Report on
The Impact of the Inter-Regional Reallocation of Central Transfers in India: A CGE based Analysis

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Chapter-I

The impact of the inter-regional reallocation of central transfers in India: A CGE based analysis

Basanta K Pradhan and Joydeep Ghosh

Introduction

The main functions of government, according to Musgrave (1959), are macroeconomic stabilization, income redistribution and resource allocation. Macroeconomic stabilization refers to employment generation and price stability. The government is mainly responsible for generating employment and ensuring price stability in the economy. The equitable distribution of income in the economy is the second major function of the government. The efficient use of resources is the third important function of the government.

The poor performance of central governments in achieving macroeconomic stability, sustainable growth and adequate level of public services has led to the emergence of the concept of fiscal decentralization (Yilmaz, 2002). A strong positive correlation has been found between decentralization and GDP per capita, thus supporting the argument that as people become more educated and better informed, they desire to have a greater say in the policies that directly affect their lives (Smoke, 1994). In a fiscally decentralized system the policies of regional governments are permitted to differ in order to reflect the preferences of their residents. The main objectives of decentralization are efficiency, transparency and accountability.

Transfer of resources from federal government to sub-national governments is a key policy problem in many large countries including in India. Generally, the state governments have fewer resources but larger responsibilities. Hence federal fiscal transfers are a necessity. There are mechanisms for transferring central resources to state governments.

In India, central (federal) resources are transferred through Finance Commission, Planning Commission and Central Ministries. Almost all the transfers are based on some form of equity consideration. Finance Commission's transfers are based on equity, efficiency and

autonomy considerations. Poorer states get more whether it is revenue sharing or grants-in aid revenue, and whether it is unconditional or conditional.

Governments at the state level have limited powers to raise resources to perform their functions effectively, as mentioned earlier. Therefore, an efficient system of inter-governmental transfers (between the national and state governments) is required to ensure that governments at the state level are able to perform their assigned functions. There are two types of imbalances associated with fiscal transfers – vertical and horizontal. A vertical imbalance occurs when a state is not able to raise enough revenue to meet its expenses. This type of imbalance occurs because most of the revenue raising powers is vested with the national (central) government, while most of the expenditure is done at the state level. Horizontal imbalance refers to the differences between states to perform their functions due to regional disparities in income levels, as a result of differences in the level of economic and social development.

Vertical imbalance is addressed by transferring resources from the central government to state governments. The amount of transfer depends on the resources available with the central government, and the need to ensure a minimum provision of public services by the state governments. In the Indian context, there has been long term stability in the share of the centre and states in the combined tax revenues of the economy (Rangarajan, 2008). According to Rangarajan, this stability in the sharing of taxes between the centre and states is desirable. According to him the proposed move to a national GST could have significant adverse implications for the vertical imbalance in fiscal transfers. To maintain the existing extent of vertical imbalance, a concurrent system of GST is recommended by him. The GST rates for the two tiers should be determined taking into account the present level of revenues of the two tiers from taxes. To overcome the horizontal imbalance, Rangarajan recommends the equalization approach. The concept of equalization is considered to be a guiding principle for fiscal transfers as it promotes equity and efficiency in resource use. Equalization transfers aim at ensuring uniform standard of public service across all states. In applying the equalization principle in India, state fiscal capacity is measured by the Gross State Domestic Product (GSDP) at factor cost.

In India, prior to transfers, the central government collects about 64 percent of the total revenue, while the rest (36 percent) is collected by the states. After transfers, the states get about 64 percent of the total revenue, while the remaining 36 percent is the share of the central government. The states spend about 57 percent of the total expenditure, while the central government accounts for 43 percent of the total expenditure. The difference between the total expenditure and total revenue of the central government is financed through borrowings.

According to Rangarajan, it is difficult to apply the equalization principle in India due to large disparities in income levels (GSDP per capita) across states. The GSDP per capita of the richest state (Maharashtra) is about six times the GSDP per capita of the poorest state (Bihar). Further, the population that resides in the main 'donor' states is less than the population in the 'recipient' states. There are also large interstate differences in cost conditions. To achieve equalization, the following guidelines are followed by the Finance Commission – a) shares of individual states are proportional to their populations; b) sum of shares of all states should sum up to one; and c) a state with lower per capita fiscal capacity should have higher per capita share, and per capita shares should be equal for states with equal per capita fiscal capacity. According to Rangarajan, 50 percent of the transfers address the vertical imbalance, 40 percent of the transfers are equalizing in nature, and the rest is for special needs.

Objective

The main objective of this study is to estimate the impact of reallocation of central transfers on the welfare of regional households. The study examines whether the equalization process is welfare improving or not.

A multiregional CGE model is constructed and used to simulate the reallocation of transfers to regions. The multiregional model captures the linkages that exist between regions and thus gives a more realistic view of the impact of reallocation of transfers between regions.

Literature review

Buchanan's 1950 paper is based on the fiscal capability argument. The paper argues that there exist disparities in income levels among different regions (states) within a country. There is

a concentration of high income earners in specific geographical areas. As a result there exist disparities among states in their capacities to support public services. If states are not identical in fiscal capacity, people in low capacity (income) states are subjected to greater fiscal pressure (higher taxation and/or lower value of public services) than people in high capacity states. Buchanan argues that the citizens of a federal country should be in a position to enjoy similar level of public services regardless of where they live within the country. Otherwise, there is incentive for migration of labour and capital into areas of least fiscal pressure (high income areas). The paper suggests that inter-governmental transfers (between the centre and the states) of resources are a means to allow states originally unequal in fiscal capacity to provide equal public services at equal rates of taxation. The fiscal system is viewed as a major means for the redistribution of income in a country.

There are several papers arguing for the case of efficiency in the inter-governmental transfer of resources. Efficiency advocates point out two types of inefficiencies in transfers. The first type of inefficiency is due to the inefficient inter-state allocation of factors of production as a result of location specific externalities (public goods provided by the states) and economic rents (immobile factors of production in fixed supply). It is argued that there is an optimal inter-state transfer that corrects for these distortions and establishes an efficient regional distribution of mobile factors (known as 'efficiency in migration' argument). Important papers advocating this line are Boadway and Flatters (1982), Myers (1990), Mansoorian and Meyers (1994), Petchey (1993, 1995). According to Boadway and Flatters (1982) labor migration may not lead to efficient allocation of labor across regions in a federal economy. Self-interested regional governments acting on behalf of their residents may follow budgetary policies that lead to inefficiencies and inequities in the economy as a whole. Therefore, the federal government is justified in using a system of equalization payments to achieve equity and efficiency in the economy as a whole. The authors feel that the equalization formula should take into account the actual conditions prevailing in the economy. Under a set of assumptions the authors conclude that the ideal equalization formula from an efficiency perspective is the one that fully equalizes all regional tax revenues per capita. On equity grounds too, full equalization is desirable.

Levtchenkova and Patchey (2004) say allocating to each state (in Australia) what you collect from them, if labor mobility is sufficiently high, leads to a Pareto optimal solution (ie national welfare increases). According to the authors equalization should be efficiency rather than equity based, and new disabilities should be designed to capture inter-state differences in fiscal externalities, economic rents and any other factors that affect the distribution of mobile factors of production across regions in an inefficient way.

The second type of inefficiency is due to inefficient strategic behavior by states. This means that states follow certain policies to influence the amount of transfers, at the cost of other states. Swan and Garvey (1991) argue that equalization may create 'transfer dependency', for example, in the case of the Atlantic Provinces in Canada. In case of Australia, one could argue that equalization has slowed down the process of inter-state income convergence.

In a recent paper, Ivanyna (2009) argues that inter-governmental sharing of resources between different jurisdictions (rich and poor) in a country can enhance efficiency of public service in the country. This sharing of resources may also benefit the residents of the rich region (donor).

The important CGE papers in the area of inter-governmental transfer of resources are by Jones and Whalley (1989), Dixon, Madden and Peter (1993), and Groenewold, Hagger and Madden (2003).

Jones and Whalley (1989) have used a multi-regional CGE model of Canada to simulate the regional effects of government policies. The authors reported that there is a gain of $4.6 billion (1.5 percent of GNP) if federal government taxes/subsidies/transfers are replaced by a uniform rate federal sales tax. Among regions, Alberta is the largest gainer from the removal of federal policies, with a gain of 51 percent of regional income. According to the authors, this large gain in regional income is mainly due to the removal of energy price controls and energy taxes under the federal government's National Energy Program.

