EXPLORING THE EVOLUTION OF INDIA'S ECONOMIC STRUCTURE: THE CASE OF MANUFACTURING-SERVICES INTER-LINKAGES

Chaitanya Talreja*

Abstract

The Indian economy has seen a rapid increase of the service sector share in its GDP since the early 1990s or during the post-reforms period. The manufacturing sector share in output stagnated during the same period. Moreover, the period did not see a commensurate increase in the employment share of the service sector and the manufacturing employment share also remained largely stagnant. With this backdrop this paper makes an attempt to understand the growth process associated with the evolution of India's economic structure during the post-reforms period. This is done specifically by analyzing the production and demand linkages between the manufacturing and service sectors using the Input-Output tables for India. The paper finds that manufacturing sector has been much more integrated within India's production structure both, in terms of input cost and as a stimulator of output and employment for other sectors, as compared to services. Service sector in this rapid growth phase saw a larger share of value added being generated in modern producer services like financial, Information and Communication Technology (ICT), real estate and business services, which contributed much less to the service sector employment. The dependence of manufacturing on these service inputs has not been found to have increased as opposed to the internationally established patterns of such dependence which tends to increase over the course of economic development. The role of final demand as a source of service sector demand was much more than intermediate demand. Within final demand private consumption has been

* PhD student at South Asian University, Chanakyapuri, New Delhi
Email: chaitanya@students.sau.ac.in
Postal Address: E-56, Phase-1, Ashok Vihar, Delhi-110052, India
Acknowledgements: I am extremely thankful to my supervisor Dr. Anirban Dasgupta for his valuable guidance which helped me produce this research work.

the major source of service sector demand. At the same time service sector share in India's private consumption has risen steeply over this period, and was much higher than that of manufacturing. This finding is also incompatible with India's stage of economic development when compared to international experiences. The findings of this paper are consistent with the suggestions in the existing literature on the Indian economy that point towards a co-evolutionary process between income inequality and the production structure of the Indian economy.

Keywords: inter-sectoral linkages, structural change, manufacturing, services, production structure, demand pattern

JEL classification: D57, L60, L80, O14

I. INTRODUCTION

Economic progress is considered to be fundamentally dependent on rapid output growth in an economy. According to Rodrik (2013), two traditions related to output growth can be identified in economic theory. The one based on development economics identifies an economy as an amalgam of heterogeneous sectors[1] which differ in their logic of production. Economic growth in this set-up depends on the interdependence among the various sectors of the economy. On the other hand the neoclassical theory of economic growth focuses on output growth irrespective of sectoral distinctions.

The present paper considers inter-sector heterogeneity and their interactions to be important in understanding the evolution of output growth. It is in this context that the seminal works of Hirschman (1958) and Kaldor (1967) provide bases for identification of growth-inducing sectors in an economy. Industrialization through manufacturing sector growth has been central to a Kaldorian economic growth paradigm. In it, manufacturing sector exhibits economies of scale, manufacturing output growth leads to increased productivity growth, and overall productivity growth can be increased by shifting resources to the manufacturing sector due to diminishing returns to factors in the agricultural sector (Targetti, 2005; Bagchi, 2005). The Hirschmanian arguments rest on the idea of backward and forward linkages of sectors in ascertaining their growth stimulating potential on the economy. Backward linkages depict the demand stimulus a sector creates on the other sectors by using inputs from other sectors in the economy. Forward linkages capture the stimulating impact a sector creates on the others through its use as inputs in other sectors. The role of forward linkages as an inducement mechanism is argued to be dependent on the existence of backward linkages. Therefore, backward linkages assume central importance here[2]. Hirschman suggested

the use of input-output tables in assessing inter-sectoral linkages. Although he has not been as explicit as Kaldor, in his analysis on economic and industrial development, manufacturing activities have implicitly assumed particular significance.

The evolution of India's economic structure depicted by thesectoral composition of GDP and employment during the post liberalization period i.e. after 1991, suggests that the role of manufacturing has been rather muted in driving the economic growth of the Indian economy. The GDP share of manufacturing has stagnated around 15-16 percent from 1991-92 to 2012-13 as compared to an increase from 9 percent to 15 percent from 1950-51 to 1990-91. The manufacturing employment share between 1993-94 and 2011-12 hovered around 10-12 percent (Mehrotra et al., 2014). The GDP share of services on the other hand has grown rapidly from 38 percent to 53 percent from 1991-92 to 2012-13 as compared to 27 percent to 36 percent from1950-51 to 1990-91[3]. Mehrotra et al. (2014) show that services employment share increased from 21 percent to 27 percent during 1993-94 to 2011-12. Clearly, employment contribution of the service sector has not been commensurate with its GDP contribution during this period. These findings suggest that the gap in the average value added between those employed in manufacturing and service sector has been persistently high during the post-reform period.

