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JOURNAL OF THE INDIAN SOCIETY OF AGRICULTURAL STATISTICS 69(3) 2015 231-242

Input-Output Transactions Tables at Regional Level*

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SUMMARY

There is a vast literature on the compilation and use of Input Output Transactions Table (IOTT). The System of National Accounts (SNA–2008), the most recent international Standard presents the Input Output framework explaining how a pair of supply and use tables may be transformed into a single symmetric input output matrix. Each of the supply and use tables shows disaggregation by products and industries. In an IOTT one of these dimensions is eliminated. Thus a single table may show the relationship between the supply and use of products or alternatively the output of industries and the demand for the output of various products among the producing industry sectors and final users (households, non-profit institutions serving households, general government, gross fixed capital formation, change in stocks, valuables and net exports) during a year for an economy/ region. The uses of IOTT are well known.

At national level, the first official IOTT, consistent with the National Accounts Statistics related to the year 1968-69 and was published by the Central Statistical Organisation (CSO) in 1978. Subsequently the CSO has been undertaking preparation and publication of IOTT for the economy on regular basis once in every five years. At regional level, however, official regional IOTT based on survey data and following SNA guidelines have not been constructed in the country by the States. Survey based methods give high accuracy but they have not been undertaken so far, mainly due to lack of resources and non-availability of required disaggregated data at regional level. Research Institutions and researchers have prepared regional IOTT for some States using non-survey, semi-survey techniques and hybrid methods under all kind of assumptions. The limitations of such efforts include borrowing input structures from national level, assuming ratios of specific final use category to GDP as invariant for economy and region, not making IOTT aggregates' and State accounts aggregate's consistent, not making any efforts to prepare the required matrices (Absorption and Make matrices, Trade and Transport matrices and the Taxes on products and Subsidies on products matrices) and not following the SNA recommendations for preparing symmetric matrices and IOTT.

This presentation considers all relevant issues for compiling IOTT at regional level and suggests a feasible methodology for constructing regional IOTT. The proposed methodology takes care of balancing of supply and uses of most services products which form a major share of total products in the economy and more importantly makes IOTT consistent with official State macro-aggregates based on survey data.

1. INTRODUCTION

The relationship of input–output was partly inspired by the Walrasian analysis of general equilibrium via inter-industry flows. The earliest reference on input-output is from François Quesnay (1758) who summed up system of political economy in Tableau économique which diagrammed the relationship between the different economic classes and sectors of society and the flow of payments between them. Wassily Leontief (1936) is considered pioneer of input-output analysis. Leontief's technique involves the use of a matrix containing the various industries of an economy, and the products they buy and sell one to another. Although of fluctuating popularity,

*Dr. V.G. Panse Memorial Lecture delivered at the 69th Annual Conference of Indian Society of Agricultural Statistics held at University of Kota, Kota during 14–16 December 2015.

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input-output analysis has been a mainstay of economics and economic policy and planning throughout the world since the middle of the twentieth century, a valuable tool in efforts to understand and maintain economic health and prosperity. Leontief won a Nobel Prize in Economics for his development of this model.

There is a vast literature on the compilation and use of input-output transactions tables and it is not the intention of this presentation to give an account of appreciation of the range of complexities of compilation and inventiveness of applications. The *Manual of Supply, Use and Input-Output Tables* and a visit to the web site of the International Input-Output Association (www.iioa.org) are good places to see the detailed investigation of the potential in this field. *The System of National Accounts* (SNA–2008) presents the Input Output framework explaining how a pair of supply and use tables may be transformed into a single symmetric input output matrix. Each of the supply and use tables shows disaggregation by products and industries. In an input output transactions table, one of these dimensions is eliminated. Thus a single table may show the relationship between the supply and use of products or alternatively the output of industries and the demand for the output of various products.

An Input Output Transactions Table (IOTT) depicts a comprehensive and detailed account of supply and use/ acquisition of various products among the producing industry sectors and final users (households, non-profit institutions serving households, general government, gross fixed capital formation, change in stocks, valuables and net exports) during a particular time period (usually a year) for an economy/ regional economy.

For the Indian economy at national level, the first official Input-Output Transactions Table (IOTT), consistent with the *National Accounts Statistics* related to the year 1968-69, was prepared jointly by the Central Statistical Organisation (CSO) and the Planning Commission and published by the CSO in its publication *National Accounts Statistics*, 1978. Subsequently the CSO has been undertaking preparation and publication of IOTT for the economyon regular basis once in every five years. Thus we have the national IOTT for the reference years 1973-74, 1978-79, 1983-84, 1989-90, 1993-94, 1998-99, 2003-04 and 2007-08 disseminated as the CSO publications in 1981, 1989, 1990, 1997, 2000, 2005, 2008 and 2012 respectively.