Dixon et al (1993) have studied the effects of reallocating resources among Australian states. The distribution formula, which favors less populous states, has been criticized by other state governments. According to the critics of the distribution formula, the inclusion of location-specific 'disability factors' in the distribution formula has lead to an inefficient allocation of resources. The authors found that employment in the Northern Territory (sparsely populated region) would be reduced by over 20 percent by the adoption of equal-per-capita distribution of resources. Employment in Tasmania would be reduced by over 4 percent by the adoption of equal per capita distribution, but would fall by only about 0.6 percent in response to the elimination of location-specific disability factors from the distribution formula.

Groenewold et al (2003) use a CGE model to estimate the impacts of changes in the federal government's inter-regional transfers, in a framework in which regional governments maximize the welfare of its residents. The study concludes that when regional governments are welfare optimizers, the shock to federal government transfers has only small effects on per capita private consumption, on per capita consumption of the government good and on welfare. The authors show that whether the transfer is welfare enhancing depends on the relative magnitudes of fixed per capita profit distributions, the effects of which on welfare may be offset by the federal government's transfers. The main effect of the transfer shock is to induce migration of the labour force from the donor region to the recipient region.

In a related paper, Kraybill et al (1992) used a multiregional CGE model to estimate the impacts of US budget and trade deficits on two regions in the US – Virginia and rest of the US (ROUS). The authors found that Gross Regional Product (GRP) of Virginia increases 9.6% in nominal terms and 8.9% in real terms. There is a 0.6% increase in the regional (Virginia) price level. In ROUS both nominal and real GRP increase by approximately 4%. Real household consumption rises 12.1% in Virginia and 0.8% in ROUS. International exports drop 20% in each region. Nominal imports rise 14.2% in Virginia and 11.4% in ROUS. Net household income increases 10% in Virginia and 4.9% in ROUS. The study thus reveals the differential impacts of national level macroeconomic imbalances on different regions within a country.

Several studies have been conducted on the inter-governmental transfer of resources in India. According to Srivastava (2006), there exist large inter-state disparities in state level per capita expenditure on education and health in India. The author feels there is an urgent need to reduce these disparities, keeping in view the nationwide positive externalities that would accrue from a better educated and healthier populace. The Twelfth Finance Commission has also emphasized the need to reduce inter-state disparities in the provision of education and health to the citizens of the country. The author suggests that the redistribution of resources from richer to poorer states also benefit the richer states by reducing 'congestion', in the context of public services (like education and health), as a result of excessive migration from poorer to richer states. The author feels that it is worthwhile to equalize the provision of these public services so that people do not migrate from one state to another just for the difference in the provision of these services. The study reveals that there is a positive relationship between per capita GSDP (Gross State Domestic Product) and Human Development Index (HDI). Further, states that spend more on education and health are ranked higher in terms of HDI, irrespective of their per capita GSDP.

Hajra et al (2008), also suggest that there should be adequate spending to build good social and economic infrastructure across the states, in India. The authors suggest social sector expenditure as a criterion for the horizontal sharing of resources.

Singh (2007) has done a comparative study of fiscal decentralization in India and China. According to him economic decentralization has lagged behind in India. After economic reforms in India, although there is more decentralization at the state level, devolution of economic power to local government has not taken place. In contrast, sub-provincial governments in China have greater economic power. According to the author this devolution of economic power to local governments has contributed to economic development in China.

To sum up, the literature in this area highlights the following main points. First, there are income disparities across regions within a country. Low income regions are subjected to higher tax rates and/or lower levels of public services. Therefore, a system of fiscal transfers from the rich to the poor regions is desirable, in order to avoid excessive migration of factors into the rich

region. The objective is to transfer resources from the rich to the poor regions so that the poor regions are able to provide comparable levels of public services as their rich counterparts. Second, there are two types of inefficiencies associated with transfers. The first is due to inefficient allocation of factors of production across regions, and the second is due to inefficient strategic behaviour by the regions. The central government is therefore justified in transferring resources to regions in such a way that would lead to higher equity and efficiency in the economy as a whole. Finally, in the Indian context, there exist large disparities in the provision of public services across regions. There is an urgent need to reduce these disparities through the transfer of resources between regions.

Model

CGE models are multi-sector models of the economy. They are based on Walrasian general equilibrium models of market-clearing on both the product and the factor sides. CGE models have been primarily used to analyze tax and trade policies. As in any neo-classical model, producers are assumed to be profit maximizers, and in typical CGE methodology they can sell their output either on the domestic market or on the export market, based on relative prices. Households maximize utility by consuming a mix of domestic and imported goods. The composition of domestic supply depends on the relative prices of domestic products and imports. There is endogenous determination of equilibrium prices (commodity prices, factor prices and the exchange rate) to clear the product, factor, and foreign exchange markets. Specific functional forms are used to capture the behavior of economic agents. The parameters of these functional forms are obtained by 'calibration' to a dataset (usually a Social Accounting Matrix - SAM) for a given year. The benchmark year is considered to be in equilibrium for calibration purposes.

The model constructed for this study is a multiregional model. There are three types of multi regional CGE models: Top-down, Bottoms-up, and Hybrid. Top-Down models have two parts - national and regional. The feed back exists only from national to regional. Hybrid models use regional data at national level. Bottoms-up models build regional SAMs including trade flows. Regional SAMs are added up to get national SAM. Here, regional economic dependence is endogenised. Regions differ in technology, factor endowments, tax rates, household

consumption patterns, government expenditure patterns, trade relationships, labor market specifications etc. Bottoms-up models identify channels for trade and income transmissions. Regions' responses get transmitted back to the national economy and vice versa. Top-down and Hybrid models ignore these interactions. Hence, bottoms up models are more realistic. An example is the Monash-MRF (Peter et al 1996). The Bottoms-up approach is used in this study.

A four-sector model of each region was constructed for this study. The model is based on the Standard CGE Model developed by Lofgren et al (2002). The four regions are rich, middle, poor and special. The four sectors are agriculture and mining ('AGMIN'), manufacturing ('MANU'), services ('SERV'), and education and health ('EDU'). Each sector produces a single good, using intermediate inputs from these four sectors, and using two factors of production (labour and capital). Perfect competition (price-taking behaviour) is assumed for each sector. This assumption is reasonable in this case due to the high level of aggregation in the sectors. Therefore, even if there exists market power for any particular industry (within a sector), that would be submerged within the aggregate (Berck et al, 1996). Producer behaviour is captured by CES (constant elasticity of substitution) type production functions at two levels. At the top level output is a function of aggregated value added and an aggregate of intermediate inputs. At the bottom level aggregate value added is itself a CES function of factors of production (labour and capital). Intermediate inputs are used in fixed proportions to form the aggregate intermediate mix. The demand for labor and capital is derived from the first-order conditions of profit maximization taking into account the value-added or net price. There are nine types of households in each region – five rural (self employed in non agriculture, agricultural labour, other labour, self employed in agriculture and others) and four urban (self employed, regular wage/salary, casual and others). The Linear Expenditure System (derived from Stone-Geary utility function) is used to model consumer behavior.

CGE models allow for imperfect substitution between domestic goods and foreign goods. Since our model is regional in nature, 'foreign goods' implies goods sourced from 'rest of India' and goods sourced from 'outside India'. Substitution is allowed between goods sourced from 'rest of India' and goods sourced from 'outside India'. Thus, substitution takes place at two levels. At the top level, an Armington function is used to capture the substitution possibilities between domestic goods (goods produced in the region) and composite imported goods, while at the bottom level, another Armington function is used to capture the substitution possibilities

between imports from 'rest of India' and from 'outside India'. The mix of imports from 'rest of India' and 'outside India' forms the composite import commodity. In a similar way, exports are modeled using the CET (constant elasticity of transformation) function, at two levels.

Macroeconomic closures (current account and government balance) play an important role in determining the results of CGE models. The current account balance is at two levels – one for trade with 'rest of India' (domestic trade balance) and another for trade with 'outside India' (foreign trade balance). There are two exchange rates for each region in the model – one for trade with 'rest of India' and another for trade with 'outside India'. The current account balance for trade with both 'rest of India' and 'outside India' is fixed (at the benchmark year level). Since this is a single period model, fixing the current account balance is desirable in order to avoid the misleading welfare effects that appear if the current account balance is allowed to vary. If the current account is allowed to vary a positive impact on current account balance would raise welfare in the single period model, which is misleading because it would not capture the welfare losses in later periods due to larger foreign debt (Lofgren et al., 2002). The exchange rate for trade with 'outside India' is allowed to vary, while the exchange rate for trade with 'rest of India' is fixed.

