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Service Boom in the Indian Economy : An Analysis of Causal Influences

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Madhusudan Datta*

Abstract *The paper decomposes the influence behind the growth of value added in service activities in the Indian economy over three decades into three components – the final-demand effect, input-structure effect and reallocation effect – and makes empirical assessments thereof. In terms of the influences the behavior of the group of services used basically as intermediate inputs, designated as category-I services, was distinct from the rest of heterogeneous services combined as 'community, social and personal services'. The study finds that apart form the final demand effect, the other two influences too played very important but different roles in different phases of growth.*

JEL Classification : L8, O14
Key Words : Service sector, Intermediate demand, Final demand effect, Input-structure effect, Reallocation effect

I. Introduction

The sharply rising share of the tertiary or the services sector in GDP of the Indian economy in recent times, defying the stylized facts summarized by Kuznets (1971) regarding the evolving pattern of sectoral shares in the course of development of an economy, has generated a lot of interest (World Bank, 2004). Relative GDP shares of the major sectors change in the course of development in conformity with change in the structure of final demand. The associated change in the production structure involves not only expansion in scale but also technical change[1], including change in production organization, and market structure. Change in production organization includes emergence of specialized service providers and consequent splintering of activities (Bhagwati, 1984; Inman, 1985). The process is supposed to favor the service sector at the cost of the share of the secondary sector in particular.

By way of illustration, it is not difficult to see the intimate relationship between finance and other activities. The more advanced does the

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corporate structure become, the more intimately do the companies get connected to financial institutions[2]. The tendency of business corporations these days seems to be to splinter away financial functions and outsource them from specialized financial institutions. While the development of the financial infrastructure is a sine qua non for modern economic growth (Singh, 2008; Masih, et. al., 2009) the greater part of the product of financial institutions constitutes an intermediate input of other productive sectors. As such, and to that extent, the rapid growth of financial services (unlike final services like education and health) do not directly add to the aggregate value of *final* goods and services domestically produced (GDP). Thus a full understanding of the relative growth of the tertiary sector requires a distinction between the influence of rising importance of services in final expenditure and that coming from other sources. With this in view the present paper seeks to make some quantitative assessment of the major influences on sectoral shares using the input-output transactions tables (IOTT) of the Indian economy.

Our study is based principally on three IOTTs – those for 1973-74, 1993-94 and 2003-04. In section-II of the paper we take a quick look at the basic facts about the changing structure of the Indian economy over the last five and a half decades and the related literature. The section also discusses some conceptual issues relating to constant-price estimates. Section-III illustrates, taking the case of trade and transport services, the important role of demand for services as intermediate-inputs. This consideration brings forth the importance of technical and organizational changes in the evolving sectoral composition through changes in intermediate input coefficients. Based on the nature of demand we have divided the services into two categories: category-I includes those services demanded basically for intermediate use while the other category called community, social and personal services (CSP) club together services demanded basically for final use. Section-IV suggests a decomposition of the growth of value added into three components – growth caused by change in final demand abstracting from associated changes in the technology matrix and the market structure, growth caused by change in the structure of input demand reflected in the technology matrix and finally, that caused by reallocation of value added among sectors caused by both changes in technology and market structure. Section-V makes an empirical assessment of the role of the three causes for the Indian economy during the two decades to 1993-94 and the next decade to 2003-04. Section VI draws the conclusion of the study.

2. Issues Regarding Changing Sectoral Shares

2.1 Basic Facts

Tables 1 and 2 present the relative sectoral shares in GDP at current and constant prices respectively. The share of the tertiary sector increased all through and particularly rapidly during the last one and a half decades[3]. The share of the secondary sector also rose similarly during the first four decades but only falteringly during the subsequent period. Thus the tertiary sector captured almost the whole of the share lost by the primary sector in the nineties and thereafter. *The current and constant price estimates give remarkably similar results in this regard*[4].

Table 1: Shares of Major Sectors in GDP* at *Current Prices*: Percentage Distribution of 2-yearly Averages.

Year	Prim-ary	Secon-dary	Tertiary	*(Shares of Sub-sectors in Tertiary Sector GDP)*						
				THR	*TSC*	*only C*	*FIRB*	*only FI*	*only B*	*CSP*
1950-52	55.8	14.6	29.6	*21.2*	*11.6*		*34.8*	*3.0*		*32.4*
1960-62	46.1	19.7	34.3	*22.2*	*12.2*		*35.3*	*3.5*		*30.4*
1970-72	44.7	20.8	34.5	*25.2*	*12.4*	*1.7*	*30.8*	*5.5*	*0.5*	*31.7*
1980-82	37.8	24.7	37.6	*32.1*	*12.4*	*1.7*	*24.8*	*8.5*	*0.9*	*30.7*
1985-87	32.7	26.2	41.1	*31.5*	*13.4*	*1.7*	*24.8*	*8.8*	*1.4*	*30.2*
1990-92	30.9	26.6	42.5	*29.8*	*14.4*	*2.4*	*26.0*	*11.2*	*1.4*	*29.8*
1995-97	28.3	26.2	45.6	*34.0*	*16.0*	*2.9*	*24.7*	*13.4*	*1.2*	*25.4*
2000-02	22.4	24.7	52.9	*29.0*	*15.2*	*3.0*	*26.7*	*11.2*	*4.8*	*29.2*
2005-07	17.6	27.5	55.0	*31.6*	*16.1*	*3.8*	*26.5*	*10.6*	*7.1*	*25.9*

Note : * At factor cost;

Abbreviations – THR : trade, hotels and restaurants; TSC: transport, storage and communications; C: Communication which is a part of TSC. FIRB: Finance, insurance, real estate and business services. FI and B are parts of FIRB. CSP: community, social and personal services.