The well-established patterns of structural change observed across the world indicate that during the initial stages of development, with increase in per-capita income, the share of agriculture in terms of employment and output tends to fall and the share of the secondary sector (of which manufacturing is the most important) goes up. It is at more advanced levels of per capita income that the service sector takes over as the dominant sector of the economy.

Kochar et al. (2006), Papola (2006) and Ghose (2016) discuss the distinctness of India's structural change in relation to its per capita income. The former using cross country regressions shows that India's

service sector during the post-reforms period was a positive outlier in terms of its GDP share and a negative outlier in its employment share. On the other hand the manufacturing sector contribution to employment and output remained comparably low. Papola (2006) compares the experience of India's structural change from 1960 to 2002 with Asian economies like China, Indonesia, Malaysia, South Korea, Philippines and Thailand. He finds India's pattern of structural change distinct in three aspects. The relatively lower role of industry (manufacturing plus non-manufacturing industries) in output and employment over the course of structural change, the shift of labour force from agriculture to non-agricultural sectors has been much slower in India and its service sector share in GDP was the largest among compared economies but service sector employment share was the lowest. Similarly, Ghose (2016) points out that in comparison to selected Asian economies like China, Indonesia, Malaysia and Thailand which had higher per capita income than India in the reference year 2012, India exhibited a significantly smaller employment and output share in manufacturing. India's service sector output share was the highest and its employment share was the lowest among the countries compared.

Recent works like Dasgupta & Singh (2006), Ghani & O'Connel (2014) and Kucera & Roncolato (2016) have seriously investigated if there is a role of service sector as a driver of economic growth. Kucera & Roncolato (2016) identify three important views from the literature on this issue. These views include services as a substitute to manufacturing as an engine of growth, service sector as a leading or lagging complement to manufacturing sector in the growth process and co-evolutionary movement of services and manufacturing in the growth process. In the context of India, Dasgupta and Singh (2006) based on their analysis in the Kaldorian framework suggest Information and Communication technology (ICT) services to be crucial as an engine of growth.These services in the Indian context have been regarded as complementary/additional engine of

growth to manufacturing. Ghani & O'Connel (2014) discuss the possibility of services as a substitute to manufacturing for rapid economic growth for less developed regions. Their analysis focuses on the African region where various low-income economies have witnessed premature de-industrialisation i.e. decline in manufacturing employment and output shares at low levels of per capita income.They attempt to assess if in such a scenario service sector could lift these economies to higher levels of economic development. Guerrieri & Meliciani (2005) discuss the co-evolutionary processes of manufacturing and service growth in advanced economies. They suggest that growth and international competitiveness of modern producer services like finance, real estate and business services hinge on their linkages with knowledge intensive manufacturing industries and in this context there is a possibility of combined growth in the two sectors taking advantage of these linkages.

The recognition of manufacturing and services as potential drivers of economic growth has also led to inquiries into production and demand linkages between the two sectors. Park (1987), Park & Chan (1989) and Tregenna (2008) have used Input-Output transactions tables (IOTTS) to assess the manufacturing-service interactions on Hischarmanian lines. The production and demand linkages of sectors in an economy not only enable us to assess the sectoral integration within the production structure but also growth and employment inducement potential of different sectors. Park (1987) and Park & Chan (1989) in their cross-country analysis find manufacturing-services input dependency on each other for production and identify patterns of these dependencies across countries according to their per-capita income classifications. For example, the latter work shows evidence for increased input dependence of manufacturing on producer services as an economy moves from low per capita income to advanced stages of development. Tregenna (2008) analyses manufacturing-services input-output linkages with each other and the rest of the economy for South Africa. The study finds that even with a decline in manufacturing

share in GDP and a larger service-GDP share, manufacturing remained more "growth pulling" in terms of its backward linkages with the rest of the economy.