Somehow, at regional level preparation of supply and use tables (SUT) and IOTT based on official statistics and survey data have not been taken-up seriously. The 2008 SNA does give clear guidelines for constructing SUT and IOTT at the national level but unfortunately no specific guidelines are provided for regional IOTT or regional accounts. Some Countries (Australia, U.K.) prepare regional accounts purely by allocation. In India the official guidelines on Regional Accounts are pretty old as dates back to 1976 and no official committee has been setup to update the guidelines for regional accounts despite updating of International Standard SNA from 1968 to 1993 to 2008. No official regional IOTT using survey data has been completed so far except an IOTT for Delhi for 2007-08 for 9 sectors prepared recently by the Directorate of Economics and Statistics, Government of NCT of Delhi (DES Delhi, 2013). Unfortunately the Delhi IOTT is quite primitive on the pretext of non-availability of data on final uses and is subject to severe limitations, conceptual issues and using non-survey data. Government of Madhya Pradesh (M.P.) did establish an advisory committee few years back for constructing IOTT for M.P., but it has yet to accomplish the task. It is most desirable that the National Statistical System pays attention to the updating of recommendations on Regional Accounts including SUT and regional IOTT in view of the two important revisions of the International Standard (1993 and 2008 SNA). It is important to note that for implementing 2008 SNA recommendations on preparing sequence of accounts at the national level it is necessary to

reconcile the supply and use of products to obtain a reconciled GDP at market prices. As a corollary, thus at regional level feasible exercises on reconciling of supply and use of products are highly desirable if not essential. Once a reconciliation procedure is made feasible, exercises on regional IOTT that are technically on sound footing would become available.

It is well known that construction of IOTT needs an extensive amount of data and thus preparing a survey based regional IOTT by an individual researcher is not an easy task. The objective of this presentation is to consider issues that are relevant for understanding of regional IOTT based on survey data thus encouraging official agencies (State Directorate of Economics and Statistics, and others) for undertaking the task of preparing regional IOTT making use of all available survey data following SNA recommendations rather than the current practices followed by many researchers for compiling regional IOTT making use of non-survey methods and making all sorts of assumption on the pretext of cost and time. Researchers undoubtedly require regional IOTT for their research on regional modelling work and analytical studies. Official agencies have the responsibility to follow the most recent international Standard, SNA recommendations on preparing the national (as well as regional) accounts including SUT and IOTT.

This presentation is organized to discuss the following issues that are relevant for the construction of regional IOTT: SNA Framework for constructing IOTT at national level, Current practices and limitations of available Regional IOTT, Framework for Regional IOTT, Interpretation of Exports, Imports in Regional IOTT, Data availability on intermediate Consumption Expenditures in Regional IOTT, Data availability on Final Consumption Expenditures in Regional IOTT, Data availability on Gross Fixed Capital Formation in Regional IOTT, Data availability on Change in Stocks in Regional IOTT, Gross State Domestic Product (GSDP) at factor cost and market prices in Regional IOTT, Trade-Transport margins, Taxes on products, net of subsidies in the Regional IOTT, Methodology of Construction of Regional IOTT, Supply and Use Tables for Regions.

1.1 SNA Framework for Constructing IOTT at National Level

A standard IOTT can be viewed as consisting of three major components (also known as blocks or quadrants). First quadrant depicts purchases of various products as intermediate uses by the industries or supply of various products to the producing industries, basically the transactions of various products to different industries. Second quadrant shows the acquisition of products by categories of final users, namely households (household final consumption expenditures (HFCE) or private final consumption expenditure (PFCE) if final consumption expenditure of Non-profit institutions serving households is merged with HFCE), general government (government final consumption expenditures (GFCE) that includes central, state and local government units), gross capital formation (comprising gross fixed capital formation (GFCF), change in stocks (CIS) and valuables), and net exports. The elements in the second quadrant are final uses of various products produced within the economy that are available from domestic production, stocks as well as imports. The third quadrant shows primary inputs that generate in the various industries producing their outputs or the payments to the owners of resources in the industries. These include payments to the owners of resources namely Human (compensation of employees), Natural (rent to the owner of land, mines, other natural resources), Produced (gross capital formation) and Financial (interest), making the gross value added (GVA) comprising the compensation of employees and operating surplus (2008–SNA).