Sources **:** *Given in table-2 below.*

Table 2: Shares of Major Sectors in GDP* at *1993-94 Prices*: Percentage Distribution of 2-yearly Averages

Year	Prim-ary	Secon-dary	Tertiary	*(Shares of Sub-sectors in Tertiary Sector GDP)*						
				THR	*TSC*	*only C*	*FIRB*	*only FI*	*only B*	*CSP*
1950-52	57.2	14.9	27.8	*30.9*	*12.2*	*1.4*	*23.1*	*3.4*	*1.6*	*33.1*
1960-62	52.1	18.7	29.2	*34.1*	*13.8*	*1.8*	*20.5*	*4.6*	*1.3*	*31.6*
1970-72	45.6	21.8	32.5	*33.7*	*14.6*	*2.2*	*18.4*	*5.4*	*1.0*	*33.4*
1980-82	39.6	23.9	36.5	*33.5*	*17.0*	*2.7*	*18.1*	*6.4*	*1.0*	*31.4*
1985-87	35.4	25.1	39.5	*32.3*	*16.1*	*2.6*	*21.0*	*8.2*	*1.1*	*30.6*
1990-92	31.8	27.0	41.3	*30.3*	*15.4*	*2.5*	*24.7*	*10.9*	*1.7*	*29.7*
1995-97	28.2	27.9	43.8	*31.9*	*15.8*	*3.4*	*26.0*	*12.3*	*3.0*	*26.3*
2000-02	24.0	26.9	49.1	*30.2*	*16.9*	*5.8*	*25.5*	*13.3*	*3.6*	*27.4*
2005-07	18.6	27.7	53.7	*29.0*	*22.8*	*11.6*	*24.7*	*13.4*	*4.8*	*23.5*

Note: Business Services (B) incorporates freshly available data on computer services, renting of machinery and R&D from 1999-2000 onwards; * At factor cost.
Source : Calculations for tables 1 and 2 are based on various issues of *National Accounts Statistics*, CSO.

Using the concept of Net Material Product (Beckerman,1991) of erstwhile socialist countries, Datta (1989 and 2001) shows that rapid growth of the service sector did not affect the balance between final goods and services in the Indian economy until early nineties. After that, however, the balance tilted and gradually the share of final services in GDP creeped up a little towards the end of the century. The pace must have picked up after that though we do not have estimates. Analysts have tried to understand the phenomenon of coming into prominence of the service sector. Many have pointed to the gradual rise in the service intensity of

the industrial sector in particular (Bhowmik, 2003; Sastry, et.al, 2003 and Gordon and Gupta, 2004) as an explanation[5]. Banga and Goldar (2007) reached the same conclusion using growth accounting.

Other possible causes cited by analysts rather cursorily are splintering and higher income elasticity for services. However, it needs to be pointed out that splintering is accounted for in rising service intensity[6] and while higher income elasticity may cause rise in service's share in consumption, that is at least partially balanced, so far as GDP shares are concerned, by rising share of investment in GDP as investment consists of, almost entirely, final goods. Rakshit (2007) has shown convincingly that the rapid growth of service exports since mid-nineties must be an important explanation for the prominence of the service sector as well as the rapid growth of the Indian economy over the relevant period.

In contrast to the behavior of the major sectors, when we come to the sub-sectors of the tertiary sector we find the *relative shares as well as their trends to be substantially different between current and constant price estimates*. Thus, trade's (THR) share at current prices show upward trend during the first three decades, though not subsequently. But constant price estimates show a different behavior. In view of the divergent trends the question arises which one is more appropriate? Before taking up the issue we should point to a basic fact. Both current and constant price estimates in tables 1 and 2 establish very fast growth of communication (part to TSC) and business services (part of FIRB) surpassing that of any other sub-sector over the last decade.

2.2 Constant or Current Price Estimates?

When we use constant price estimates the idea is that we have discounted for price changes and, therefore, what we deal with are real changes. Naturally, the question is *what does real (or constant price) value added (VA) represent?* It is often supposed to be an estimate of the difference between outputs and inputs of a production process when both are

evaluated at respective base year prices. This double-deflation procedure ensures that aggregate real VA is equal to the sum total of sectoral final uses at constant prices just as it is true (being a national accounts identity) for current price evaluation. But the problem is that we are evaluating current year quantities at base year prices. This violates the norm of allocative efficiency that requires input substitution when relative prices change. This makes constant price VA obtained by double deflation unworthy of interpretation as what the current year level of output would have generated for distribution among primary factors had it been produced in the base year.