There have been important works that have used IOTTS to analyze inter-sectoral linkages in India as well. This includes Sastry et al. (2003), Saikia (2011), Das (2015), Hansda (2001) and Bhowmik (2003). The first three studies look at the production and demand structure of the Indian economy at the aggregate level of agriculture, industry (manufacturing plus non-manufacturing industries) and service sectors. They discuss the inter-dependence between any two sectors based on their dependence on each other for inputs in the production of their respective outputs. Also, on the demand side they look at the importance of a sector for the others in terms of the demand it generated for other sectors. The period of analysis in these three studies includes IOTTS ranging from 1968-69 to 2003-04 (Saikia; 2011), 1968-69 to 1993-94 (Sastry et al.; 2003) and 1979-80 to 1998-99 (Das; 2015). A common finding in these studies is increased agriculture dependence on industrial inputs over time but reduced industry dependence on agricultural inputs, reflecting broad-based growth of industry. Services tended to be more strongly related to industry than agriculture over time.The other two articles i.e. Hansda (2001) and Bhowmik (2003) focus on the importance of service sector in the inter-sectoral production and demand. Bhowmik (2003) analyzes the IOTTS for the period ranging1968-69 to 1993-94 and Hansda (2001) only studies the 1993-94 IOTT. The first shows that service intensity of production increased during the pre-reform period and metal products, machineries, trade and banking had been the key sectors in terms of service intensity during this period. The latter argues service sector to be an important sector in the Indian economy based on its intensive usage in production of output of various sectors. There is no available study that analyzes manufacturing-services production and demand linkages in India, for an extended period since the economic reforms. This paper fills this gap by

analyzing five IOTTS of the Indian economy from 1993-94 to 2013-14 and explores some important aspects of India's post-reform structural transformation. Based on its findings it suggests areas for further research.

The following part of the paper is divided into five sections. Section two discusses the recent research on post-reform rapid service sector growth and manufacturing-services interaction in India. Section three provides an analysis of the production and demand linkages of the manufacturing and service sector based on the IOTTS. Section four delves into a closer analysis of the services at the level of sub-sectors. Finally, section five provides a brief summary and discussion on the findings with suggestions for further research.

II. RECENT RESEARCH ON SERVICE SECTOR GROWTH AND SERVICE-MANUFACTURING INTERACTION IN INDIA

The increasing share of service output in the Indian economy during the post-reform period has drawn attention of various researchers. This is because the growth in service sector output superseded the other major sectors of the economy during this period. Ghose (2015) points out that the share of services at 30 percent of India's GDP was already large relative to other sectors at the beginning of 1980s. Its contribution to GDP growth which surpassed all the other sectors put together that makes the structure of GDP growth distinct from the pre-1980s period. This tendency has strengthened in the post-reforms period. Table 1 below depicts the average annual growth rates of the sectors in the Indian economy. It can be seen that during 1990-91 to 1999-2000 and 2010 to 2015-16 the average annual service sector growth superseded that of all the other sectors and the Indian economy. Even during the decade between 2000-01 and 2009-10 it was only marginally lower than and second to the construction sector, which witnessed the fastest average annual growth during this

period. Service sector growth in 1980s was relatively faster than many sectors but remained behind mining & quarrying and electricity, gas & water supply. Also, it can be seen that the gap between average annual growth rates of services and manufacturing widened in the post 1990 era as compared to the 1980s when the gap was much lower.

Table 1

Average annual growth rate of sectors (at 2004-05 prices)

	1980-81 to 1989-90	1990-91 to 1999-2000	2000-01 to 2009-10	2010-11 to 2015-16
Agriculture, forestry and fishing	3.3	3.1	2.6	2.5
Mining and Quarrying	8.2	4.2	4.6	4.5
Manufacturing	6.4	5.8	8.1	4.0
Electricity, Gas and Water Supply	8.8	7.3	6.0	5.4
Construction	3.8	4.9	9.6	4.6
Services	6.8	8.0	9.3	9.0
GDP	5.4	5.9	7.5	6.7

Source: Author's calculations of Compound Annual growth rates (CAGRs) at 2004-05 prices based on back series, NAS 2011 and NAS 2017, Central Statistics Office, Government of India.