Construction of national level IOTT requires compilation of two basic matrices namely the Absorption matrix and Make matrix. The Absorption matrix is compiled initially at

purchasers' price, making use of the input data of various industries shown in columns of the first quadrant. The second quadrant shows in columns the various final uses by products. The third quadrant as explained above shows GVA or the primary incomes that generate in the various industries.

Using the following notations the Absorption matrix is placed:

$\mathbf{X_{ij}}$: $\mathbf{i}^{th}$ product use by industry **j** for its production $\mathbf{g_j}$; Matrix **X**: $\mathbf{(X_{ij})}$

$\mathbf{V_j}$: Gross Value Added (GVA) generated in $\mathbf{j}^{th}$ industry; $\mathbf{g_i}$: Output of $\mathbf{i}^{th}$ industry

$\mathbf{C_i}$: Private Final Consumption Expenditure (PFCE) of $\mathbf{i}^{th}$ product

$\mathbf{G_i}$: Government Final Consumption Expenditure (GFCE) of $\mathbf{i}^{th}$ product

$\mathbf{F_i}$: Gross Fixed Capital Formation of $\mathbf{i}^{th}$ product; $\mathbf{S_i}$: Change in Stocks of $\mathbf{i}^{th}$ product

$\mathbf{E_i}$: Exports of $\mathbf{i}^{th}$ product; $\mathbf{I_i}$: Imports of $\mathbf{i}^{th}$ product; $\mathbf{q_i}$: Output of $\mathbf{i}^{th}$ product.

To / Industry Products	Inter Industry Use					Final Use						Product Output
	1	2	. .	j	. .	n	PFCE	GFCE	GFCF	CIS	Export	Import (-)	
1	X_{11}	X_{12}	. .	X_{1j}	. .	X_{1n}	C_1	G_1	F_1	S_1	E_1	I_1	q_1
2	X_{21}	X_{22}	. .	X_{2j}	. .	X_{2n}	C_2	G_2	F_2	S_2	E_2	I_2	q_2
.	.	.	. .	.	. .	.	.	.	.	.	.	.	.
i	X_{i1}	X_{i2}	. .	X_{ij}	. .	X_{in}	C_i	G_i	F_i	S_i	E_i	I_i	q_i
.	.	.	. .		. .	.	.	.	.	.	.	.	.
n	X_{n1}	X_{n2}	. .	X_{nj}	. .	X_{nn}	C_n	G_n	F_n	S_n	E_n	I_n	q_n
Primary Inputs	V_1	V_2	. .	V_j	. .	V_n							
Industry Output	g_1	g_2		g_j		g_n	C	G	F	S	E	I (-)	X

Fig. 1. Absorption Matrix

It may be noted that industries produce products and by-products. Thus output of industry **i** $\mathbf{(g_i)}$ would not be equal to $\mathbf{i}^{th}$ product output in the economy $\mathbf{(q_i)}$. However in the economy total output from all industries $\mathbf{(\sum g_i's)}$ would be equal to the total output of all products $\mathbf{(\sum q_i's)}$. The Absorption matrix is a Product x Industry matrix.

Make Matrix **(M)** is the output matrix of products and by products (at basic prices). Rows represent industry groups and columns represent Product groups. Thus the outputs $\mathbf{q_i}$ of products are obtained from the Make (Output) matrix of products and by products (at basic prices). Let $\mathbf{m_{ij}}$ denote output of $\mathbf{j}^{th}$ product produced by $\mathbf{i}^{th}$ industry; industry output $\mathbf{(g_i)}$ is row total. A Make matrix, **M**: $\mathbf{(m_{ij})}$ is an Industry x Product matrix and would appear as

To / from Industries	Products							Industries Output
	1	2	. .	j	. .	n		
1	m_{11}	m_{12}	. .	m_{1j}	. .	m_{1n}		g_1
2	m_{21}	m_{22}	. .	m_{2j}	. .	m_{2n}		g_2
.	.	.	. .	.	. .	.		.
i	m_{i1}	m_{i2}	. .	m_{ij}	. .	m_{in}		g_i
.	.	.	. .		. .	.		.
n	m_{n1}	m_{n2}	. .	m_{nj}	. .	m_{nn}		g_n
Products Output	q_1	q_2		q_j		q_n		

Fig. 2. Make Matrix

The Make matrix cross tabulates the products and by-products of the various industries to generate the outputs of various products $\mathbf{(q_i)}$ at basic prices. It needs to be noted that the row totals in the absorption matrix $\mathbf{(q_i)}$ above are at purchaser's prices whereas the $\mathbf{(q_i)}$ from Make matrix are at basic prices. Thus an important task of constructing the IOTT is to reconcile the generated product outputs $\mathbf{(q_i)}$ at purchaser's prices from the absorption matrix with the product outputs $\mathbf{(q_i)}$ which are at basic prices obtained from Make matrix and duly converted to purchaser's prices making use of the estimated product-wise trade-transport margins including the taxes on products less subsidies on various products.