In obtaining the constant price VA the Central Statistical Organization of India (CSO) does not follow a uniform procedure for all the sectors. It adopts ad hoc procedures depending on the availability of data (CSO, 2007); the focus of the estimates seems to be a quantum index. The CSO, indeed, factors the current price value added into price and quantum indices (statement 3, CSO, 2008). Such an approach inevitably makes drastic conceptual compromises particularly in the cases of services where the concept of quantity is rather vague (Hill, 1977)[7]. While real life estimation problems are unavoidable, what is unacceptable in principle is that the aggregate VA obtained in this way is not equal to the aggregate value of final goods and services at constant prices.

Since aggregate VA at current prices is identically equal to the aggregate value of sectoral final products or the GDP, aggregate VA or the GDP has a real representation; that is the vector of final products. This fundamental national accounts concept should be taken as a guiding principle for constant price estimates also (assuming that services can somehow be represented in real terms). But sectoral VA does not have a separate real representation; it can only be viewed as a share of the GDP, and sectoral real VA can only be a share of the real GDP. From this point of view sectoral real VA may be obtained by deflating the current-price VA by the GDP deflator obtained as the ratio of aggregate value of final uses (of goods and services) at current and constant prices. One implication of this procedure is that the sectoral relative shares in GDP will be the same

at current and at constant prices making constant price estimates redundant for estimates of relative shares. It is important to note that value added need not bear any one-to-one correspondence with the quantity produced because of technical progress and changes in the market structure leading to changes in the degree of monopoly over time. We will come back to this point again in section-IV.

3. Intermediate and Final Services

The observed output of a sector is the outcome of interaction between demand and supply. Thus, when we look at the IOTT, the column showing the final expenditures on GDP may be taken as the vector of final demand or final products. While the sum of the elements of the vector gives the GDP, an element of the vector does not represent the size of the corresponding sector because the total product of a sector caters to intermediate demand also. Contribution of a sector to GDP is its value-added which is related to the sector's total production. Thus an understanding of the growth of the tertiary sector needs an understanding of the input-output structure of the whole economy. Some services are basically intermediate inputs while there are others catering mainly to final demand.

To take a very prominent example, demand for distributive trade is wholly a derived demand arising form demand for commodities distributed through traders though the IOTT shows part of the service that is related to the distribution of final goods as final use of the service. Also, transport is intimately related to trade (Martinez-Zarzoso and Maria, 2008), so a very large part of the demand for transport services is derived demand too. The same point can be made regarding demand for a large part of financial services also. The three broad groups involving these services account for roughly three-fourths of value-added in the service sector of the Indian economy in recent times.

3.1 Derived demand for Trade and Transport Services

We will keep the functional link between trade and transport services in mind in the following discussion and refer to the integrated trade and transport services[8] as TT service. Based on the type of the user, we can look at TT service as either final service (T_F) or intermediate service (T_I). The value of intermediate TT service used in the production of goods gets incorporated into the producers' price of the good but the final TT service is incorporated only at the stage of its distribution to final users, in the prices that final users like consumers and investors pay.

An important attribute of the structural change in the economy is increase in 'spread' and 'depth' of the production process, particularly manufacturing, in the sense that new production processes appear and gradually more and more production processes become interlinked to a chain of sub-processes. This has very interesting implications for TT intensities of production. The point may be explained with the following simple illustration.

Suppose an economy produces only two final commodities – *A* (Agricultural goods) and *M* (Manufactured goods) initially. Assume, for simplicity, that *A* is produced without any intermediate input while *M* takes intermediate input. Let, in the beginning, there be only one intermediate input, *S*, which is extracted from nature and used with TT service. Suppose further that the depth of the production process increases in the course of development. Let, with increase in depth of the manufacturing process N represent the (final) product of manufacturing that processes intermediate input *M*, which is the product of the earlier stage. The only service produced in the economy is TT service represented by *T*, which is incorporated entirely in the value of final products at market prices.

One stylized fact about economic development is that manufacturing production grows much faster than agriculture at least in the early stages

of development. Let us suppose both A and M grow smoothly at rates α and μ $(\mu > \alpha)$.

Then, $A_t = a.e^{\alpha t}$ ... (1)

$$M_t = m.e^{\mu t} = v.S_t\ (1+\tau), \qquad v > 1 \qquad \ldots \quad (2)$$

Where, τ is the trade and transport (TT)-margin that the manufacturing sector has to pay in order to get its intermediate input S. v is the constant factor by which the intermediate input $S(1+\tau)$ is multiplied in obtaining M. So, $(v-1)$ is the factor for value-added. Note that product of mining and intermediate TT are counted in 'm' in the expression for M_t. [Here we abstract from changes in relative prices; so, it does not matter which commodity we take as a *numeraire*.]