There are two levels of government – one regional government for each region, and one central government. Government income is from taxes and transfers from the centre (in case of regions). Government expenditure is on consumption of goods/services, transfer payments to households and transfers to regions (in case of central government expenditure). Regional government consumption and transfers to households are fixed proportions of regional government income. Central government consumption and transfers to households are exogenous. Regional government balance is a fixed proportion of regional government income, while central government balance is residually determined.

Household income comprises of income derived from labour (wages) and capital (non-wage), transfers from the regional/central government, and transfers from outside the region (from 'rest of India'). Households spend their money on consumption, on tax payments, and on savings.

As mentioned before there is endogenous determination of prices to clear all the markets. The consumer price index is set to be the numeraire. The export supply function, derived from the CET function, specifies the value of exports based on the ratio of domestic (regional) and

composite export prices. The import demand function, derived from the Armington function, specifies the value of imports based on the ratio of domestic and composite import prices. Composite exports are a CET aggregation of exports to 'rest of India' and 'outside India'. Composite imports are an Armington aggregation of imports from 'rest of India' and 'outside India'. The composite export supply function specifies the value of composite exports based on the ratio of export prices to 'rest of India' and 'outside India'. The composite import demand function specifies the value of composite imports based on the ratio of import prices from 'rest of India' and 'outside India'. The import/export price from 'rest of India' and 'outside India' is a function of the respective world price ('rest of India' or outside India'), the import/export tariff, and the exchange rate ('rest of India' or outside India'). The world price is assumed to be exogenous. It is important to note that linkages between the regions exist through trade and the Central Government.

On the factor side of the economy, both labour and capital are mobile across sectors, but not across regions. There is a market determined real wage rate for these factors. Both the factors are fixed in supply for each region.

The GAMS software (using the PATH solver) is used to construct and solve this system of non linear equations. The model is initially solved to replicate the base year SAM by appropriately calibrating the parameters of the model. The values of the elasticities used to calibrate the model are provided in Appendix A. The elasticity values are based on the literature and best 'guesses'.

Data

For the purpose of this study four regional SAMs of India were constructed (the details about the construction of the SAMs is provided in another study). The regions are – rich income, middle income, poor income and special category. The rich income region comprised of the following states – Gujarat, Maharashtra, Punjab, Haryana, Puducherry, Delhi, Goa and Chandigarh. The middle income region had Andhra Pradesh, Kerala, Karnataka, Tamil Nadu and West Bengal. The poor income region had Bihar, Uttar Pradesh, Jharkhand, Madhya Pradesh, Orissa, Chattisgarh and Rajasthan. Finally, the special category region had the following states – Jammu and Kashmir, Himachal Pradesh, Uttarakhand, Assam, Mizoram, Tripura, Manipur, Arunachal Pradesh, Nagaland, Meghalaya and Sikkim. Since the All India I-O table is available

for 2003-04, the regional SAMs were constructed for 2003-04. The required data for constructing an I-O are the state-wise values of output produced, inputs consumed by sectors and sector-wise components of final demand. For the SAM, sector–wise value added were further divided into labour and capital, personal incomes and sector–wise expenditure of households. Data on Central transfers to states were provided by the Finance Commission. Other data used in the study include data on central/regional taxes and subsidies, and data on inter-regional trade.

Results

As mentioned above, the main objective of this study is to see the impact of different reallocations of Central transfers on the welfare of households in the four regions. To address this objective, several simulations were done whereby the level of transfers is reallocated between regions.

The regional SAMs constructed for the study provide important insights into the regional economies. Some of the important characteristics of the regions are presented in the tables below. In Table 1, per capita GDP of the regions are presented. In Table 2, total transfers by the Central Government to the regions, and per capita Central Government expenditure on education and health are presented. Formula Based transfers, Non Formula Based transfers, subsidies and tax concessions (see report by Chakraborty et al, 2008) represents total Central transfer to a region . Formula Based transfers include tax devolution and Formula Based grants. Non Formula based transfers include Plan Grants outside normal Central assistance, Centrally sponsored schemes, other Non Plan Grants and Direct Transfers to Districts.

Table 1: Macroeconomic characteristics of the regions

REGION	GDP PER CAPITA (Rs.)	POPULATION (2001)
RICH	40,104	210,126,362
MIDDLE	31,003	303,483,819
POOR	17,259	513,790,908
ALL REGIONS	**25,990**	**1,027,401,089**

Source: Regional SAMs constructed for this study ; population data based on Census 2001

Table 2: Total transfers to states (based on 2006-07 data), and Central Government expenditure on Education and Health

REGION	TOTAL TRANSFER PER CAPITA (Rs.)	PER CAPITA EXPENDITURE ON EDUCATION AND HEALTH (Rs)
RICH	3095 (7.7*)	253 (0.6)
MIDDLE	3338 (10.8)	308 (1.0)
POOR	3743 (21.7)	223 (1.3)
ALL REGIONS	**3531 (13.6)**	**255 (1.0)**

Source: Finance Commission for data on transfers, and regional SAMs for education and health expenditure data; *figures in parentheses are percent of per capita regional GDP

A few observations can be made based on the above tables. First, there is considerable difference in GDP per capita across the regions. Second, the rich region is characterized by relatively high GDP per capita, and relatively low population. Third, the poor region is characterized by the lowest GDP per capita, and the highest population. The highest level of transfer in per capita terms is received by the poor region. The level of transfers is guided to a great extent by equity considerations. Finally, per capita central government expenditure on 'education and health' is the highest in the middle region and the lowest in the poor region. The above tables thus give us a glimpse of regional disparities in income levels in India and the role of Central transfers to counter these disparities.

PART 1: SIMULATIONS WITH DIFFERENT REALLOCATIONS OF FORMULA BASED TRANSFERS

Keeping in view these characteristics of the regions, many simulations were done to see the impact of reallocation of Formula Based transfers between regions on the welfare of households. The best results are presented in this paper.

In **Simulation 1 (Horizontal Equity)**, transfer to the rich region is reduced by 10 percent, while transfer to the poor region is increased by the same amount. As a result of this reallocation, the new levels of transfer on per capita basis are approximately Rs 771, Rs 1225 and Rs 1736 for rich, middle, and poor region, respectively. The base values are approximately Rs 857, Rs 1225 and Rs 1704, for the three regions, respectively. The amount transferred is approximately 0.22 and 0.21 percent of GDP of rich and poor region, respectively. It is to be noted that the overall level of transfers remains the same in this simulation. There is only reallocation of transfers between regions. The welfare impact on households in the four regions

is measured in terms of equivalent variation (EV). Equivalent variation is the amount of money that leaves a person as well off (or worse off) as they would be after a change in policy. EV is the monetary measure of the policy change, before it is actually implemented. A policy decision is said to be 'pareto efficient' if EV has a net positive value, taking into account all individuals who are influenced by that decision. EV depends on net household income (household income net of savings and income tax) and consumer price. In this model household income is from wages, rents/profits, and transfers from the government and outside the region ('rest of India'). As discussed before the consumer price is a composite of the price of regionally produced goods and price of composite imports. Imports are from two different sources – 'rest of India' and 'outside India'. Imports from these two sources combine to form a composite import commodity. The price of the composite import commodity is a function of import prices from the two different sources, the elasticity of substitution between imports from the two different sources, and the shares of imports from the two different sources. The import prices from the two different sources are a function of world price ('rest of India' or outside India'), import tariff and the relevant exchange rate ('rest of India' or 'outside India'). The net welfare gain (Table 4) in this simulation is worth Rs 15,873 lacs, implying that this policy option is pareto efficient. In this simulation, some households (mainly urban) in the rich region experience welfare loss, while households in other regions experience welfare gains. Overall real household consumption falls in the rich region, and rises in other regions. The fall in household consumption in the rich region is mainly due to fall in household income. Household income falls due to lower level of transfers from the government. Household consumption rises in the middle and poor region because of rise in household income. Although the middle region is not directly affected by the policy in this case, household income in the middle region rises as a result of income transmission from the other two regions through inter-regional trade. The impact on the middle region, however, is relatively small. The poor region gains due to the higher level of transfers to the region. The impact on GDP is very small, for all regions. Small changes are observed in GDP because of the assumption of full employment of factors. Whatever change in GDP occurs is only due to the reallocation of factors among sectors. The percentage changes in real GDP are 0.066, -0.002 and 0.005 for rich, middle, and poor region, respectively.