As mentioned above, the IOTT at purchaser's prices is arrived at after completing the balancing exercise of the absorption matrix. The IOTT at basic prices is derived from the one at purchaser's prices by removing the components of trade margins, transport margins, taxes on products, subsidies (with negative sign) on products from each of the entries of the absorption matrix (input flow matrix at purchaser's prices) and placing in a column sum total of all trade (transport) margins culled out from entries that are goods in that column against the trade (transport) row. The

taxes on products net of subsidies on products removed from the entries of each of the columns are then placed as a separate row showing the net taxes on intermediate inputs of the industries in the first quadrant and in the final use categories the net taxes on products in the final use category in the IOTT.

Further it is important to mention that the analysts require for product or industry planning the pure matrices Product x Product or Industry x Industry rather than the Product x Industry matrix available in the above mentioned absorption matrix which is prepared at basic prices. Such matrices are simple mathematical derivations under appropriate assumptions like industry technology assumption/ product technology assumption or a mixed technology assumption. The technology assumptions are in fact for transferring the outputs of secondary products and are as under.

Industry Technology assumption is one where input structure of a secondary product is considered to be similar to that of the industry where it has been produced.

Product Technology assumption is one where input structure of the secondary product is assumed to be similar to that of the industry where it is primarily produced.

Under any of these assumptions the pure matrices can be derived making use of the basic matrices and derived matrices of make matrix, namely the Product Mix and Market Share matrices **C** and **D**.

C: Product Mix Matrix: the columns of which show the proportions in which a particular industry produces various products, $\mathbf{C = M' g^{*-1}}$

D: Market Share Matrix: the columns of which show the proportions in which various industries produce the total output of a particular product, $\mathbf{D = M q^{*-1}}$

Where, $\mathbf{q^*}$, $\mathbf{g^*}$ are diagonal matrices and so are their inverse.

Symmetrical or Pure Matrices under two assumptions are summarized in the following Table:

Table 1

	Product	Industry	Final Demand
Product	$A=BC^{-1}$ (Product Tech. Ass.) =BD (Ind. Tech. Ass.) $W=Aq^*$	$B=Xg^{*-1}$	f
Industry	Product Mix Matrix $C=Mg^{*-1}$ Market share Matrix $D=Mq^{*-1}$	$E=C^{-1}B$ (Product Tech. Ass.) =DB (Ind. Tech. Ass.) $Z=Eg^*$	$\phi=C^{-1}f$ (Product Tech. Ass.) $\phi=Df$ (Ind. Tech. Ass.)

Where the matrix notations used are:

X: (X_{ij}) Product × Industry matrix

M: (X_{ij}) Industry × Product matrix

B: Product × Industry coefficient matrix

ϕ: Final use of the industry output mix

A: Product × Products coefficient matrix

W: Products × Products flow matrix

E: Industry × Industry coefficient matrix

Z: Industry × Industry flow matrix

F: Final use of products

Importance of IOTT is well known for its various analytical uses. Leontief (1936) was pioneer of IO analysis giving use of IO model under homogeneity assumption and illustrating with the US economy. In reality industries produce products, by-products and other products and it is the SNA (1968) that considered no homogeneity assumption and provided the methodology of constructing IOTT elaborated above. It is clear from above that when we consider pure Product × Product matrix of the IOTT, the matrix equation derived from the rows appear as $\mathbf{Aq + f = q}$ which implies the Leontief

model as $\mathbf{q = (I-A)^{-1} f}$. The model found its uses in the planning of products. Similarly for planning of industries, the Leontief model appears as: $\mathbf{g = (I-E)^{-1}\phi}$. There are several uses of IOTT like backward/ forward linkages, relationship of prices to wages and profits derived from the columns as $\mathbf{P = (I-A)^{-1} (W + \pi)}$, where **P** denotes price vector, **W** the wage vector and the profit vector (Leontief, 1937). The Leontief inverse $\mathbf{(I-A)^{-1}}$ actually depicts the sum of direct and indirect requirements of producing the required final demand since $\mathbf{(I-A)^{-1} = I + A + A^2 + A^3 + \ldots}$ the terms $\mathbf{A + A^2 + A^3 + \ldots}$ accounting for indirect requirements. Impact of taxes or subsidies on products taking all direct and indirect impacts, man power planning and transport planning are some other uses of IOTT.