Clearly, $S_t = [\,m/_{v.(1+\tau)}\,].e^{\mu t} = s.e^{\mu t}$, **[putting** $s = m/_{v.(1+\tau)}$**]** ... (3)

Now, total value-added in TT services is the sum of value-added in intermediate TT (T_I) and final TT (T_F) services. So, $T = [T_I + T_F]$ may be written in terms of a uniform TT-margin as:

$$T_t = (S_t + A_t + M_t).\tau = (a.e^{\alpha t} + m.e^{\mu t}).\tau + s.e^{\mu t}.\tau \qquad \ldots \quad (4)$$

And, GDP $= Y_t = (a.e^{\alpha t} + m.e^{\mu t}).(1+\tau)$ ... (5)
So, TT share in GDP, W_t**, is** $[T_t / Y_t]$.

$$\text{Or, } W_t = \{(a.e^{\alpha t} + m.e^{\mu t}).\tau + s.e^{\mu t}.\tau\} / (a.e^{\alpha t} + m.e^{\mu t}).(1+\tau)$$
$$= \{\tau/(1+\tau)\} + [s.e^{\mu t} / (a.e^{\alpha t} + m.e^{\mu t})].\{\tau/(1+\tau)\} \quad \ldots \quad (6)$$

The first and the second terms account for final and intermediate TT services respectively. The ratio between the intermediate and final services is given by: $s.e^{\mu t} / (a.e^{\alpha t} + m.e^{\mu t})$.

From (6) it is clear that W rises with time particularly in the initial phases when slowly growing A_t accounts for a large part of the GDP. *This growth of the trade share is entirely explained by rising share of intermediate trade caused by faster growth of manufacturing production vis-à-vis agricultural production, as manufacturing involves intermediate trade.* Final TT service is a constant proportion of GDP.

Let us now consider the effect of growing depth of the manufacturing process. This depth occurs as M is further processed in the second stage to produce N.

Now, let $N_t = wM_t(1+\tau) = ne^{\mu t}$ ... (7)

[Writing w to be the factor by which the value of intermediate inputs is multiplied in the second stage of manufacturing.]
Clearly, $n = wm(1+\tau)$.

Now, the growth of manufacturing production is caused not only by spread or what is equivalent to expansion of scale (manifested in the growth of intermediate input in the first stage of production, S) here, but also by additional processing in the second stage thus adding to depth. This also enhances intermediate TT to the extent of $M_t\tau$. So, total intermediate service now is $T_{I,t} = (M_t + S_t)\tau$,

and total value-added in TT service is $T_t = (S_t + M_t + N_t + A_t)\tau$.

***Or,* $T_t = (ae^{\alpha t} + ne^{\mu t})\tau + (s+m)e^{\mu t}.\tau$ ... (8)**

And, GDP = $Y_t = (ae^{\alpha t} + ne^{\mu t})(1+\tau)$ ... (9)

So, now $W_t = \{\tau/(1+\tau)\} + [(s+m)e^{\mu t} / (ae^{\alpha t} + ne^{\mu t})]\{\tau/(1+\tau)\}$ (10)

The TT share now, under normal assumptions regarding V and W, takes a jump because of intermediate TT caused by the additional stage of manufacturing production [compare (6) with (10)][9]. As in equation (6), the final TT ratio is a constant given by $\tau / (1+ \tau)$ in equation (10) also. So, the *share of TT in GDP rises over time solely because of the growth in the share of intermediate TT necessitated by the rising spread and depth of manufacturing.* This is the result of both higher and rising TT-intensity of manufacturing[10].

3.2 Change in Production Structure

The above result is crucially dependent on the assumptions that manufacturing grows faster, through rise in spread and depth, than the rest and the TT-margin is the same for both intermediate and final trades and also for trades in all commodities. In terms of the IOTT it translates into a higher and growing intermediate TT-coefficient. Though excessively simple, the model gives an insight. There may be several causes acting to violate the conclusion of the model. One prominent cause is that in the initial phase of development subsistence farming may form a large part of agriculture so that a large part of agricultural produce may remain out of the ambit of distributive trade. This part should gradually decline boosting final-trade and its ratio to GDP; but this effect will peter out as agriculture loses its relative weight in GDP. A second prominent cause acting in the opposite direction may be the growth of services other than TT (ignored in the model). Services use relatively little material inputs and reach the final users without the intermediation of traders. So, the growth of non-TT services is a restraint on the growth of the TT ratio (χ).

However, intermediate TT may be restrained by vertical integration and *vice versa*. There may be other factors like manufacturers themselves installing capital goods at the sites of purchasing firms (this, though, will require transport). Variation of TT margins over activities (and over time) may bring complications into the straightforward account given above.

Thus, how the relative shares of intermediate and final TT services will behave in the course of economic growth will depend on a host of developments apart from the growing spread and depth of manufacturing.

When we think about actual developments the case of food processing comes to mind readily as an example of 'spread' of activities. Milk dairy movement has led to value addition in the processing of milk. In the absence of processing, milk would be considered a product of animal husbandry and it would be distributed largely without the intermediation of traders. This spread has led to enormous value addition in trade and transport of milk and its products. At a more sophisticated level we can look at the ongoing global integration process. The multinational companies strive at reducing their costs by de-verticalizing their activities – outsourcing certain functions and sub-contracting the production of numerous components (think of automobiles and electronics goods). Shift from single stage to multi-stage production process adds to the 'depth' of the process. As a result there has been enormous increase in trade within industries. Of course, vertical integration is known to be a means of cutting transactions costs but there are limits to such strategies in the face of growing competition and the contrary trend is strongly felt in East-Asian markets (Yusuf, 2004, p.2) [11] . The Indian economy, one presumes, is not free from such effects and these effects should affect the intermediate input coefficients of the relevant sectors.