Table 3: Simulation 1 (Horizontal Equity): Transfer to the rich region is reduced by 10 percent, while transfer to the poor region is increased by the same amount (Equivalent variation in percentage)

HOUSEHOLD	RICH	MIDDLE	POOR
Self employed in non-ag (rural)	0.001	0.001	0.023
Ag labour (rural)	0.002	0.002	0.016
Other labour (rural)	0.001	0.001	0.018
Self employed in ag (rural)	0.001	0.001	0.022
Others (rural)	-0.001	0.000	0.024
Self-employed (urban)	-0.001	0.000	0.032
Regular wage/salary (urban)	-0.001	0.000	0.030
Casual labour (urban)	0.002	0.001	0.014
Others (urban)	-0.001	0.000	0.038
All households	**-0.00007**	**0.0006**	**0.024**
Transfer/GDP (%)	**0.22**		**0.21**
Change in real GDP (%)	**0.066**	**-0.002**	**0.005**

Table 4: Simulation 1: Equivalent variation in lac Rs

HOUSEHOLD	RICH	MIDDLE	POOR
Self employed in non-ag (rural)	17	62	1638
Ag labour (rural)	67	120	884
Other labour (rural)	25	39	590
Self employed in ag (rural)	79	99	4635
Others (rural)	-25	21	1193
Self-employed (urban)	-98	27	2668
Regular wage/salary (urban)	-108	-2	2920
Casual labour (urban)	19	19	191
Others (urban)	-14	-2	808
All households	**-36**	**384**	**15525**

In **Simulation 2 (Horizontal Equity)**, transfer to the rich region is reduced by 10 percent, while transfer to the middle and poor region is increased by 8 and 2 percent, respectively. As a result of this reallocation, the new levels of transfer on per capita basis are approximately Rs 771, Rs 1236, and Rs 1761 for rich, middle and poor region, respectively. The amount transferred is approximately 0.22, 0.04 and 0.16 percent of GDP of rich, middle and poor region, respectively. The net welfare gain (Table 6) is worth Rs 8122 lacs. In this simulation, all households experience welfare gains. Household consumption rises due to increase in household income as a result of the policy change. Household income rises across all regions due to income

transmission through trade and transfers. The percentage changes in real GDP are 0.054, 0.001 and 0.005, for rich, middle and poor region, respectively.

Table 5: Simulation 2 (Horizontal Equity): Transfer to the rich region is reduced by 10 percent, while transfer to the poor and middle region is increased by 8 and 2 percent, respectively (Equivalent variation in percentage)

HOUSEHOLD	RICH	MIDDLE	POOR
Self employed in non-ag (rural)	0.001	0.001	0.011
Ag labour (rural)	0.001	0.002	0.007
Other labour (rural)	0.001	0.001	0.008
Self employed in ag (rural)	0.001	0.001	0.010
Others (rural)	0.001	0.001	0.011
Self-employed (urban)	0.001	0.000	0.015
Regular wage/salary (urban)	0.000	0.000	0.014
Casual labour (urban)	0.001	0.001	0.006
Others (urban)	0.001	0.000	0.018
All households	**0.0007**	**0.0009**	**0.011**
Transfer/GDP (%)	**0.22**	**0.04**	**0.16**
Change in real GDP (%)	**0.054**	**0.001**	**0.005**

Table 6: Simulation 2: Equivalent variation in lac Rs.

HOUSEHOLD	RICH	MIDDLE	POOR
Self employed in non-ag (rural)	26	81	756
Ag labour (rural)	49	154	376
Other labour (rural)	22	52	259
Self employed in ag (rural)	78	130	2108
Others (rural)	25	30	561
Self-employed (urban)	94	43	1290
Regular wage/salary (urban)	42	18	1420
Casual labour (urban)	12	25	77
Others (urban)	9	0	388
All households	**355**	**533**	**7234**

In **Simulation 3 (Vertical Equity)**, transfer to the rich, middle and poor region is increased by 2 percent, each. As a result of this reallocation, the new levels of transfer on per capita basis are approximately Rs 874, Rs 1250 and Rs 1738 for rich, middle and poor region, respectively. The amount transferred is approximately 0.04, 0.08 and 0.22 percent of GDP of rich, middle and poor region, respectively. The net welfare gain (Table 8) is worth Rs 5010 lacs. In this simulation, households in the rich and middle region experience welfare loss (due to income loss), while households in the poor region experience welfare gains (due to income gain).

There is negligible impact in the middle region. The welfare effect is relatively low in this simulation. Many households in the rich and middle region experience welfare losses in spite of higher level of transfers. This is probably due to the fact that giving more to the relatively advanced regions (rich/middle) leads to lower marginal returns. The poor region however experiences welfare gains. The percentage changes in real GDP are 0.086, 0.008 and 0.001 for rich, middle and poor region, respectively.

Table 7: Simulation 3 (Vertical Equity): Transfer to the rich, middle and poor region is increased by 2 percent, each (Equivalent variation in percentage)

HOUSEHOLD	RICH	MIDDLE	POOR
Self employed in non-ag (rural)	-0.001	0.000	0.010
Ag labour (rural)	-0.001	0.000	0.007
Other labour (rural)	-0.001	0.000	0.008
Self employed in ag (rural)	-0.001	0.000	0.009
Others (rural)	-0.001	0.000	0.009
Self-employed (urban)	-0.002	0.000	0.010
Regular wage/salary (urban)	-0.001	0.000	0.008
Casual labour (urban)	-0.001	0.000	0.005
Others (urban)	-0.001	0.000	0.011
All households	**-0.001**	**-0.00006**	**0.009**
Transfer/GDP (%)	**0.04**	**0.08**	**0.22**
Change in real GDP (%)	**0.086**	**0.008**	**0.001**

Table 8: Simulation 3: Equivalent variation in lac Rs.

HOUSEHOLD	RICH	MIDDLE	POOR
Self employed in non-ag (rural)	-34	-6	683
Ag labour (rural)	-42	-27	396
Other labour (rural)	-22	-5	268
Self employed in ag (rural)	-86	-23	1929
Others (rural)	-50	1	454
Self-employed (urban)	-169	1	830
Regular wage/salary (urban)	-144	3	787
Casual labour (urban)	-10	-3	72
Others (urban)	-22	3	224
All households	**-577**	**-56**	**5643**

In **Simulation 4 (Vertical Equity)**, transfer to the rich, middle and poor region is increased by 2, 2 and 8 percent, respectively. As a result of this reallocation, the new levels of transfer on per capita basis are approximately Rs 874, Rs 1250 and Rs 1840 for rich, middle and

poor region, respectively. The amount transferred is approximately 0.04, 0.08 and 0.87 percent of GDP of rich, middle and poor region, respectively. The net welfare gain (Table 10) is worth Rs 17,420 lacs. In this simulation, most households across the three regions experience welfare gains, implying that household income rises across the three regions. This simulation suggests that giving relatively more to the poor region is an important condition to achieve higher welfare impact in the economy. The percentage changes in real GDP are 0.464, 0.038 and 0.003, for rich, middle, and poor region, respectively.

Table 9: Simulation 4 (Vertical Equity): Transfer to the rich, middle and poor region is increased by 2, 2 and 8 percent, respectively (Equivalent variation in percentage)

HOUSEHOLD	RICH	MIDDLE	POOR
Self employed in non-ag (rural)	0.002	0.000	0.029
Ag labour (rural)	0.000	0.000	0.023
Other labour (rural)	0.001	0.000	0.026
Self employed in ag (rural)	0.001	0.000	0.028
Others (rural)	0.005	0.000	0.027
Self-employed (urban)	0.007	0.000	0.023
Regular wage/salary (urban)	0.004	0.000	0.017
Casual labour (urban)	-0.001	0.000	0.016
Others (urban)	0.005	0.000	0.020
All households	**0.003**	**0.0001**	**0.025**
Transfer/GDP (%)	**0.04**	**0.08**	**0.87**
Change in real GDP (%)	**0.464**	**0.038**	**0.003**

Table 10: Simulation 4: Equivalent variation in lac Rs.

HOUSEHOLD	RICH	MIDDLE	POOR
Self employed in non-ag (rural)	57	19	2091
Ag labour (rural)	-7	17	1303
Other labour (rural)	14	8	883
Self employed in ag (rural)	79	16	5866
Others (rural)	184	9	1330
Self-employed (urban)	703	2	1972
Regular wage/salary (urban)	527	-12	1649
Casual labour (urban)	-13	2	219
Others (urban)	82	2	417
All households	**1626**	**64**	**15730**

A few observations can be made based on the above simulations. First, there is a net positive impact on welfare in all the above simulations, suggesting that all the above policy scenarios are pareto efficient. Second, the net welfare impact of reallocation of transfers depends on the amount of transfer to a particular region. The net welfare gain is the highest when transfers are increased (relatively more to poor) across all regions (vertical equity). High welfare gain is also observed when transfers (from the rich region) are to the poor region only (horizontal equity). As discussed above the welfare impact depends mainly on changes in household income as a result of the policy change. Third, households in the rich region experience welfare losses because of transfers in some scenarios, while households in the middle and poor region experience welfare gains most of the time. There is overall net gain, as mentioned above. Finally, the impact on real GDP is relatively small in all the simulations.