It has already been mentioned that from an international perspective India's employment and output structure in the backdrop of rapid service sector growth has been distinct during the post-reform period. In explaining the growth success of the service sector during the post-reforms three factors have been highlighted by researchers. On the supply side, first, India heavily focused on tertiary education with substantial public investment which was exceptional at its level of development. This as a result led to creation of relatively cheap skilled workforce to be employed in skill intensive sectors (Kocchar et al.; 2006, Nayyar; 2012). Second, after economic liberalization, government policies in terms of taxes and

FDI rules were relatively less restrictive for the service sectors as compared to the manufacturing sector (Nayyar, 2012). Thirdly, demand side growth accounting of the service sector using IOTTS between 1979 and 2008 shows that major part of the service sector growth can be explained by domestic final demand and exports (Eichengreen & Gupta, 2011a; Nayyar, 2012; Ghose, 2015). Inter-industry demand contributed much less to this growth. It has been argued that the limited role of intermediate demand in service sector growth shows lack of *splintering* i.e. outsourcing of various industrial activities to the service sector. While the role of exports has grown in explaining service sector expansion post reforms, domestic final demand has remained dominant since the pre-reform years.

Datta (2015) challenges the consensus on rapid service sector growth in contemporary India and argues that a decline in relative price of manufacturing due to rapid productivity improvements in this sector vis-à-vis services, especially education, health and public administration & defence (EHPAD) is responsible for the value added share increase in favour of service sectorin the post-reforms period. Since this argument is restricted only to EHPAD services, it is unable to explain the rise in value added share of the service sector as a whole[4]. Another distinct view in the context of post-reform service sector growth is that of Nagaraj (2009). According to him the service sector output since 1991 is overestimated due to underestimation of price deflators for this sector. However, the paper does not quantify the extent of this overestimation.

There are also studies that have discussed the different aspects of the combined growth process in the service and manufacturing sectors without analyzing their production and demand linkages explicitly. The implications of a relatively large service sector in the economy based on its relationship with the commodity producing sectors (manufacturing and agriculture) have been discussed in Bhattacharya and Mitra (1990). The paper argues that service sector growth between 1950-51 and 1986-87 as

compared to the real output of the commodity sectors, may not reflect a real output growth as service output does not reflect tangible physical output.The income generated in the service sector during this period as opposed to increase in service sector output may have been reflected in service sector growth.This is because the increment in the employment share of the service sector was relatively low, rising only by 3 percent from 15 percent to 18 percent from 1960 to 1981 whereas output share grew by 7 percent from 30 percent to 37 percent. They point out that income growth[5] and shift of non-market services to the market might have contributed to the sector's output growth. They also argue that this gap between relative output and employment shares for the service sector had been much narrower in other developing countries[6], while the bulk of employment in the advanced economies was absorbed in the service sector by that time. Based on an econometric exercise estimating elasticity of service sector value added with the commodity producing sectors, they do not find statistical support in favour of induced growth (spillover of growth from other sectors to service sector) in the sector. In such a scenario, they predict that disproportional service sector growth could be inflationary and may increase import demand because of increased demand for the goods from commodity producing sectors through rise in the relative incomes of those associated in service production. These observations were made for the pre-liberalization period when Indian economy was relatively closed. Recently, Ghose (2016) also argued on similar lines suggesting that rapid growth of service sector incomes has contributed to an import-intensive manufacturing growth in India during the last decade.

Banga and Goldar (2004) looked at organized manufacturing and service sector linkage to analyse the productivity of the manufacturing sector during 1980-81 to 1999-2000. They find that the importance of services as an input in manufacturing increased during the first decade of the post-reforms period. They also find a favourable role of services in

manufacturing productivity during the 1990s. This study uses KLEMS methodology (KLEMS-Capital, Labour, Energy, Material and Services inputs) to analyse the productivity of inputs used in producing organized manufacturing gross output. In this supply side analysis service inputs have been calculated as a residual of total inputs minus the KLEM inputs assuming the residual inputs to be from the service sector.

Ghani et al. (2016) studies the spatial pattern of manufacturing and service sector growth in India during 2001-2010. They use Annual Survey of Industries (ASI) and National Sample Survey Organisation (NSSO) establishment level data to track manufacturing and service activity across Indian states and between rural and urban areas.They find service activities to be more urbanized as compared to manufacturing. According to them, there is evidence of spatial correlation between manufacturing and services, both being concentrated in a few states. They also find manufacturing to be more dependent on infrastructure for its development while human capital being important for services on the other hand. Additionally, they show that manufacturing and services do not appear to crowd out each other, which is the only finding that discusses interaction between manufacturing and service sector. They find limited statistical support for employment growth to be correlated between the two sectors. They suggest this evidence for weak complementarity may be understood as evidence against crowding-out between the two sectors.