The above discussion makes it abundantly clear that trade and transport and, by the same logic, finance and business services, should not be discussed in the same strain as other services like public administration, education, health and personal services grouped together in national accounts as community, social and personal services (CSP). CSP is demanded mainly for direct gratification of personal needs while the former category of services, we call it *service-I*, is linked functionally to material goods (products of the primary and the secondary sectors) production. The growth of service-I is very closely related to the growth of the primary and the secondary sectors, but not vice versa as services

generally use relatively little material inputs. While this point has been generally recognized in the literature (Datta, 2001, Gordon and Gupta, 2004; Rakshit, 2007), what we attempt at here is to get some measure of how far the growth of different sectors are attributable to changes in intermediate input coefficients of the technology matrix. Further, there are other important influences too which we will focus on in the next section.

4 Decomposition of Sectoral Shares by Causes

4.1 The Analytical Framework:

Let us use the following notations where all the variables are represented at current prices:

X = column vector of output;

F = the column vector of final uses and A = input-output coefficients matrix or the technology matrix.

Now, total output may be taken as the sum of its intermediate and final uses[12]

$$\text{So, } X = AX + F = (I - A)^{-1}F \qquad \ldots \quad (11)$$

If we write V = diagonal matrix of value added per unit of output then the vector of sectoral value added, $\chi = VX = V(I - A)^{-1}F$ ... (12)

Using subscripts *1* and *0* for current and base years respectively, we have the vector of change in sectoral value added as: $\Delta\chi = \chi_1 - \chi_0$

$$= V_1 (I-A_1)^{-1} F_1 - V_0 (I-A_0)^{-1} F_0$$

$$= V_0 (I-A_0)^{-1} \Delta F + V_0 \Delta (I-A)^{-1} F_1 + \Delta V (I-A_1)^{-1} F_1 \qquad \ldots \quad (13)$$

We may now define the first term of the expression, $V_0 (I-A_0)^{-1} \Delta F$, as the total direct and indirect **effect (i.e., increase in value added) due to change in the final demand**. This takes into account the direct additional

demand and the indirect additional demand caused by the need to produce additional quantities. Similarly, the second term, $V_0\Delta(I-A)^{-1}F_1$, is the **effect due to change in input structure** reflected in the technology matrix A, which basically reflects supply side factors like changes in organization of production and splintering as discussed above; and the last term, $\Delta V(I-A_1)^{-1}F_1$, is the **effect due to change in value added per unit of output (or reallocation of value added)** caused by a complex interaction of demand and supply side factors discussed below. Change in sectoral distribution of value added in the economy over time is the result of all these effects.

4.2 Conceptual issues in measurement

When we compare the production structure of two different periods the idea is to compare real quantities as distinct from values. Each variable must be represented at a base year price so that the constant price representations may be viewed as quantity indices. In that case changes in the technology matrix reflect the technical and organizational changes. However, as pointed out in section-III, the concept of constant price sectoral value-added does not have a quantum representation. Value added is an accounting entity defined as the difference between the value of output and the value of intermediate inputs used. It is viewed as the contribution of the primary factors, broadly defined, in production and is distributed among them. However, value added includes a residual element, depending on market conditions, which is more difficult to be factored as price and quantity. This makes it difficult to view real value added as a quantum index of primary factors employed. Nevertheless, quantifiable primary factors employed remain an important determinant of real value added. A simple exercise may illustrate the point.

Let there be only two commodities: M (for material goods) and S (for services). Let us define physical unit of a commodity to be the quantity available for a unit of money in the base year; so, price of each commodity in unity in the base year. Then, we can take the technology matrix, A, the final demand and production vectors – F and X – all represented in real terms (physical units). For the current year, deflation by relevant price

indices is supposed to convert money values to quantum indices. But, in order to focus on real value added let us assume A and F, and so, X to remain unchanged between the base year and the current year. Also, we assume the productivity of the only primary input, labour, to increase in the M-sector but remain unchanged in the S-sector and that uniform wages prevail across the two sectors (Baumol, 1967, Baumol, *et.al*, 1985)[13].

Let us denote the base year and the current year by subscripts 0 and 1 respectively. We denote the sectors by superscripts. So, by assumption, $A_0 = A_1$, $F_0 = F_1$ and $X_0 = X_1$. This means that the real GDP (Y) is the same in the two years; or, $Y_0 = Y_1$.

For labor input, let it be equal in the two sectors in the base year and let us define the unit of labor such that $l^M_0 = l^S_0 = 1$. This also means $l^S_1 = 1$. Due to improvement in productivity in the M-sector, let production of the same output in the M-sector take only half as much labor in the current year as in the base year. Or, $l^M_0 = 2l^M_1$. This means distribution of value added between the sectors, which was 1:1 in the base year, is 1:2 in the current year[14] and value added per unit of output has also changed in the same proportion. This will be reflected in a rise in the relative price of the S-commodity[15].

With the above changes when we present the IOTT for the current year in real terms, we no longer have the equality between the row sums and the column sums. The row sum for the M-sector, of course, is the real quantity of M-commodity but the corresponding column sum is now the cost of intermediate inputs at base year prices plus the sectoral *real* value added at *current market conditions*. In fact, what we do is to distinguish between the real productions links through the technology matrix and the value added in production which reflects the current market

conditions[16]. Though the physical quantities produced as well as the technology matrix in the current year remain the same as that in the base year, change in real value added per unit of output now emerges as a factor explaining the change in relative shares of the sectors. This process is widely believed to favor public servants and this is reflected in reallocation effects for CSP, as we discuss below.