PART 2: SIMULATION WITH DIFFERENT REALLOCATIONS OF CENTRAL GOVERNMENT EXPENDITURE ON THE EDUCATION AND HEALTH SECTOR

Apart from transfers by the Finance/Planning Commission, there are other channels (like Ministries etc) through which the Central government transfers resources to the states. Central government expenditure in the regions is an important component of regional demand. As discussed above, spending on the social sector is especially important in a federal system. The equitable distribution of public services is desirable from both equity and efficiency perspectives. Keeping in view this objective, one simulation was done to see the impact of reallocation of central government expenditure on education and health between the rich and poor region.

In **Simulation 5** (Table 11), the level of central government expenditure on 'education and health' is reduced by 8 percent in the rich region, while the level of expenditure is increased by the same amount in the poor region. As a result of this reallocation, the new levels of expenditure on per capita basis are approximately Rs 233, Rs 308 and Rs 231 for rich, middle and poor region, respectively. The base values are Rs 253, Rs 308, and Rs 223, for the three regions. The amount transferred is approximately 0.05 percent of GDP of rich and poor region. The net welfare gain (Table 12) in this simulation is worth Rs 30,563 lacs. Most households experience welfare gains, while a few households in the middle region experience welfare loss. Changes in welfare can be explained on the basis of changes in household income. In this simulation most households across all regions experience rise in income. The percentage changes

in real GDP are -0.102, 0.027 and 0.049 for rich, middle and poor region, respectively. This simulation shows the benefit of higher spending on education and health in the poor region, as revealed by the relatively large overall welfare impact.

Table 11: Simulation 5: Eight percent reduction in Central Government spending on the Education and Health sector in the rich region, and same increase in spending on the Education and Health sector in the poor region (Equivalent variation in percentage)

HOUSEHOLD	RICH	MIDDLE	POOR
Self employed in non-ag (rural)	0.017	0.001	0.043
Ag labour (rural)	0.018	0.001	0.046
Other labour (rural)	0.018	0.001	0.046
Self employed in ag (rural)	0.016	0.001	0.045
Others (rural)	0.014	0.000	0.036
Self-employed (urban)	0.015	0.000	0.028
Regular wage/salary (urban)	0.011	-0.001	0.018
Casual labour (urban)	0.015	0.000	0.041
Others (urban)	0.010	0.000	0.031
All households	**0.014**	**0.0002**	**0.037**
Transfer/GDP (%)	**0.05**		**0.05**
Change in real GDP (%)	**-0.102**	**0.027**	**0.049**

Table 12: Simulation 5: Equivalent variation in lac Rs

HOUSEHOLD	RICH	MIDDLE	POOR
Self employed in non-ag (rural)	495	64	3095
Ag labour (rural)	706	85	2565
Other labour (rural)	347	29	1538
Self employed in ag (rural)	1292	52	9519
Others (rural)	499	18	1809
Self-employed (urban)	1466	-26	2323
Regular wage/salary (urban)	1424	-101	1783
Casual labour (urban)	179	6	577
Others (urban)	178	-11	653
All households	**6585**	**115**	**23862**

PART 3: SIMULATION WITH MIGRATION OF WORKERS FROM POOR TO RICH REGION

As discussed before there is a tendency for workers to migrate from poor to rich regions within a federal system mainly due to lower provision of public services/employment and/or higher tax rates in the poor region relative to the rich region. A simulation (Table 13) was done to see the impact of migration from the poor to the rich region. Based on migration data (for 1999-2000) and the labourforce in the poor region, it was estimated that approximately two percent of the labourforce from the poor region migrated to the rich region. Therefore, the simulation involved reducing the labourforce in the poor region by this number, and increasing the labourforce in the rich region by the same number. The results of this simulation are presented in the tables below. The net welfare gain for the economy as a whole is worth Rs 18,190 lacs (Table 14). In this simulation households in all the regions experience welfare gains, suggesting that migration helps in increasing incomes of households throughout the country. The rich region has relatively more capital than labour, and therefore an increase in the supply of labour (from the poor region) leads to higher output in the rich region. This in turn has ripple effects throughout the economy. The percentage changes in real GDP are 0.004, 0.0006 and 0.002 for rich, middle and poor region, respectively.

Table 13: Simulation 6: Two percent reduction in the labor force in the poor region and same increase in the labor force in the rich region (equivalent variation in percentage)

HOUSEHOLD	RICH	MIDDLE	POOR
Self employed in non-ag (rural)	0.004	0.001	0.025
Ag labour (rural)	0.005	0.002	0.020
Other labour (rural)	0.004	0.001	0.021
Self employed in ag (rural)	0.004	0.001	0.025
Others (rural)	0.004	0.001	0.024
Self-employed (urban)	0.005	0.001	0.029
Regular wage/salary (urban)	0.003	0.000	0.024
Casual labour (urban)	0.004	0.001	0.017
Others (urban)	0.003	0.000	0.035
All households	**0.004**	**0.0009**	**0.025**
Change in real GDP (%)	**0.004**	**0.0006**	**0.002**

Table 14: Simulation 6: Equivalent variation in lac Rs

HOUSEHOLD	RICH	MIDDLE	POOR
Self employed in non-ag (rural)	115	77	1811
Ag labour (rural)	184	130	1109

Other labour (rural)	87	47	716
Self employed in ag (rural)	332	118	5270
Others (rural)	135	34	1210
Self-employed (urban)	450	52	2407
Regular wage/salary (urban)	373	44	2382
Casual labour (urban)	48	23	232
Others (urban)	59	7	738
All households	**1783**	**532**	**15875**

PART 4: SIMULATION WITH TRANSFER OF CAPITAL FROM RICH TO POOR

Transfers by the Finance Commission are also used by the states for capital formation. A simulation was done to see the impact of transfers on capital formation. The simulation involved reducing transfers (Formula Based) to the rich region by ten percent, and simultaneously increasing capital in the poor region by this amount. The results of this simulation are presented in the tables below. In this simulation, households in the rich region experience welfare loss, while households in other regions experience welfare gains. Impact on welfare is due to changes in household income. The net welfare gain is worth Rs 28,540 lacs (Table 16). The percentage changes in real GDP are 0.007, 0.014 and 0.006 for rich, middle and poor region, respectively.

Table 15: Simulation 7: Reduction in capital by ten percent of transfers to rich region, and using this amount for capital formation in the poor region (equivalent variation in percentage)

HOUSEHOLD	RICH	MIDDLE	POOR
Self employed in non-ag (rural)	-0.002	0.002	0.051
Ag labour (rural)	0.000	0.002	0.050
Other labour (rural)	-0.001	0.002	0.050
Self employed in ag (rural)	-0.001	0.002	0.052
Others (rural)	-0.004	0.001	0.044
Self-employed (urban)	-0.006	0.001	0.040
Regular wage/salary (urban)	-0.004	0.001	0.030
Casual labour (urban)	0.001	0.002	0.044
Others (urban)	-0.004	0.001	0.047
All households	**-0.003**	**0.001**	**0.046**
Change in real GDP (%)	**0.007**	**0.014**	**0.006**

Table 16: Simulation 7: Equivalent variation in lac Rs

HOUSEHOLD	RICH	MIDDLE	POOR
Self employed in non-ag (rural)	-55	123	3634
Ag labour (rural)	-7	167	2762

Other labour (rural)	-17	69	1689
Self employed in ag (rural)	-90	168	10995
Others (rural)	-163	65	2217
Self-employed (urban)	-616	90	3386
Regular wage/salary (urban)	-473	72	2928
Casual labour (urban)	7	33	610
Others (urban)	-75	21	996
All households	**-1487**	**809**	**29218**

Conclusions:

