13	L: Labour	105693	0	85432	7340	39203	285408								
14	K: Capital	670952	42486	591192	98891	3509	962246								
15	HHD: Households													523076	1972476
16	FIRM: Non Financial Firms														379449
17	GOVT: Government	30997	11560	61713	439	3463	66339	1301	2726	52548	0	0	23729		
18	CENB: Central Bank														8472
19	BANS: Banking System														8879
20	ROW: Rest of the World							40023	170562	368819	0	56	29469		
21	HHD: Households														
22	FIRM: Non Financial Firms														
23	GOVT: Government														
24	CENB: Central Bank														
25	BANS: Banking System														
26	ROW: Rest of the World														
27	CUC: Currency														
28	DEP: Deposits														
29	BON: Bonds														
30	LON: Loans														
31	OFF: Other Flows														
32	Total	1279078	80163	2357780	356542	256192	5199103	1299027	241284	2291356	609832	257944	5022993	523076	2369276

Source: Condensed form of the Financial SAM of Pakistan constructed by Waheed and Ezaki (2006).

Appendix-A(continued): Macro Finanical Social Accounting Matrix for Pakistan 1999/2000

		Current Account of Institutions						Capital Account of Institutions						Flow of Funds					
		HHD	FIRM	GOVT	CENB	BANS	ROW	HHD	FIRM	GOVT	CENB	BANS	ROW	CUC	DEP	BON	LON	OFF	Total
		15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
1	AGR: Agriculture						19966												1279078
2	MNQ: Mining & Quarrying						4070												80163
3	MAN: Manufacturing						471619												2357780
4	EGW: Electricity, Gas & Water						0												356542
5	CON: Construction						0												256192
6	OTS: Other Sectors																		5199103
7	AGR: Agriculture	584651		0				13898	7991	34883	-11	3319							1299027
8	MNQ: Mining & Quarrying	44589		0				3263	1876	8189	-3	779							241284
9	MAN: Manufacturing	736950		0				20783	11950	52165	-16	4963							2291356
10	ENG: Electricity & Gas	83478		0				11240	6463	28212	-9	2684							609832
11	CON: Construction	0		0				9564	5499	24005	-7	2284							257944
12	OTS: Other Sectors	955170		351624				57834	33253	145161	-45	13811							5022993
13	L: Labour																		523076
14	K: Capital																		2369276
15	HHD: Households		173110	436			128893												2797991
16	FIRM: Non Financial Firms			2295															381744
17	GOVT: Government	13705	98848				47940												415308
18	CENB: Central Bank																		8472
19	BANS: Banking System																		8879
20	ROW: Rest of the World		74430																683359
21	HHD: Households	379449															4898	0	384347
22	FIRM: Non Financial Firms		35356													24916	-2781	25026	82517
23	GOVT: Government			60953											18858	148551	96697	100002	425061
24	CENB: Central Bank				8472									68433	142206			-17489	201622
25	BANS: Banking System					8879									29225	6588	8644	30660	83996
26	ROW: Rest of the World						10871								2295	-10051	22262	-2585	22792
27	CUC: Currency							48475	36	-578		20500							68433
28	DEP: Deposits							59297	1192	66965	-8327	81066	-12780					5171	192584
29	BON: Bonds							97617	2083	1283	181334	-90781	26808					-48340	170004
30	LON: Loans							1847	16750	-1962	23061	57376	32648						129720
31	OFF: Other Flows							60529	-4576	66737	5645	-12006	-23884					43169	135614
32	Total	2797991	381744	415308	8472	8879	683359	384347	82517	425061	201622	83996	22792	68433	192584	170004	129720	135614	

Source: Condensed form of the Financial SAM of Pakistan constructed by Waheed and Ezaki (2006).