5 Empirical Results

We have condensed three IOTTs for 1973-74, 1993-94 and 2003-04, published by the Central Statistical Organization of India (CSO), into nine-sector input-output tables with sectors matching the nine-sector classification in the National Accounts Statistics[17]. Four of the nine sectors belong to the tertiary sector; the first three of which have been grouped by us as service-I, as discussed above, and the last one is CSP. The IOTTs provide, apart from the input-output transactions matrix, the vectors of intermediate and final demands.

Tables 3 and 4 present the decomposition of the increase in sectoral value added[18]. It is seen that, in the aggregate, the input-structure effect and the reallocation effect are close in magnitude and opposite in sign. The insight for this comes from the consideration that aggregate output is the sum total of aggregate intermediate input use and aggregate value added while the aggregate value added is identically equal to aggregate final uses. For example, if change in final uses leads to a more-than-proportionate change in output caused by increase in intermediate input intensity, there must be an offsetting change in value added per unit of output. This process does not affect all the sectors in the same way; so, there is some reallocation of value added between sectors.

Table 3: Decomposition of Increase in Value-added by Causes

1973-74 to 1993-94 *(Unit; Rs.Crores)* Base Year: 1993-94

(1)	(2) Value Added 1973-74	(3) Value Added 1993-94	(4) Final-demand Effect $V_0(I-A_0)^{-1}\Delta F$	(5) (Col.2+Col.4)	(6) Input-structure Effect $V_0\Delta(I-A)^{-1}F_1$	(7) Re-allocation Effect $\Delta V(I-A_1)^{-1}F_1$
Agr. Etc.	14599077	23189811	17938270	32537347	-4430804	-4916777
Primary	**0.4760**	**0.2792**		**0.3949**		
Mining	274026.7	2023357	309653	583680	672492	767158
Manu.	5033532	13892293	10442635	15476167	3194984	-4778947
Cons	1456231	4420816	2236859	3693090	-89198	816917
El &.G.	296582	2067452	604621	901204	1216473	-50240
Secondary	**0.2302**	**0.2697**		**0.2507**	**4994751**	**-3245112**
Transport	1588517	6725593	3352124	4940641	1389956	394962
THR	3308021	11521281	6476058	9784079	196826	1540326
FIRB	1548201	8594126	4772574	6320775	2476088	-202777
Service-I	**0.2101**	**0.3232**		**0.2554**	**4062870**	**1732512**
CSP	2565616	10620743	5594002	8159618	979932	1480212
CSP(%)	**0.0837**	**0.1279**		**0.0990**		
Tertiary	**0.2938**	**0.4511**		**0.3544**		
Total	30669805	83055472	51726796	82396601	5606749	-4949164

Abbreviations – Manu: manufacturing, Cons: construction, El & G: electricity, gas and water supply, THR: trade, hotels and restaurants; TSC: transport, storage and communications FIRB: Finance, insurance, real estate and business services. CSP: community, social and personal services.

Source: Input-output transactions tables for the relevant years, published by the CSO, Govt. of India, condensed into 9x9 tables (Datta and Bhattacharya, 2010).

We note that during the two decades to 1993-94 agriculture's share in GDP declined by about 20 percentage points. Roughly half of the decline can be explained in terms of decline in the sector's weight in aggregate final demand (column-5); the input-structure effect and the reallocation effect had large roles in the sector's decline. During the next decade also (table-4) the reallocation made a substantial drag though the input-structure effect was almost neutral.

Table 4: Decomposition of Increase in Value-added by Causes

1993-94 to 2003-04 *(Unit; Rs.Crores)* Base Year: 1993-94

(1)	(2) Value Added 1993-94	(3) Value Added 2003-04	(4) Final-demand Effect $V_0(I-A_0)^{-1}\Delta F$	(5) (Col.2+Col.4)	(6) Input-structure Effect $V_0\Delta (I-A)^{-1}F_1$	(7) Re-allocation Effect $\Delta V(I-A_1)^{-1}F_1$
Agr. Etc.	23189811	28457685	6725556	29915367	62714	-1518592
Primary	***0.2792***	***0.1883***		***0.198***		
Mining	2023357	3765261	535726	2559083	833977	372460
Manu.	13892293	27333830	14786031	28678324	3815016	-5157731
Cons.	4420816	10288717	4266612	8687428	43284	1558649
El. & G.	2067452	2464358	2016728	4084180	-513876	-1105779
Secondary	***0.2697***	***0.2901***		***0.291***	**4178402**	**-4332400**
Transport	6725593	13009264	9337469	16063062	1354043	-4407002
THR	11521281	23270045	10860777	22382058	1337894	-448418
FIRB	8594126	16873868	8036628	16630754	499482	-255284
Service-I	***0.3232***	***0.3517***		***0.364***	**3191419**	**-5110705**
CSP	10620743	25681362	11532394	22153137	-1092032	4622827
CSP(%)	***0.1279***	***0.1699***		***0.147***		
Tertiary	***0.4511***	***0.5216***		***0.511***		
Total	83055472	151144411	68097921	151153394	6340503	-6338870

Abbreviations : As explained in table-3.