1.2 Current Practices and Limitations of Available Regional IOTT

So far none of the State Directorates of Economics and Statistics (DESs) has attempted a regional (State) IOTT based on survey data and following SNA guidelines. Survey based methods give high accuracy but they have not been undertaken so far, mainly due to lack of resources and non-availability of required disaggregated data at regional level. Researchers however have been trying short cuts using non-survey and semi survey techniques in the construction of regional IOTT. Efforts of researchers are stated below.

Construction of regional IOTT in India by researchers dates back to early eighties. A large number of studies dealing with methodology and construction of regional input tables have been made (Venkatramaih, 1979; Alagh, Bhalla and Kashyap, *et al.*, 1980; Saluja and Bhalla, *et al.*, 1990; Saluja and Sharma, 1991, 1992; Swaminathan, 2008; Dhal and Saxena, *et al.*, 2005; Goswami, 2005). Beside, in literature researchers have also advocated in several studies for constructing regional IOTT using non-survey methods/ hybrid methods/location quotient methods (Round, 1978; Flegg *et al.*, 1995; Flegg and Webber, 1997, 2000; Lahr, 1993, 2001; Okamoto and Zhang, 2007; Bonfiglio and Chelli, 2008; Swaminathan, 2008; Sinha Anushree, 2009, 2011; Inderjeet Singh and Lakhvinder Singh, 2011). Official IOTT at regional level have not been taken-up seriously.

As mentioned above Research Institutions and researchers have prepared IOTT for certain States but adopting all kind of assumptions, following non-survey methods, borrowing input structures from national level, assuming ratios of specific final use category to GDP as invariant for economy and region, not making IOTT aggregates' and State accounts aggregate's consistent, considering more than one final use categories (exports, imports, change in stock, NPISH final use) as residual and not making any efforts to prepare the required matrices (Absorption and Make matrices, Trade and Transport matrices and the Taxes on products and Subsidies on products matrices) and not following the SNA recommendations for preparing pure matrices and IOTT.

1.3 Framework for Regional Input Output Transactions Table (IOTT)

A regional IOTT in principle should appear exactly similar to the one for the economy mentioned above in the form of absorption matrix, to start with at purchaser's price with of course, a redefined interpretation of exports/ imports from other regions (States for example) and other countries (or rest of the World).

1.4 Interpretation of Exports, Imports in the Regional IOTT

In regional IOTT exports could be to the other regions within the country or to the other countries. Similarly imports could be from the other regions within the country or from the other countries. Important point to be noted is that in an open economy for a region exports/ imports information is not readily available with the official statistical system. Thus special surveys are required to obtain such information of export/ import for a region to/ from other regions in the economy as well as from Rest of the World countries. Since it is a difficult task it would be

necessary to find other options to deal with the situation. One possible way out to deal with could be to treat net export as a residual category of final use assuming domestic output as firm.

1.5 Data Availability on Intermediate Consumption Expenditures in the Regional IOTT

Data availability on intermediate consumption expenditures of various industries in the Regional State IOTT is not a serious issue since all States compile their GVA estimate using information on output and intermediate consumption. What all needed is the break-up of intermediate consumption by products. This should not pose serious problem as information from public sector parts can be culled out from the analysis of respective budget documents/ annual reports. For private sector part, information from Enterprise surveys can be used. Beside now we also have access to MCA21 database for corporate sector part wherever required. For agriculture sectors use should preferably made of Cost of Cultivation Studies of the State. Organized mining and manufacturing sector detailed data is available from Indian Bureau of Mines and Annual Survey of Industries. Borrowing input structures of industries from national level IOTT should be the last resort.