A four sector multiregional CGE model was used to analyze the impact of reallocation of Formula Based (tax devolution and formula based grants) and other Central transfers, across three regions (rich, middle and poor) of India. Regional Social Accounting Matrices (SAMs) provided the relevant data, for constructing and solving the model. The regional SAMs capture regional differences in technology, consumption patterns, factor endowments, taxes etc. Inter-regional trade and income flows are also captured in the data. Several simulations were done to estimate the impact of reallocation of transfers on regional households, in terms of welfare (equivalent variation). Equivalent variation is the monetary measure of the change in real household consumption as a result of the policy change. The main conclusions based on the simulations are - first, there is a net positive impact on welfare in all the simulations, suggesting that the transfer of resources from the rich to poorer regions within the country is desirable. Second, the net welfare impact of reallocation of transfers depends on the amount of transfer to a particular region. The net welfare gain is the highest when the level of transfers is increased across all regions (vertical equity), while giving relatively more to the poor region. High welfare gain is also seen when transfers are made from the rich to the poor region (horizontal equity). The welfare impact mainly depends on changes in household income as a result of the policy change. Third, households in the rich region experience welfare losses in some scenarios because of transfers, while households in the middle and poor region experience welfare gains in most cases. There is overall net gain, as mentioned above. It is to be noted that the regions are inter-linked through trade and the Central Government, and therefore a policy change affects all regions (households), directly or indirectly. Fourth, one of the simulations suggests that reallocation of Central Government expenditure on 'education and health' between the rich and poor region produces relatively large welfare benefits. A relatively small amount of reallocation produces large overall increase in welfare suggesting the need to allocate more resources to the

social sector in the poor region in order to achieve equity and efficiency objectives. Fifth, the impact of migration from poor to rich region was analyzed. The results suggest that migration leads to net welfare gain for the economy as a whole. In this simulation all households across all regions experience welfare gains. Sixth, a simulation was done to see the impact of capital formation in the poor region by transferring resources from the rich region. A relatively large increase in welfare is seen in this case thus suggesting the need to promote capital formation in the poor region. Finally, the simulations suggest that impact on regional GDP is relatively small, but positive in most cases. The policy recommendation therefore would be to increase the level of transfers to the poor region so that this region can improve the provision of public services (education and health), and can promote capital formation.

The study thus supports the hypothesis that transfer of resources from rich to poorer regions within a federal system leads to net welfare benefit for the country as a whole. However, the impact depends on the level of transfer to a particular region. The transfer of resources is therefore desirable from both equity and efficiency perspectives. This study will hopefully lead to more research in this area.

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APPENDIX A

Elasticity values

Armington elasticity (between domestic goods and composite imports):

Value used by De Janvry and Sadoulet (2001) for Asian countries	Value used in this study (for all sectors and regions)
Range: 0.5 - 30	10.01

Armington elasticity (between imports from 'rest of India' and 'outside India'):

Estimate of Hertel et al for imports from different sources (2004)	Value used in this study (for all sectors and regions)
Range: 1.8 – 34.4	29

CET elasticity (between domestic goods and composite exports):

Value used by De Janvry and Sadoulet (2001) for Asian countries	Value used in this study (for all sectors and regions)
Range: 0.5 – 1.2	0.99

CET elasticity (between exports to 'rest of India' and 'outside India'):

Value used in this study (for all sectors and regions)
29

Production elasticity (factor substitution):

Region*	**Value of elasticity of substitution between labour and capital (for all sectors)****
Rich	0.8
Middle	0.7
Poor	0.7

*The literature suggests that a rapidly growing economy tends to have a relatively high value of elasticity of substitution between factors (see paper by de la Grandville, 1989). Therefore, relatively higher value was used for the rich region.

** Estimates for India are in the range of 0.6 to 1.6 (Pohit et al. 1995)

Production elasticity (between aggregate value added and aggregate intermediate mix)

Value used in this study (for all sectors and regions)
0.3

Chapter-II

Construction of regional Social Accounting Matrices for India- (2003-04)

M R Saluja and BhupeshYadav

Introduction

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), actual or imputed, within the economy and with respect to the rest of the world. A SAM is thus a comprehensive accounting framework within which the full circular flow of income— from production to factor income to household incomes to household demand and back to production— is captured. In a SAM, all the transactions in an economy are presented in the form of a matrix as opposed to the double entry format. Each row of the SAM details the receipts of an account while the columns detail the corresponding expenditure. The rows and columns follow the same ordering and hence, a SAM must always be square matrix. An entry in row *i* and column *j* of the SAM denotes the receipts of account *i* from account *j*. This may alternatively be expressed as the expenditure by account *j* to be paid to account *i*. The structure of a SAM can change depending upon how the component accounts of a SAM are defined and disaggregated, within this generalized schema.

A SAM can be regarded as an extension of the well-known Input-Output (I-O) table. The I-O table is a widely used matrix framework supplying detailed information on the flow of goods and services, and on the structure of production costs. In this matrix, final consumption expenditure, capital formation and trade are shown by industry of origin, and intermediate consumption by both industry of origin and destination. Income generation is shown by way of value added divided into its different components such as wage and non-wage (profit) incomes. I-O techniques are important tools for quantitatively analyzing the structure of production in an economy, and have been widely used for national economic planning and decision making. These I-O techniques, initially developed by Nobel Prize winning economist Wassily Leontief in the 1930s and 1940s, rest on the assumption that there exists a constant (proportional) relationship between the inputs of intermediate goods and production factors, on the one hand, and the level of sector wise production, on the other. The usefulness of I-O analysis is in that it

brings out not only the direct (output and income) effects of an increase in final demand, but also the indirect effects, that result from induced intermediate transactions between domestic sectors of products.

The SAM, developed by Nobel Prize winning economist Sir Richard Stone and his associates in the 1950s, extends the I-O matrix in one fundamental way: unlike the I-O matrix, the SAM shows the interrelationship between income distribution and final expenditures. In other words, the circular flow of income, which is not closed in the I-O model, is partly closed at the macro level in the SAM model. This difference has major implications for the outcomes of I-O model and SAM model analyses. For example, the economy wide effects of a change in an exogenous variable (say, export demand) turn out to be larger in the SAM model than in the I-O model, because the SAM model captures he induced effects on production and income that operate via household incomes and final demand. More importantly for policy making, the structural pattern of effects due to such an exogenous change differs significantly between the SAM and I-O models. A further difference between the SAM and I-O models is that the I-O models do not include enough institutional detail (for example, income distribution) to provide a framework for obtaining the full impact of a policy change. In fact, the SAM framework was inspired by the wish to reconcile the I-O and social accounts with macroeconomic national accounts.

The Structure of SAM

The basic structure of SAM is based on the following transactions and transfers in the economy. Production requires intermediate goods and the primary factors of production, viz. labour and capital. These factor endowments are contributed by the institutions (viz. households, firms and government), who in turn, receive factor payment as value added. Apart from value added, institutions get income from other sources such as transfers from the government and from rest of the world. Income is spent as the consumption expenditure on goods and services and for payment of taxes and the rest is saved for the future. Total supply in the economy has to be matched by the demand made by the institutions and capital formation, i.e. purchase of investment goods. In the SAM, extra breakdown of the household sector is done to reflect the role of people in the economy.

The schematic structure of a SAM presented (table 1) here has, mainly, five major accounts, viz, production, factors, institutions, capital and rest of the world (ROW) accounts. Concepts of these accounts are given below.

Production account consists of two parts: activities (Industries) and commodities. The activity account is nothing but the make matrix. Each row of this matrix gives the distribution of the outputs of different commodities produced by the industry of that row. Each column of this matrix gives the value of output of the commodity of that column produced by different industries (A1.2). On the other hand, industry purchases goods and services in the form of commodities (A2.1) and hires factor services in the form of labour & capital (A3.1) and pays indirect taxes towards the purchase of goods & services (A8.1). In totality this is called the absorption matrix.

Aggregate supply of the economy consists of imports in addition to commodities produced by industries (A10.2). This supply of commodities, in addition to meeting the intermediate demand of industries, meets the requirements of the components of the final demand. The components of final demand are households (A2.4), government (A2.7), Gross fixed capital formation (A2.9) and exports (A2.10).

Factors receive value added, in (A3.1), as a payment for their services, which is otherwise known as gross domestic product (GDP) at factor cost, i.e. net of indirect taxes on activities. They also receive net factor income from abroad, (A3.10). This total value added, i.e. GDP plus net factor income from abroad, is termed as gross national product (GNP) at factor cost. Since factor services are provided by institutions income is either remitted abroad or accrues to domestic institutions. Hence, the total GNP at factor cost is distributed as (1) factor income to households, (A4.3), (2) operating profits of private corporate,(A5.3), (3) operating surplus of public non-departmental enterprises, (A6.3) and (4) income from entrepreneurship to government, (A7.3).

The gross national product is the primary source of income for the institutions. In addition to the value-added income, other sources of income for households are government transfers and interest

on public debt, (A4.7), and net current transfers from abroad, (A4.10). In column 4, household spends its income on consumption expenditure, pays direct taxes, (A7.4) and indirect taxes on purchases, (A8.4), and keeps residual income as savings, (A9.4). Apart from operating profit, source of income of private corporate sector is interest on public debt from the government, (A5.7). The private corporate sector pays corporate taxes, (A7.5), out of its earnings and saves, (A9.5). Value added is the only source of earning for the public non-departmental enterprises. The only entry in Column 6 is that of public sector savings, (A9.6), to match with the total public sector earnings.