Dehejiya and Panagariya (2014) attempt to provide a framework to understand India's manufacturing and services growth experience in recent years through a symbiotic relationship between the two sectors. The primary aim of the study was to understand the accelerated service sector growth in India in the post-liberalization era. They use NSSO data from 57^{th} (2001-02) and 63^{rd}round (2006-07) for service sector enterprises. They suggest that service sector growth took place due to both, direct demand as an input in manufacturing and indirect income induced demand through accelerated growth in manufacturing, leading to a downward shift

in the latter's relative prices. They support this claim by regressions showing a statistically significant relationship between services and manufacturing growth. They use only 1998-99 IOTT in their regression framework to provide some basis of manufacturing sector use of service inputs but the study does not attempt to understand the input-output linkages between manufacturing and services exhaustively across the post-reform period. Importantly, they also provide econometric evidence of growth in capital-intensive services to be associated with use of imported inputs enabled by trade liberalization.

These are important contributions towards understanding post-reform manufacturing-service co-evolution in India. But none of these studies analyse the interaction between manufacturing and services for post-reform period comprehensively from a structuralist perspective. In particular, the extent of integration of these two sectors through their production and demand linkages and their relative contribution to India's production structure have not been adequately investigated for the entire post –reform period. This analysis is carried out in the following sections using the five available IOTTS for the Indian economy since the early 1990s.

III. MANUFACTURING AND SERVICE SECTORS IN INDIA'S PRODUCTION STRUCTURE

The Central Statistics Office (CSO), Ministry of Statistics and Programme Implementation (MOSPI), Government of India publishes IOTTS for the Indian economy. There are four IOTTS published by CSO since the economic reforms. These are for the years 1993-94, 1998-99, 2003-04 and 2007-08. CSO published Supply and Use Tables (SUTs) in 2011-12 and 2012-13. IOTTS are square matrices with equal number of sectors in the rows and columns, but SUTs have been published as rectangular matrices with unequal number of rows and columns. Kanhaiya and Saluja (2016) have modified the 2012-13 SUT to obtain the IOTT for

2013-14 which has been used for this study[7] as the most recent data point along with the four IOTTS published by the CSO. The 1993-94 and 1998-99 IOTTS contain 115 sectors and for the later three i.e. 2003-04, 2007-08 and 2013-14 there are 130 sectors of the Indian economy. The SUTs have been published with 140 rows and 66 columns. For the purpose of analysis at the aggregate/broad sectoral level the five IOTTS have been collapsed into 6 sectors. These include agriculture and allied activities, mining and quarrying, manufacturing, construction, electricity & water supply (CEW), services and public administration and defence. These broad sectors contain various sub-sectors. These sub-sectors have been collapsed into these 6 broad sectors following the sector classification provided with IOTTS by CSO. The CSO has also provided information regarding concordance of sectors across IOTT years where the sector numbers vary as discussed above, which has been followed while aggregating the sub-sectors.

The sectors in an IOTT are embedded in a way that each sector's output can be traced as an input in other sectors. All the sectors can be visualised as input providing upstream sectors and input using downstream sectors in the same table. The rows of an IOTT depict all the sectors as upstream sectors and the columns depict them as downstream sectors. The importance of the input providing upstream sector in the production of output of a downstream sector reflects the production linkage between the two sectors. The demand for an upstream sector's output as an input in all the sectors constitutes its intermediate demand. The importance of a downstream sector as a source of intermediate demand for the upstream sector reflects demand linkages[8]. This set-up of input-output linkages between sectors reflects the production structure of an economy in the IOTT context. The IOTTS also provide information on use of a sector's output outside the production structure i.e. final use/demand. The final demand includes private final consumption expenditure (PFCE), government final consumption expenditure (GFCE),

gross fixed capital formation (GFCF), change in stocks (CIS), valuables and net exports. This reflects the final demand composition/structure of each sector. An IOTT allows us to analyse both, the production and demand structure of an economy. The linkages between sectors within the production structure enable identification of important sectors on Hirschmanian lines, both in terms of their use as inputs and due to the intermediate demand they generate for other sectors. The most important tool of analysis, based on the theoretical understanding provided by Hirschman, is that of backward linkages. In a crude sense, it is the demand stimulus a downstream sector generates on the other/upstream sectors of an economy while using their outputs as inputs in its production process[9].

We begin the analysis by looking at the share of all the sectors in the total input cost incurred to produce the output of the Indian economy for the available time points.