1.6 Data Availability on Final Consumption Expenditures in the Regional IOTT

At present in the official IOTT prepared for the Indian economy, Private Final Consumption Expenditure (PFCE) is considered as one of the category of final consumption expenditure. Conceptually PFCE is the sum total of the Household Final Consumption Expenditure (HFCE) and the Final Consumption Expenditure of the Non-Profit Institutions serving Households (NPISH). Information on final consumption expenditure of NPISH is still not available in the official statistical system, though the census numbers on NPISH are now available. Thus the present practice followed at national level final consumption expenditure compilation as well as the final use in IOTT is to consider PFCE instead of HFCE and NPISHFCE separately since surveys to capture final consumption expenditure of NPISH have not been conducted as yet. For regional IOTT it is, however, not feasible to take PFCE as the final use category and compile it following the commodity flow approach as done at the economy level since the information on net export be side PFCE is not available at the regional level. Estimates of HFCE at State (region) can however be obtained using the results of Household Consumption Expenditure Surveys conducted by the NSSO quinquennially. Estimate of NPISHFCE at regional level can be worked out either applying a proportion of PFCE to HFCE at national level or assuming ratio of PFCE to Gross Domestic Product invariant at regional and economy level.

Estimation of Government Final Consumption Expenditure (GFCE) at State level does not pose any technical problem since through the analysis of the State (as a region) government and the local bodies' budget documents of the State and taking central government expenditure allocation for the State provides the conceptually correct GFCE estimate. Yes!, it has to be estimated by type of product and thus deeper analysis including obtaining details of expenditure from the various departments/ offices of government units as done at the national level needs to be undertaken. Care need to be taken for local bodies'final consumption expenditure as also the final consumption expenditure of the NPISH serving Government which are considered along with the government sector as per the SNA recommendations.

1.7 Data Availability on Gross Capital Formation in the Regional IOTT

Gross Capital Formation has three components namely Gross Fixed Capital Formation (GFCF), Change in Stocks (CIS) and Valuables. The GFCF appear in the IO framework as column showing the acquisition *less* disposals of capital assets by the producers in the economy by type of product, CIS appear as a column showing the various products that are goods and held by the producers

or traders, and valuables also appear in a column by type of product. Information on net acquisition of valuables is as on date quite scanty and most States do not publish information on valuables acquired in the regional economy. Despite necessary guidance and encouragement provided by the Central Statistics Office (CSO), not all States are compiling estimates of GFCF. Even the States that prepare GFCF estimates are mostly doing for only public sector only.

Let us discuss the issue of compiling estimates of GFCF by type of asset at the State level since that is what is required in the IOTT framework for the State. The GFCF by type of asset basically includes construction and 'machinery and equipment'. Of course other items as per 2008 SNA would include expenditures on Intellectual Property Products (which include research and development, software, databases, mineral exploration/ evaluation, etc.), increase in cultivated biological resources (increment in livestock, plantation) and certain asset acquisition by defence forces (not yet included in the national accounts). It may be mentioned that the construction output is already estimated by the State DESs in the course of compiling their domestic product estimation exercises making use of the allocation of main items like cement and Iron and Steel. The *Kuchha* construction is obtained by expenditure method.

The construction output comprises of gross fixed capital formation portion and current expenditure in the form of repairs and maintenance. The estimate of GFCF in the form of construction thus can be arrived at by knocking out the estimated repairs and maintenance expenditure from the estimated construction output. The estimate of GFCF in the form of 'machinery and equipment' can be obtained using relevant information from institutional sectors namely public and private sector. Public sector comprises of the general government administrative departments, departmental commercial undertakings (DCU) and non-departmental commercial undertakings (NDCU) enterprises. Information relevant to GFCF in the form of 'machinery and equipment' is obtainable by analyzing the budget documents/ annual reports of these institutions. As regards private sector part, the Annual Survey of Industries (ASI) does provide registered part and unregistered part could be estimated using information from Enterprise surveys. It may be mentioned that the ASI somehow does not capture GFCF expenditure as many times the capital acquisition takes place at the instance of the Headquarters and not the establishment from where the ASI schedules are canvassed.

For the new series (Base Year 2011-12), estimates for the non-financial private companies have been prepared using the database created under an e-governance project, called MCA21, by the Ministry of Company Affairs. It is perhaps possible to build up estimates of GFCF for the corporate sector for a State since State code is available in the MCA21 database. The only problem visualized would be that the information of the Company location pertains to time of registration and a company may have its unit in another State and not exactly the State where it got registered under Company Law? In any case this new database has to be explored to provide the valuable information on GFCF in the corporate sector.

Beside above, it may be mentioned that the CSO has recently attempted estimates of GFCF of all States taking public sector part from the actual analysis of budgets/ reports and private sector part probably by allocation of national level information. This needs to firm-up with the interaction/ collaboration with State DESs and further examination and exploitation of MCA21 database. It is true that the use of corporate sector data at State level is still a challenge. In short though perfectly feasible, greater effort is still needed to compile reasonable estimates of GFCF by type of assets for regions.