Source: Same as that of table-3.

The secondary sector gained in relative share in GDP (column-3) more than what can be explained by change in the weight of the share in final demand (column-5) during the first two decades. Here input-structure effect had a large positive role to play indicating a deepening of the industrial structure as discussed in section-III above. The input-structure effect was so pronounced that it more than compensated for a substantial negative reallocation effect. Strong input-demand and reallocation effects are observed in the next decade also. But compared to the previous two decades the reallocation effect was stronger, and it neutralized the positive input-structure effect in the later decade.

As for category-I services, the input-demand component was, as expected, very strong and positive in both the periods, similar to the secondary sector. This finding is consistent with our observations in sections-III and IV regarding the nature of the services concerned. The reallocation effect for service-I was also positive, though weak, in the first two decades. But it was strongly negative in the later decade, so much so that it more than washed out the positive input structure effect. Thus, category-I services would claim a smaller share of GDP during the two decades to 1993-94 if that share were determined only by the change in the structure of final demand (column-5 table-3) in isolation from input-structure and reallocation effects. However, during the next decade strong negative reallocation effect restrained substantially the rapidly growing share of the category.

If the strong negative reallocation effect for category-I services observed during the later decade is contrary to general perceptions regarding technological progress in services, then it has to be noted that the general perception is shaped principally by public administrative services (grouped with CSP). Our findings regarding *CSP are distinct in that it had substantial positive reallocation effects during both the sub-periods in full conformity with expectations.* During the last decade the positive

reallocation effect for CSP counterbalanced the negative effect for category-I; so, the tertiary sector as a whole gained only marginally (table-4) from the input-structure and reallocation effects taken together. By contrast, during the previous two decades the reallocation effect for CSP was positive and the input-structure effect was positive too. The tertiary sector as a whole gained enormously (table-3) from the two effects.

6 Summary and Conclusion

Using nine-sector IOTTs for the Indian economy for the years 1973-74, 1993-94 and 2003-04 we analyze the major influences on structural changes over the two decades to 1993-94 and the decade to 2003-04. The tertiary sector's relative share is found to have risen by 16 percentage points during the earlier two decades compared to only seven percentage points during the later decade. However, this observation conceals some very interesting changes during the later decade.

The paper decomposes forces for the change in sectoral shares into three components – the final-demand effect, input-structure effect and reallocation effect – and makes an empirical assessment of the three components. Further, the paper distinguishes between services which are demanded predominantly for intermediate uses from those which are basically final services. The former category is called category-I services and the latter category of diverse services are clubbed together as CSP services. Focus on the service sector as a whole conceals distinct behaviors of service-I vis-à-vis CSP. The distinct behavior of CSP and similarities in the behaviors of the secondary and service-I sectors are important findings of the study.

It is observed that apart from final-demand effect, input-structure and reallocation effects played very important roles in determining sectoral shares of all major sectors of the Indian economy during the whole period

under study. While the input-structure effect was negative for agriculture, it was positive for the secondary and the category-I services. The reallocation effect was negative for the primary and the secondary sectors, but for category-I services the effect was positive in the earlier period and strongly negative in the last decade.

Interestingly, for category-I services the final demand effect explains a rise in relative share by only four and a half percentage points during the earlier two decades; strong input-structure effect and substantial reallocation effect explain the additional more than eleven percentage-point hike in relative share of the sector. For CSP also the input-structure effect was positive but the reallocation effect was much stronger and positive. These two effects together explain about two-thirds of the rise in relative share of CSP by roughly four and a half points. Thus, *for the tertiary sector as a whole, the input-structure and reallocation effects together explain about sixty percent of the total increase in relative share over the two decades to 1993-94.*

The story for the next decade was somewhat different. As for service-I, the input-structure effect was again very strong but the reallocation effect was stronger and opposite (negative). The strong negative reallocation effect should be taken as a manifestation of technical progress and greater competition in providing services like banking, insurance, communications and information technology enabled services (ITES)[19] consequent to economic liberalization. In fact, *reallocation effect pulled down the relative share of category-I services by roughly one and a half percentage points even after suppressing the strong and positive input-structure effect. The reverse happened to CSP.* A very strong reallocation effect did overcome a moderate negative input-structure effect and raised the relative share of the sector by more than two percentage points.

On the whole, the share of the tertiary sector increased by only one percentage point on account of the input-structure and the reallocation

effects taken together when the relative share of the sector increased by more than seven percentage points over the last decade to 2003-04. So, the final-demand effect could explain eighty-five percent of the increase and category-I services accounted for two-thirds of that. This should be viewed in the light of the fact that emergence of foreign demand as a major source service growth constitutes perhaps the most striking feature of India's macro-economy over the last decade (Rakshit, 2007). *It would have brought category-I services in sharper focus than what is apparent had there not been a huge negative reallocation of value added.*

The point that bears emphasis is that each sub-sector of service-I had substantial and positive input-structure effect, as one would expect, during both the sub-periods. In this respect this service sector resembles the sub-sectors mining and manufacturing. Our study also brings out the distinct behavior of CSP in that it had substantial positive reallocation effects during both the sub-periods, again, in full conformity with expectations. This underscores why talking about the tertiary sector as a whole without distinguishing between service-I and CSP may not always be very enlightening.