Column 7 and row 7 balance the government's budget. Receipts of the government consist of income from entrepreneurship, (A7.3), direct taxes, (A7.4) and (A7.5), and indirect taxes, (A7.8). On the other hand its outlay includes its final consumption expenditure on goods and services, (A2.7), its transfers to institutions, (A4.7) and (A5.7), and indirect taxes on purchases, (A8.7). The residual government saving (A9.7) balances the budget.

Capital account represents the aggregate capital account of all the institutions in the economy. It defines the savings and investment closure of the economy. Column 9 of the capital account shows the investment demand in the economy. It has gross domestic capital formation inclusive of changes in stocks, (A2.9), and indirect taxes on purchase of investment goods, (A8.9). Row 9 indicates the sources of savings in the economy including aggregate capital depreciation in the economy, i.e. consumption of fixed capital, (A9.3). Household, private corporate, public sector and government contribute to the domestic savings. These are net domestic savings. When added to the depreciation, it becomes gross domestic savings. The foreign saving or the current account balance, (A9.10), matches the difference between total investment, inclusive of indirect taxes, and the gross domestic savings.

Here, it is worth mentioning that the capital account can be detailed by dividing the institutions into current account of institutions and capital account. The capital account in this case represents the source of funds and their use in a detailed manner. This exercise will, particularly, be interesting to analyse the financial sector. The external sector, i.e. the rest of the world can also have current as

well as capital accounts in order to differentiate between merchandise trade balance and flow of capital.

It should be noted that international transfers along with current account balance must finance the difference between imports and exports in the external closure. Transactions between domestic economy and the rest of the world are represented by column and row 10. Total foreign exchange inflows for the country come from exports, (A2.10), net factor income, (A3.10), net current transfers, (A4.10) and net capital transfers, (A7.10), from abroad. Total Import, (A10.2), represents the foreign exchange outflow from the country to the rest of the world. The difference between the foreign exchange receipts and out flow, after paying the export taxes, (A8.10), gives us the net foreign exchange reserve as foreign savings, (A9.10).

Table 1: Schematic Structure of a SAM

		Activities	Commodities	Factors	Households	Private Corp.	Pub. Enter.	Govt.	Ind. Taxes	Capital A/C	ROW	Total
		1	2	3	4	5	6	7	8	9	10	
1	Activities		Gross output A1.2									Output
2	Commodities	Purchase of raw material A2.1			Household consumption A2.4			Govt. consumption A2.7		Gross Fixed Capital Formation A2.9	Exports A2.10	Aggregate demand
3	Factors	Value added A3.1									Net factor income A3.10	Factor Income
4	Households			Endowment Of HH A4.3				Govt. transfer, interest on debt A4.7			Net current transfer A4.10	Total Household income
5	Private Corp.			Operating Profits A5.3				Interest on debt A5.7				Income of Private Corporate
6	Pub. Enter.			Operating Surplus A6.3								Income of Public departmental
7	Govt.			Income from entrepr. A7.3	Income tax by households A7.4	Corporate taxes A7.5			Total indirect taxes A7.8		Net capital transfer A7.10	Total govt. earnings
8	Ind. Taxes	Taxes on intermediate A8.1			Taxes on purchases A8.4			Taxes on purchases A8.7		Taxes on investment goods A8.9	Tax on exports A8.10	Total Indirect taxes
9	Capital A/C			Depreciation A9.3	Household savings A9.4	Corporate savings A9.5	Public sector savings A9.6	Govt. savings A9.7			Foreign savings A9.10	Gross savings of economy
10	ROW		Imports A10.2									Foreign exchange payments
	Total	Total cost of production	Aggregate supply	Total factor endowments	Total use of household income	Private corporate income	Income of Public departmental	Aggregate govt. expenditure	Total indirect taxes	Aggregate investment	Foreign exchange receipts	

Construction of Regional SAM

A number of SAMs have been constructed for India in the past (for details see Pradhan etal.). the recent SAM relates to the year 2003-04 (See Saluja and Yadav). There has hardly been a SAM for any state of India. Although a few village level SAM have been constructed in India. In this exercise we have tried to construct regional SAM for 2003-04 by dividing the Indian states into the following four categories based on the per capita Gross State Domestic Product (GSDP).

- Poor States (Bihar, Uttar Pradesh, Jharkhand, MP, Orissa, Chhattisgarh, and Rajasthan)
- Middle level States (Andhra Pradesh, Kerala, Karnataka, Tamil Nadu and West Bengal)
- Rich States (Gujarat, Haryana, Goa, Delhi, Maharashtra, Punjab. Pondicherry and Chandigarh) and
- Special category of States (Jammu and Kashmir, Assam, Arunachal Pradesh, Himachal Pradesh, Uttaranchal, Tripura, Manipur, Meghalaya, Mizoram, and Nagaland)

Since the state or a region consisting of a number of states, is an open economy, there are problems in getting data for a number of variables specially values of goods and services going out of the state/region and coming into the state/region. The method of construction of the I-O tables along-with the sources of data used and the problem encountered along with their solutions, wherever feasible is given in the next section. Section II gives the methodology and data sources for building other blocks of SAM, like division of GVA into wage and non-wage income, PFCE and personal income by economic categories of households.

Compilation of Input-Output Tables

The required data for constructing an I-O table are the sector wise values of output produced, inputs consumed by different sectors and sector wise consumption of different components of final demand. The sector classification is done on the basis of detailed levels of classification at which the data are available. The input structure of primary and tertiary sectors is generally

available from the worksheets prepared for compiling the Gross State Domestic Product (GSDP). These are made available to us by Central Statistical Organisation (CSO). For manufacturing sectors, the data for organized parts are available from the Annual Survey of Industries (ASI) and for the unorganized parts from National Sample Survey Organisation (NSSO) conducted survey for 2000-01. We now turn to the methods and sources for getting the estimates by broad producing sectors and by components of final demand.

Producing Sectors

1. **Agriculture**

Crop wise, state wise values of output are compiled for estimation of state domestic product for agriculture. For this purpose the estimates of major inputs consumed are also available. The estimates are available for seed, feed for livestock on farm, fertilizers, organic manure, pesticides, irrigation charges, electricity, diesel oil and other operational costs. The state wise estimates of crop wise values of output as well as those of different inputs consumed by agriculture are made available to us by the CSO. The estimates of inputs consumed are, however, available only for the entire agriculture; while for the construction of the I-O table agriculture is divided into a number of sectors. For this exercise we have 4 sectors under agriculture.

For estimation of inputs for 4 sectors under agriculture, we have used the all-India I-O table for 2003-04. In the I-O table for the Indian economy, agriculture is divided into 20 sectors. We have first estimated the state wise structures of inputs for 20 sectors under agriculture by making use of all-India I-O table and then aggregated these structures to 4 sectors. The state wise structures obtained this way have been pro-rata adjusted so as to get the control input totals available at state level. It may be noted that rice, wheat, dal etc milling are included along with respective crops.

2. **Other Primary Sectors**

State wise values of output of different products under animal husbandry, forestry, fishery and mining are made available by the CSO. GVA for forestry and fishery are also made

available. All-India input structure is used to get the structures for different states. In case of animal husbandry we do not have separate estimates of GVA at state level. We have therefore used the GVA to Output ratio also based on all-India I-O table. In case of mining the values of output of different minerals are available at state level. The all-India input structures of different minerals have been used to get the mineral wise state level structures. Pro-rata adjustments are made in the structures to get the value added estimates given by the CSO for different states.

3. Manufacturing Industries

Manufacturing industries are divided into two parts registered and unregistered or organized and unorganized. For organized part the state wise values of output as well as GVA are available at 2 digit level of industrial classification (supplied by CSO). For the unorganized part, only the GVA's are available. The values of output of the unorganized part are obtained by making use of the Survey of Unorganized Manufacturing 2000-01 conducted by NSSO. The input structure is obtained by using on the raw data of ASI at state level. There are 19 sectors under manufacturing; based on ASI data, state wise as well as all-India input-output structures are constructed for these sectors. Similar structures are constructed from the all-India I-O table for the year 2003-04. ASI state structures are divided by the all-India structures and multiplied by the structures obtained from all-India I-O table. Directly the state wise structures are not used because of the followings reasons.