1.8 Data Availability on Change in Stocks in the Regional IOTT

The estimates of Change in Stocks (CIS) at national level are compiled by type of institution,

namely (i) Public Non-Financial Corporations, (ii) Private Non-Financial Corporations, (iii) Public Financial Corporations, (iv) Private Financial Corporations, (v) General Government and (vi)Households including NPISH. The estimates of CIS are not readily available for regions. Therefore, the estimates of CIS at State level need to be prepared by the State DESs following the institutional approach as at national level even if it is not perfect. CSO can help in encouraging the DESs also by making available such estimates prepared by type of institutions and allocated to States appropriately.

The information on Valuables category is now available at national level. This can appropriately be allocated to States and thus requires cooperation of CSO in this regard.

1.9 Gross State Domestic Product (GSDP) at Factor Cost and Market Prices

The States at present compile Gross State Domestic Product (GSDP) at factor cost prices only. It should be noted that as per 2008 SNA the GDP is always at market prices. Thus the GSDP estimates at factor cost compiled by the State DESs are in fact not the GDP estimates for the States but only the Gross Value Added estimates that get generated in the process of production activity in the States. For obtaining the estimates of GDP of the State which should be at market prices we need to add the net indirect taxes to the GVA (which at present is termed as GDDP at factor cost prices) of the State.

For implementing 2008 SNA recommendations all the States need to compile their estimates of GVA at basic prices by considering the output at basic prices and subtracting the intermediate consumption at purchasers' prices. In fact most of the times it is being inadvertently done that way only and thus the estimates of GVA are in a way there at basic prices only. Indirect taxes have to be distinguished between the taxes (subsidies) on products and taxes (subsidies) on production. Taxes (*less* subsidies) on production are inside the GVA at basic prices. Taxes on product less subsidies on product are to be added to the GVA at basic prices to get the GDP of the State which is always at market prices. The CSO has since completed the task of compiling the estimates of net indirect taxes at State level for the estimation of GSDP at market prices. What remains now is to modify the methodology to provide the estimates of taxes on products less subsidies on products for the States instead of net indirect taxes. This has been already done by the CSO for the new series with base year 2011–12 of national accounts. The States can thus come out with the estimates of their GSDP that will be at market prices by adding the taxes on p.

1.10 Trade-Transport Margins, Taxes on Products, Net of Subsidies in the Regional IOTT

Trade transport margins on products for the region (State) are required to make adjustments on product output which is at basic prices when taken from the Make matrix, to convert it at producer's prices. Actually transport margins are required by type of transport activity (Railway, Road, Water, Air, others) separately. These margin rates are required also for converting the input-flow entries in the absorption matrix which are at purchasers' price, to producers' price. Components of trade and categories of transport margins on goods are to be removed from each of the entries in the columns of absorption matrix and placed against the respective (Railway, Road, Water, Air, others) row in the column.

Taxes on products and subsidies on products information is required to make adjustments on product outputs at producers' prices to convert them at purchaser's prices. The product outputs at basic prices that are taken from Make matrix and converted to purchasers' prices by first adding the trade-transport margins and then the taxes on products less subsidies on products are used for reconciliation exercise of IOTT at national level. For the Regional (State) IOTT it is proposed to use these product outputs at purchasers' prices as control totals of the rows of absorption matrix and derive the net exports entries as residuals. These taxes on products and subsidies on products rates are required also for

converting the above mentioned input-flow entries in the absorption matrix which are at producers' prices, to basic price. Components of net taxes on products on both goods and services are to be removed from each of the entries in the columns of absorption matrix and placed as a separate row at bottom.

As explained above, information on trade transport margins as well as taxes on products and subsidies on products is required for two purposes, one to obtain the product outputs at purchasers' prices and two to convert the input flow at purchaser's prices to basic prices. The CSO and the State DESs need to put necessary efforts to get to the requisite information and share such information to firm-up the rates involved and improve quality of IOTT compilation exercises.

