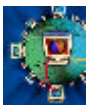


CHAPTER 3

Impact Analysis through SAM Multipliers and Computer Penetration

3.1 What is SAM?

A Social Accounting Matrix (SAM) can be defined as an organized matrix representation of all transactions and transfers between different production activities, factors of production and institutions (like households, firms and government) within the economy and with respect to the rest of the world. SAM is, thus, a comprehensive accounting framework within which the full circular flow of income from production to factor incomes, household income to household consumption and back to production is captured. In a SAM all the transactions in the economy are presented in the form of a matrix. Each row gives receipts of an account while the column gives the expenditure. The total of each row is equal to the total of each corresponding column. An entry in, say, row i and column j represents the receipts of account from account.

A SAM can be regarded as an extension of an Input-Output (I-O) table. SAM gives a picture of income distribution at a disaggregated level by juxtaposing social accounts with the I-O table. This then helps to trace the differential impact of economic activities in a particular sector on different income groups, which is of vital interest to the policy maker for formulating poverty alleviation policies. SAM facilitates the impact analysis by providing the household income multipliers which when multiplied by the value of output stimulus provided by any sector gives the additional income received by corresponding household groups.

Total Income multipliers give direct as well as indirect increase in GDP due to a unit increase in the value of output of a final demand vector. Household income multiplier gives the corresponding effect on the incomes of the household due to a unit increase in the value of output of a final demand vector.

3.2 SAM Multipliers

Production of IT generates the direct requirement in the IT sector as well as the indirect requirement in other consuming sectors. These direct and indirect requirements along with their total impact on the economy are obtained by using the Social Accounting Matrix (SAM). The SAM framework allows us to study these impacts at a disaggregated level — by sectors and by socio-economic groups in the country. The two outcomes we are interested in are GDP and employment. While aggregate economic activity (or GDP) is of obvious interest, employment is one of the most crucial aspects of growth for India today.

With a large army of youth entering the labour force over the next few years, expansion in economic activity that does not generate corresponding growth in labour demand will be hard to sustain. Hence, we use the SAM to address these two issues. The output multipliers in the IT sectors give us the impact on aggregate output while the employment multipliers give us the aggregate labour demand requirements of the increased production.

The multipliers measure the response of the economy to a change in demand of a sector. A shock in, say, sector, *A*, like an exogenous increase in output, impacts the

aggregate economic activity through sector A's growth, but also due to the indirect growth induced by those that are connected to sector *A*. In general, we define direct effects as the immediate effects associated with a change in the final demand for a particular industry; the indirect, or secondary, effects are due to the backward linkages of sector. As mentioned above, the output multipliers capture both these direct and indirect effects.

We define the output multiplier of a sector as the amount by which the total output increases for a unit increase in the output of that sector. It is customary to measure the unit change in INR lakhs (00,000). Thus, if the output multiplier for a sector is 4, it implies that for every INR 1 lakh (100,000) increase in the sectoral output, total output (of the entire economy) increases by INR 4 lakhs (400,000). Similarly, the employment multiplier of a sector gives an estimate of the aggregate direct and indirect employment changes, in person years, resulting from the increase in INR 100,000 of output of that sector. Total Income multipliers give direct as well as indirect increase in GDP due to a unit increase in the value of output of a final demand vector. Household income multiplier gives the corresponding effect on the incomes of the household due to a unit increase in the value of output of a final demand vector.

Let column vector denote the set of accounts. In an input-output table, the set of accounts is the set of all output sectors. The SAM set of accounts includes more than the sectoral outputs; in particular, it includes the individual group accounts like factors of production (labour and capital) and socio-economic groups (like the households in top quintile of the rural population). The social accounting matrix is a matrix that gives the circular flow of accounts. Thus a column in this matrix gives the distribution of the total value of a sector across the various accounts. In general, for the household account, the column is the expenditure by households on each account; the row is the income earned by the household from each account (or, sector). We define *A* as the coefficient matrix where each column is divided by the total account of that sector. We can, therefore, write

(1) $Y = AY + X$

where X is the set of exogenous accounts. In our case, X is the export demand vector. Assuming that A is non-singular, we can rewrite equation (1) as

(2) $Y = (I - A)^{-1} X \equiv MX$

where M is called the SAM multiplier matrix. Each M_{ij} entry in cell ij is the total impact on account i due to a change from an exogenous injection in account j.

In this chapter we evaluate the impact on labour, capital and households differentiated by their expenditure. Table 3.1 gives definitions of different categories of the households.

Direct and indirect output generated in economy for production (Rs 26850 crore) in IT sector for 1999-00 was Rs 88512 crore and value added was Rs 40477 crore which formed 2.2 per cent of the GDP and 5.6 per cent in 2004-05 (Table 3.2). Let us assume a 30 per cent increase in production of the IT sector over 2004-05. The direct and indirect output generated in the economy is Rs 457091 crore, an increase of Rs 105482 crore over 2004-05 and Value added would be to the tune of Rs 209029 an increase in Rs 48237 crore over 2004-05 and the household income is Rs 168080 crore leading to an increase of Rs 38788 crore.

While the major effect of this increase is on the affluent rural and urban classes, the poor households also get positively affected by the increase in IT sector production. The household income multipliers for the IT sector are given in Table 3.3. The sector wise effect of this increase is maximum on the IT sector itself leading to an increase in output of Rs 36904 crore followed by Trade, Other transport services, Banking and food products. Total employment generated in all the sectors is 34.2 million person years as compared to 26.3 million person years in 2004-05, which implies that additional employment generated by increase in production within this sector would be in tune of 7.9 million person years.