Table 2

Share of different sectors in total input cost of the Indian economy

S No.	*Year*	*1993-94*	*1998-99*	*2003-04*	*2007-08*	*2013-14*
	*Sectors**					
1	Agriculture and Allied activities	15	14	13	12	11
2	Mining and quarrying	7	6	8	9	13
3	Manufacturing	38	39	42	43	41
4	CEW[#]	9	9	8	8	11
5	Services	30	31	29	29	23
6	Total Input Cost	100	100	100	100	100

Source: Author's calculations based on IOTTS, CSO for the years 1993-94 to 2007-08 and IOTT prepared by Kanhaiya and Saluja (2016) for the year 2013-14

#Construction, Electricity and Water Supply

*Public administration and defence contained "0" entry in all the cases as it only enters IOTTS as a Final expenditure under the head of Government Final Consumption Expenditure. It is therefore not shown in the table.

We can notice from Table 2 that in terms of the input cost share, manufacturing and services have been the most important sectors of the

Indian economy during the post-reforms period. The importance of manufacturing in terms of input costin production of Indian economy's output has not only been much larger than services butwitnessed an increase over the post-reforms period. The importance of services in India's production structure as depicted by its input cost share witnessed a decline after 1998-99. This finding is striking given that service sector has grown rapidly in terms of value added share and manufacturing share in value added[10] remained stagnant during the post-reforms period.

In Table 3, Hirschman-type backward linkages of manufacturing and services on the Indian economy have been calculated for the post-reform period.

Table 3

Manufacturing and service sector backward linkages

SNo.	*Year*	*1993-94*		*1998-99*		*2003-04*		*2007-08*		*2013-14*	
	Sectors	*M*	*S*	*M*	*S*	*M*	*S*	*M*	*S*	*M*	*S*
1	Agriculture, Forestry and Fishing	0.18	0.06	0.21	0.06	0.17	0.06	0.16	0.06	0.20	0.05
2	Mining and Quarrying	0.11	0.03	0.11	0.02	0.16	0.03	0.21	0.03	0.30	0.06
3	Manufacturing	1.60	0.23	1.58	0.24	1.67	0.26	1.74	0.26	1.65	0.29
4	CEW	0.10	0.07	0.10	0.07	0.10	0.05	0.08	0.04	0.13	0.15
5	Services	0.39	1.23	0.38	1.26	0.39	1.24	0.41	1.24	0.31	1.24
6	Bj(Total Backward Linkage=Sum of 1 to 6)	2.37	1.62	2.37	1.65	2.49	1.64	2.60	1.64	2.58	1.79

Source: Same as Table 2
M: Manufacturing; S: Services

Each cell in Table 3 reflects the total demand (intermediate demand plus final demand) generated for the sector placed in the row, in response to a unit of final demand generated in the sector depicted in the column, expressed as a fraction/multiple of this one unit of final demand. These entries have been extracted from the Leontief inverse matrix calculated from the IOTTS (See Appendix C). Following Jones (1976), row 6 can be

interpreted as the total demand generated in the economy in response to a unit of final demand generated in the sector represented in the column, expressed as a multiple of this unit of final demand. This indicates the demand stimulating potential of a sector on the economy due to its inter-connectedness with the other sectors in the economy. It can be clearly seen here that backward linkages of both manufacturing and services increased during the post-reforms period, but manufacturing persistently remained more integrated within the production structure as compared to services. In Kaldorian and Hirschmanian terms, manufacturing sector performed as a key sector in stimulating output and employment (employment to the extent to which each unit of output production generated employment in the concerned sector- an issue we are not engaging with in this paper) in other sectors of the economy. Although, service sector grew rapidly, it remained behind manufacturing in stimulating production in the other sectors. This finding is similar to that observed by Tregenna (2008) in the context of South Africa in 2005.

The fact that services have been relatively less integrated than manufacturing in India's production structure is corroborated by Table 4 where we decompose the total demand for these two sectors into intermediate and final demands.

Table 4

Distribution of Sector Total Demand (as percentage)

Sector	*Manufacturing sector*			*Service Sector*		
Year	*Intermediate demand*	*Final Demand*	*Total Demand*	*Intermediate demand*	*Final Demand*	*Total Demand*
1993-94	49	51	100	41	59	100
1998-99	47	53	100	39	61	100
2003-04	51	49	100	40	60	100
2007-08	51	49	100	41	59	100
2013-14	49	51	100	36	64	100

Source: Same as Table 2

We notice that intermediate and final demands were equally important for the manufacturing sector during this period, but the contribution of final

demand to total demand in case of services was much more than intermediate/inter-industry demand. In the more recent period, the relative importance of final demand has only increased for services. This is a reflection of service sector being relatively less integrated in India's production structure as compared to the manufacturing sector. Being the largest sector in terms of value added share during the post-reforms period, service sector contributed relatively much less to the Indian production structure as a demand stimulant and also depended much less on it (i.e. intermediate demand) in deriving its own demand.