1. The inputs in the ASI structures are at purchaser's prices. The inputs in the all-India I-O table are at factor cost. The tables for the states are also to be constructed at factor cost. The inputs obtained by using the above method will be at factor cost. Since we do not have the trade and transport margins and indirect tax rates at the state level, we assume that these will be the same for all the states. Even at the all-India level, we do not have the reliable estimates of trade and transport margins (see Input Output Transactions Table 2003-04, CSO)
2. After getting the all-India input structures from the ASI some adjustments have to be made because of certain unspecified types of inputs.

4. Other sectors

The GVA estimated for most of the sectors are compiled by working out the estimates of SDP. For some sectors the values of output are also available. All-India input-output structures are used for state level tables.

Final Demand

Private Final Consumption Expenditure (PFCE)

NSSO survey data on household consumption expenditure for 2004-05 is used to get the sector wise estimates for different states. Based on the survey data, sector wise estimates of consumption expenditure are prepared for different states and for all-India. Sector wise estimates for a state are divided by the corresponding all-India estimates and multiplied with the all-India sector wise estimates from the I-O table 2003-04 to get the PFCE estimates for the states at factor cost.

All India estimates in the I-O table are based on the commodity flow approach. It is well known that there are differences in the estimates based on the NSSO surveys and the estimates based on the commodity flow approach. The NSSO estimates are available at purchaser's price and for regional I-O table the estimates are to be prepared at factor cost. By using the above method, we get sector wise, statewise estimates at factor cost. It is assumed that the differences are of the same proportion for different sectors over states.

Government Final Consumption Expenditure (GFCE)

Total GFCE for different states is based on their budget documents. State wise GFCE was made available to us by the CSO. The expenditure done by local authorities and the expenditure done by the central government in different states was not available. These were distributed into different states by making certain assumptions. Sector wise distribution was done by using the all-India distribution.

Gross Fixed Capital Formation (GFCF)

The estimates of gross fixed capital formation (GFCF) are not available for all the states. Some of the states have estimated the GFCF for public as well as private sectors for

construction and machinery and equipments while some others have estimated GFCF only for the public sector. For this exercise we have estimated GFCF only for 4 categories of states. The estimates are based on the proportion of component wise GFCF to GSDP of the states in each category, for which GFCF are available for both public and private sectors. The estimates obtained this way have been pro rata adjusted to make these consistent with the all-India estimates given in the all-India I-O table.

Inventories

The estimates for sectors under manufacturing are based on the ASI, while for agriculture and other primary sectors estimates of change in inventories have been taken to be nil. These are estimated only for 4 categories of states.

Exports and Imports

In this context, exports and imports mean values of commodities going out of the state and coming into the state. No estimates of the values of items going out of the states and those coming into the state are available. Railways annually compile the quantities going out of each state to different states for 78 items. For highways no such data is regularly collected. One survey was conducted by RITES for the year 1985-86. RITES has conducted another survey with reference year as 2007-08. The survey was conducted for highways. For railways, airways and shipping the data have been obtained from various official agencies like Ministry of Railways, Directorate General of Civil Aviation, and Directorate General of Shipping etc. RITES has provided us the data for 52 commodities/ commodity groups, in terms of tonnages and tonne kilometers, within the same state and from one state to other states.

We have used the data given by RITES for estimating the values of exports and imports for 4 categories of states. For items which are not available from RITES but are available from the Ministry of Railways, we have used the later source. The estimates are very rough because of the following reasons:

1. The data are available in terms of quantities and for many items these are in aggregated form. For example, the aggregate quantity of steel is available and we

cannot get the reliable values of steel going out of the state and that coming into the state.

2. The quantity of automobiles is available in tonnes, which cannot be used to get the values.
3. For some sectors the quantity of exports is more than that of imports while according to SAM the values show negative exports i.e. the value of imports is more than the value of exports. This and other problems are because of the difficulty of valuation of sectors consisting of many heterogeneous commodities like soaps and medicine in chemicals. These problems are much less in sectors like food crops, oilseeds etc.

For each sector the sum of the quantities of exports from one category of states to all other categories and corresponding imports from other categories of states to this category of state are available. These are matched with the net exports available from the I-O table to separately work out the imports as well as exports. Separate column and rows have been prepared for exports and imports to and from other countries. All India estimates of exports and imports have been divided into the estimates for different categories of states on the basis of the corresponding sector wise output levels.

Constructing SAM for Four Categories of States

This section deals with the methodology and data sources for building other blocks of SAM like division of GVA into wage and non-wage income, PFCE and personal income by various categories of households and other relevant accounts.

Division of GVA into wage and non-wage Income

Division of GVA into wage and non-wage income has been done for 41 sectors of the economy of 4 categories of states. The sources of data and methods used are given by broad sectors of the economy.

- **Agriculture and allied activities**

Population census gives state wise number of cultivators and agriculture labourers for the year 2001. This data is used to divide the wage income for the Indian economy into the wage income for four categories of states. Non-wage income is obtained by subtracting wage income from the GVA.

- **Manufacturing Industries**

For manufacturing industries wage and non-wage income are obtained by making use of data available from ASI 2003-04.

- **Other Sectors**

For all other sectors the ratios of all-India level are used.

Distribution of Sector-wise Consumption Expenditure by Occupational Categories of Households

The classification of households into classes is crucial as it gives conclusion regarding inequality and poverty. The classification can be done on the basis of expenditure levels or on the basis of occupations. In this exercise the sector wise expenditures have been divided into different occupations separately for rural and urban areas. The distribution of expenditure into occupational classes is based on the NSSO survey on consumption expenditure for the year 2004-05. The total of indirect taxes on PFCE is divided into taxes paid by different categories in proportion to the total expenditure by these categories on non-agricultural commodities, assuming that there is no tax on agricultural commodities. The total of expenditure on different sectors and taxes paid is equal to the total expenditure for each category.

Distribution of Household Income by source of Income

National Council of Applied Economic Research (NCEAR) has conducted a survey called national survey of household income and expenditure with reference to the year 2004-05. The results of this survey are published in "How India Earns, spend and saves" by Rajesh Shukla. Income and expenditure by occupation are available there separately for rural and urban areas

and also by categories of states. On our request, NCAER provided us the data according to four categories of states. From these data we got the income-expenditure ratios for all occupational categories and used these on the expenditures obtained as mentioned above, to get the incomes of these classes. For the income in terms of transfers received form Government and rest of the world, state wise population have been used to distribute these transfers into four categories of states.

References:

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2. *Input-Output Transactions Table 2003-04*, Central Statistical Organisation, Ministry of Statistics & Programme Implementation, Government of India.
3. *How India Earns, Spends and Saves*, Shukla Rajesh, National Council for Applied Economic Research, 2007
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MULTIREGIONAL SAM OF INDIA (2003-04)

(Double click on Table to open file in EXCEL)

		AGMIN RI	MANU RI	SERV RI	EDU RI	LAB RI	CAP RI	RH1 RI	RH2 RI	RH3 RI
AGMIN	RI	4225772	10963989	2596174	22546			738829	1216128	5
MANU	RI	1812060	32320597	11666934	833865			779107	1021465	5
SERV	RI	2202628	15983757	14234167	1010754			1214695	1505575	7
EDU	RI	81956	1312082	366349	351536			254219	278787	1
LAB	RI	8301944	4404266	18829307	5203989					
CAP	RI	7687473	13236523	25208354	2174707					
RH1	RI					2794135	3271444			
RH2	RI					6258485	28740			
RH3	RI					1959293	171344			
RH4	RI					4818942	13661291			
RH5	RI					1227929	4955729			
UH1	RI					3555759	5512055			
UH2	RI					12900651	1200614			
UH3	RI					1904862	389864			
UH4	RI					465950	1826448			
PVTENT	RI						3808719			
PUBENT	RI						1843610			
SGOVT	RI						564216			
SAVINV	RI						8501265	1795515	3120186	
CIS	RI									
AGMIN	MI									
MANU	MI									
SERV	MI									
EDU	MI									
LAB	MI									
CAP	MI									
RH1	MI									
RH2	MI									
RH3	MI									
RH4	MI									
RH5	MI									
UH1	MI									
UH2	MI									
UH3	MI									
UH4	MI									
PVTENT	MI									
PUBENT	MI									
SGOVT	MI									
SAVINV	MI									
CIS	MI									
AGMIN	PO									
MANU	PO									
SERV	PO									
EDU	PO									
LAB	PO									
CAP	PO									
RH1	PO									
RH2	PO									
RH3	PO									
RH4	PO									
RH5	PO									
UH1	PO									
UH2	PO									
UH3	PO									
UH4	PO									
PVTENT	PO									
PUBENT	PO									
SGOVT	PO									
SAVINV	PO									