1.11 Methodology for Construction of Regional IOTT

Having put forward the guidelines for compilation of Make matrix and Absorption matrix and its input flow conversion at basic prices, it should be fairly easy to construct pure matrices, namely Product x Product or Industry x Industry under appropriate (Industry or Product) Technology Assumption for transferring of by-products. Hence the auther proposes a feasible methodology for constructing the Regional IOTT. Of course, it requires availability of data for Absorption and Make matrices, Trade and Transport matrices and the Taxes on products and Subsidies on products matrices. The ideal methodology would require availability of information on exports and imports for the region concerned which means that not fixing the estimated net exports (exports less imports) in the Adoption matrix as residuals, and reconciling the supply and uses at purchasers' prices as done in the case of IOTT at national level. To have the estimates of exports/imports for the region we would require conducting specific Origin-Destination kind of surveys for goods transportation. Until such information on inter-state transportation (exports and imports) becomes available, it is suggested as a practical provisional solution to the problem that we estimate net exports by product of those products that are goods by residual (commodity flow) approach assuming the estimated product output at purchasers' prices fixed as already mentioned earlier. Thus the Absorption matrix framework would appear as under:

To / Industry Products	Inter Industry Use										Final Use					Product Output
	1	2	.	.	j	.	.	n	PFCE	GFCE	GFCF	CIS	Net Export	
1	X_{11}	X_{12}	.	.	X_{1j}	.	.	X_{1n}	C_1	G_1	F_1	S_1	NE_1	q_1
2	X_{21}	X_{22}	.	.	X_{2j}	.	.	X_{2n}	C_2	G_2	F_2	S_2	NE_2	q_2
.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
i	X_{i1}	X_{i2}	.	.	X_{ij}	.	.	X_{in}	C_i	G_i	F_i	S_i	NE_i	q_i
.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
n	X_{n1}	X_{n2}	.	.	X_{nj}	.	.	X_{nn}	C_n	G_n	F_n	S_n	NE_n	q_n
Primary Inputs	V_1	V_2	.	.	V_j	.	.	V_n						
Industry Output	g_1	g_2			g_j			g_n	C	G	F	S	NE	X

Fig. 3

One important point that needs to be highlighted here is that it is true that preparation of regional level IOTT poses data problems (non-availability) of exports and imports of products (primarily goods), however for most services (since few services are exported/ imported) reconciliation exercises of supply of product (service) outputs (from Make matrix converted to purchasers prices meaning including net taxes on products) and use of product (generated in the respective row of Absorption matrix) should be undertaken to remove inconsistencies. Net export of most goods may be obtained as residual considering the product output from Make matrix duly converted to purchasers' prices as fixed. Beside information about import/ export on certain specific products (that are goods) like crude to a refinery or a mineral ore are readily available in the statistical system. Thus for such products as well we need to reconcile the supply and use of goods. Since services sectors contribute major share (about two third) in the economy, the reconciliation exercise is applicable for major part of products in the economy.

1.12 Supply and Use Tables at Regional Level

As per 2008 SNA at the national levela Supply and Use Tables(SUT)is required to be prepared for reconciling the supply and use of various products

and thus obtaining a unique figure of GDP that is consistent with all the three approaches namely, production, income and expenditure on final demand. This GDP obtained from production approach is then used as proxy of income and complete sequence of income accounts are derived. However at regional level preparation of SUT poses difficulties on account of open economy and thus non-availability of export and import data beside final consumption expenditure of NPISH. Also at regional level there are problems related to data requirements as well as some conceptual issues (like resident units, supra-regional sectors) and coverage (exclusion of high sea operations, Armed forces, etc.).

One important point that needs to be highlighted here is that it is true that preparation of regional level SUT poses data problems (non-availability) of exports and imports, however for most services (since few services are exported/ imported) reconciliation exercises of supply of product outputs (from Make matrix converted to purchasers prices meaning including net taxes on products) and use of product (generated in the respective row of Absorption matrix) should be undertaken to remove inconsistencies. Since services sectors contribute major share in the economy, the reconciliation exercise is possible for major part of products in the economy. Beside information on certain specific items like crude to a refinery or a mineral ore import/ export are readily available in the statistical system.

1.13 Concluding Remarks

IOTT of Indian economy at national level are regularly prepared and published by the CSO following strictly the guidelines of the international Standard, the SNA. SNA however does not provide any guidelines for Regional Accounts or Regional IOTT. Since official State statistics is the responsibility of State DESs, they compile their State income and accounts following uniform concepts and methodology that came from the Final Report (1976) of the Regional Accounts Committee set up by CSO which is naturally based on the framework of that time, the 1968 SNA. It is high time to review the recommendations for compiling State income and accounts including SUT, IOTT at regional level.

The suggestions made in this paper for compiling the regional SUT and IOTT can be used as base paper for the deliberations of Regional Accounts review.

The methodology suggested in this paper for constructing regional IOTT would need review after few attempts by the State DESs and fresh availability of survey data.

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