The previous analysis shows that the demand that services generated for other sectors has been weaker relative to manufacturing. The latter has been much more integrated within India's production structure both in as an input and the distribution of its demand between intermediate and final demand. Given the relative importance of manufacturing and services in India's production structure the subsequent analyses investigates the interaction between the two sectors through their production and demand linkages. As previously stated, an analysis of the production and demand linkages would enable us to know the nature of manufacturing-service interaction in the period of rapid service sector growth. This shall further help us to understand the process underlying the resultant employment and output structure of the Indian economy during the post-reforms period.

Production linkages involve the dependence of manufacturing and services on all the upstream sectors for their inputs as also depicted for the Indian economy in Table 1. Demand linkages would show the importance of all downstream sectors for services and manufacturing as a source of intermediate demand, based on their use as inputs in downstream sectors. Earlier,Table 3 discussed backward linkages i.e. direct plus indirect demand stimulus that services and manufacturing created on other sectors by using them as inputs.

Table 5 and Table 6 below depict input cost share of all the sectors in manufacturing and service production, respectively. For the purpose of this paper our focus will be rows 3 and 5 in both the tables.

Table 5

Manufacturing sector production linkages with different sectors (as % of its total input cost)

S No.	*Year*	*1993-94*	*1998-99*	*2003-04*	*2007-08*	*2013-14*
	Sectors					
1	Agriculture and Allied activities	13.1	15.5	10.7	9.1	14.5
2	Mining and quarrying	9.0	8.6	12.9	15.9	24.1
3	Manufacturing	45.9	44.6	47.0	48.2	43.0
4	CEW	5.5	6.0	5.3	3.5	5.2
5	Services	26.6	25.4	24.2	23.4	13.3
6	Total input cost of manufacturing sector	100	100	100	100	100

Source: Same as Table 2

Table 6

Service sector production linkages with different sectors (as % of its total input cost)

S No.	*Year*	*1993-94*	*1998-99*	*2003-04*	*2007-08*	*2013-14*
	Sectors					
1	Agriculture and Allied activities	7.0	6.1	6.4	7.5	3.1
2	Mining and quarrying	1.1	0.9	0.1	0.1	0.3
3	Manufacturing	34.2	34.1	39.3	38.5	32.1
4	CEW	14.4	12.1	8.7	7.5	28.2
5	Services	43.3	46.8	45.5	46.3	36.3
6	Total input cost of service sector	100	100	100	100	100

Source: Same as Table 2

It can be noticed that manufacturing and service occupied much larger input cost shares in each other's production compared to all other sectors. At the same time service sector input cost share in manufacturing witnessed

a consistent decline during the post reform period (See Table 5). This is a different pattern as compared to what Park (1987), Park & Chan (1989), Guerrieri & Meliciani (2005) and more recently Driemeier and Nayyar (2018) show in their research. They find greater production integration between the two sectors over the course of economic development i.e. with higher per capita income levels. According to Driemeier and Nayyar (2018) the share of embodied services i.e. the value added share of services in value of gross manufactures' exports has globally seen a marginal increase of one percent between 1995 and 2011, with this increase being more pronounced in the European region. The fall in share of embodied services in India's manufacturing seems to be a peculiar development in this light. Table 6 shows that service sector input cost share was persistently higher than manufacturing input cost share in service production. Park (1987) based on his research of East Asian and Pacific Basin economies shows that at relatively lower levels of economic development service sector tends to be much more dependent on manufacturing for production than it does on services[11]. The importance of services in service sector production tends to be greater than manufacturing at higher levels of economic development as depicted by the case of Japan and USA in Park's (ibid) analysis. India seems to have graduated to this stage rather uncharacteristically for its level of development.

There is an important asymmetry between tables 5 and 6. Manufacturing sector dependence on services has been lower throughout than service sector dependence on manufacturing. This asymmetry has been also noted in Park (1987) for all the economies at various levels of development. What stands out for India is the greater dependence of service sector on services vis-à-vis manufacturing, a pattern shown to be occurring at more advanced stages of economic development.