Notes :

[1] For example, revolution in computing and telecommunications technology has not only given us several new products but also it has revolutionized services in most fields.

[2] Consider, for example, the role of banks in foreign trade and mergers and acquisitions.

[3] A study by Balakrishnan and Parameswaran (2007) shows that the growth of GDP for the Indian economy has two phases only. The break point is 1978-79. The annual rate of growth accelerated by almost two percentage points in the second phase when it was 5.2 percent.

[4] Growth acceleration in the 1980s in manufacturing in particular and in services in the later decade are well documented in the literature. See Rodrik and Subramanian, 2005; Srinivasan, 2005 and Balakrishnan and Parameswaran, 2007).

[5] The procedures in all these papers were flawed in that the inter-temporal comparison of Leontief technical coefficients was not based on corrections for price changes. Datta (2010) incorporates the correction and confirms the finding of rising service intensity. Also, see Francois and Reinert (1996) for a study on OECD economies.

[6] See the interesting discussion on division of tasks between Central Administrative Office and Operating Manufacturing Establishments in Siegel and Griliches, 1992.

[7] Nevertheless, for quantitative analyses undertaken in the present paper the price indices referred to here are probably the best available to researchers. We have used these indices in spite of the limitations.

[8] It may be noted that a part of transport has a direct consumption demand while demand for trade services is entirely derived demand. Final demands for the two services, as shown in the IOTTs, result from demand originating from the need for distribution of final goods plus direct final demand for transport services.

[9] Consider the bracketed part of the second term of (10).

$[(s+m)e^{\mu t} / (ae^{\alpha t} + ne^{\mu t})] =$

$[s(1+v.(1+\tau))e^{\mu t} / (ae^{\alpha t} + m\,e^{\mu t} w.(1+\tau)]$. Compare this expression with the corresponding part of equation (6). The numerator and part of the denominator of the expression are multiplied by some factors in equation (10). If V and W are equal, $\bar{\tau}_1$ in (10) is larger than that in (6); and this is true even if W is larger than V by a reasonably wide margin.

[10] Observations based on IOTT's for the Indian economy show that the share of Intermediate TT in total TT services increased significantly from about 45 percent to 53 percent over the ten year period from 1968-69 to 1978-79. Thereafter the ratio declined somewhat. The value of the ratio was 48.5 percent both in 1993-94 and 2003-04.

[11] Further, growing complexities lead to emergence of new problem resolution mechanism. Emergence of firms such as APL Logistics and Maersk Logistics now provide integrated logistics service like handling of congestions at ports and providing multi-modal transport facilities for time-sensitive items within and beyond the East-Asian region (Yusuf, 2004, p.27). This provides an example of 'spread' of service activity though not specifically belonging to but facilitating trade and transport.

[12] See Coppieters, P. (1987) in this context.

[13] A very common consequence of technological progress in a sector is decline in the price of the relevant product. This leads to change in value-added per unit of the product not only in the progressive sector but also in the relatively non-progressive sector because of maintenance of wage parity. An interesting study on Spanish car industry is Matas and Raymond, 2009.

[14] **Clearly,** $Y_0 = F^m_0 + F^s_0 = w_0(l^m_0 + l^s_0) = 2w_0$. ... (i)

Also, $Y_1 = F^m_1 + F^s_1 = w_1(l^m_1 + l^s_1) = w_1(0.5l^m_0 + l^s_0) = 1.5w_1 = 2w_0$ ... (ii)

Since $\mathbf{Y_0 = Y_1}$ by assumption, we have $w_1 = \mathbf{(4/3)}w_0$. So, distribution of value added between the sectors, which was $w_0 : w_0$ (or, 1:1) in the base year, is now $\mathbf{0.5}w_1 : w_1 = \mathbf{(2/3)}w_0 : \mathbf{(4/3)}w_0$ **(or, 1:2)** in the current year. This means, **(since $\mathbf{X_0 = X_1}$).**

[15] An elegant formal model relating changes in relative shares and relative prices to differential elasticities of demand and rates of sectoral technological progress is given in Kongsamut, et.al (1997).

[16] Here the assumption of a single quantifiable and homogeneous primary input makes the measurement of real value added straightforward. Otherwise, we could obtain the GDP deflator (based on the equality $Y_0 = Y_1$) and apply that to obtain sectoral real value added.

[17] This allows us to use as the best available sectoral price deflators those provided by the CSO in spite of their limitations..

[18] Estimates in tables 1 and 2 do not tally perfectly with those given by IOTT. One reason is the treatment of indirect tax incorporated in inputs which we have included in the value added of the using sector for consistency of input-output analysis.

[19] It, perhaps, provides a counter example to the notion that services are non-progressive and, hence, rise of the sector will be accompanied by fall in productivity (Kaldor, 1975, Inman, 1985). In fact, Bosworth and Collins (2007) notes: "Unlike for China, India's impressive performance in services is largely reflected in a rapid improvement of TFP." Also see Goldar and Mitra (2008) in this context.

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