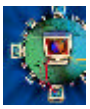


Table 3.1: Expenditure classes into which PFCE is divided

Rural	Expenditure class (Rs per month)	Urban	Expenditure class (Rs per month)
RH1	000-255	UH1	000-350
RH2	255-340	UH2	350-500
RH3	340-525	UH3	500-915
RH4	525-775	UH4	915-1500
RH5	775- above	UH5	1500- above

Table 3.2: Impact of IT on Labour, Capital and different categories of households

	Values at 1999-00 production	Values at 2004-05 production	Values at 30 % increase in production
	Rs crore	Rs crore	Rs crore
Value of production	26850	106660	138658
Labour	20574	81730	106248
Capital	19903	79062	102780
RH1	384	1382	1796
RH2	1295	5146	6690
RH3	3989	15845	20598
RH4	4787	19014	24719
RH5	6733	26747	34771
UH1	221	877	1140
UH2	913	3627	4715
UH3	3720	14779	19213
UH4	4392	17446	22680
UH5	6150	24429	31758

Table 3.3: Household Income Multipliers

	IT sector
Labour	0.77
Capital	0.74
RH1	0.01
RH2	0.05
RH3	0.15
RH4	0.18
RH5	0.25
UH1	0.01
UH2	0.03
UH3	0.14
UH4	0.16
UH5	0.23

We can interpret the Table 3.3 in the following manner: if there is an increase in the value of production by Rs 1 lakh then total income impact on the households would be in tune of Rs 1.51 lakh (consisting of Rs 0.77 lakh of labour income and Rs 0.74 lakh of capital income). As mentioned earlier the major effect of this expansion of household income would be on affluent household groups in the rural and urban areas. For instance, income of the most affluent rural household group, RH5, will increase by Rs 0.25 lakh and that of most affluent urban household group, UH5, will increase by Rs 0.23 lakh. However, they are not the sole beneficiaries. Other household groups will also witness an increase in their income. For instance, even the poorest of the household groups in both rural and urban areas, RH1and UH1 respectively, will see their income increasing by Rs 0.01 lakh individually.

3.3 Computer penetration within the State – Firm level analysis

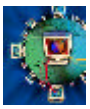
3.3.1 Percentage of units using computers

According to Annual Survey of Industries (ASI) data, there were 1,29,076 manufacturing units all over India in 2003-04. In a survey conducted by ASI, manufacturing units were asked whether they have any computer facilities or not. For All India, 59.62 per cent of the units were reported to have computer facility.

Table 3.4: Computer facilities within Manufacturing Units

	No. of Units	% of units with computer
Andaman & N. Island	21	23.81
Andhra Pradesh	14802	38.03
Assam	1570	49.55
Bihar	1460	14.79
Chandigarh(U.T.)	263	75.67
Chattisgarh	1295	55.14
Dadra & Nagar Haveli	960	70.31
Daman & Diu	1386	75.04
Delhi	3197	69.41
Goa	549	79.96
Gujarat	12795	73.22
Haryana	4265	67.83
Himachal Pradesh	530	66.60
Jammu & Kashmir	342	41.23
Jharkhand	1448	36.33
Karnataka	7068	68.42
Kerala	5491	39.76
Madhya Pradesh	2982	63.21
Maharashtra	17474	75.53
Manipur	45	8.89
Meghalaya	47	48.94
Nagaland	121	3.31
Orissa	1678	47.62
Puducherry	610	63.93
Punjab	6853	54.41
Rajasthan	5452	62.69
Tamil Nadu	20246	60.18
Tripura	269	7.81
Uttar Pradesh	9237	58.54
Uttarakhand	679	47.57
West Bengal	5942	56.55
All India	129076	59.62

Source: Annual Survey of Industries



However, there were a lot of variation across states (Table 3.4). While 80 per cent of the units in Goa had computers, only about 3 per cent of the units in Nagaland were reported to use computer. The western region of the country was the leader with Goa, Maharashtra, Gujarat, Daman & Diu and Dadra & Nagar Haveli all reportedly having more than 70 per cent of units with computer facility. Rajasthan and Madhya Pradesh had marginally better figures than the all India average - higher than expected performers. Andhra Pradesh was a surprise as only 38 per cent of the units surveyed reported using a computer. States at the bottom of the ladder were Bihar, Manipur, Tripura and Nagaland.

3.3.2 Total stock of computers as proportion of total capital stock

ASI data on total stock of computers and total capital stock is available for manufacturing units at the two-digit level of classification as per the National Industrial Classification (NIC) 1998. Closing stock of computers as a proportion of closing stock of capital is taken as another indicator of computer penetration within the manufacturing industry of a state. Delhi emerged as the state with most computer intensive manufacturing units. It topped the list in 6 of the 23 manufacturing industries. In addition, it was also second in the list in 4 and third in another 2 of the manufacturing industries. Among other states and union territories, Haryana, Chandigarh, Dadra & Nagar Haveli and Daman & Diu were found to be having relatively higher computer penetration within the manufacturing units (Table 3.5). These states also had high penetration by the earlier indicator.

Table 3.5: Stock of Computer Relative to Total Capital Stock

States & UTs	Manufacturing industries in which the States & UTs are leaders - two digit level division code (NIC-1998)*
Delhi	16, 17, 21, 24, 26
Haryana	25, 29
Chandigarh	31, 36
Dadra & Nagar Haveli	15, 20
Daman & Diu	18, 27
Madhya Pradesh	19
Andhra Pradesh	22
Goa	23
Jammu & Kashmir	28
Puducherry	30
Uttarakhand	32
Uttar Pradesh	33
Assam	34
Tamil Nadu	35

Note: * For NIC 2-digit level code, see Table A.3 in annexure.

e-Readiness Index of the States/UTs