While the dependence between manufacturing and services have declined from both ends during the entire period (except for the period between 1998-99 and 2003-04 when service sector dependence on

manufacturing increased), the fall has been sharper in the manufacturing sector dependence on services than vice versa. Appendix A shows that the relative price ratio of manufacturing and services hovered around one during the entire post-reforms period with moderate fluctuations. The decline in dependence of manufacturing on services and recently of services on manufacturing in this situation does not seem to be purely a reflection of relative price fluctuations but an actual weakening of physical linkages. This seems to be a peculiar change in India's production structure in a period of relatively high economic growth in India's post-independence period.

Next we look at the intermediate demand linkages between the two sectors in Table 7 and Table 8. These tables respectively depict manufacturing and service sector dependence on all the sectors as a source of intermediate demand.

Table 7

Manufacturing sector demand linkages with different sectors (as a % of total intermediate demand for manufacturing)

S No.	*Year*	*1993-94*	*1998-99*	*2003-04*	*2007-08*	*2013-14*
	Sectors					
1	Agriculture and Allied activities	7.2	7.3	5.3	3.4	4.3
2	Mining and quarrying	1.3	0.8	1	0.8	1
3	Manufacturing	57.4	56	56.9	60.6	53.1
4	CEW	13.3	12.9	15.6	16.7	24.4
5	Services	20.8	23.1	21.2	18.5	16.6
6	Total intermediate demand for manufacturing sector	100	100	100	100	100

Source: Same as Table 2.

Table 8

Servicesector demand linkages with different sectors (as a % of total intermediate demand for services)

S No.	*Year*	*1993-94*	*1998-99*	*2003-04*	*2007-08*	*2013-14*
	Sectors					
1	Agriculture and Allied activities	9.5	6.8	7.7	7.2	5
2	Mining and quarrying	0.9	0.7	0.9	1	4.5
3	Manufacturing	41.6	39.4	41.7	43.9	28.9
4	CEW	15.1	14.1	14.7	14.7	26.3
5	Services	32.9	39.1	35	33.3	33.1
6	Total intermediate demand for service sector	100	100	100	100	100

Source: Same as Table 2.

It can be seen from Table 7 and Table 8 that manufacturing sector was the most important source of intermediate demand for itself and the service sector (except in 2013-14 for services) during the post-reforms period. We already know that intermediate demand has played a muted role in propelling service sector growth, but within this segment manufacturing has been more important in stimulating the service sector. On the other hand manufacturing dependence on service sector as a source of demand was not only much lower, but also declined during the larger part of this period i.e. since 1998-99. This asymmetry in demand dependence between manufacturing and services in India is in agreement with the findings of Park (1987) and Treganna (2008). For the South African economy, Treganna (2008) also shows that service sector has depended more on manufacturing than vice versa in terms of intermediate demand.

The analysis of production and demand linkages points out two important things about manufacturing and service sector. In terms of production linkages, manufacturing and service sector did not witness an

intensified integration alongside rapid service sector growth contrary to what works like Park (1987), Park & Chan (1989), Guerrieri & Meliciani (2005) and Driemeier & Nayyar (2018) on various economies suggest. This is particularly the case for services share in total manufacturing input cost. Intermediate demand linkages suggest that manufacturing has been crucial as a source of intermediate demand for service sector thereby being important in stimulating its output and employment although its share in India's output remained stagnant during the post-reform period. It is important at the same time to realize that though manufacturing has been an important source of intermediate demand for services, but intermediate demand itself contributed in the range of 36-40 percent of total services demand in the Indian economy during the post-reform period (See Table 4).

This exploration so far indicates that manufacturing sector was much more broad-based in terms of its inter-industry linkages within the production structure as compared to services. On the other hand, service sector linkages in India have been comparably weaker with the rest of the economy. The greater impact of manufacturing on output and employment of the Indian economy through its backward linkages, in comparison to services, is consistent with the findings of Tregenna (2008) in the context of South Africa. The acceleration of service sector growth has drawn attention in terms of its importance for economic development of late-comers to industrialization as already discussed through the works of Dasgupta and Singh (2006) and Ghani & O'Connel (2014). The analyses in this section has clearly established that service sector integration with the overall production structure has not been commensurate with its rapid growth and sharp increase in its value added share during the post-liberalisation period. The finding adds an important dimension to the debate on economic growth and structural change particularly for India and other developing economies in general. It is therefore, important to explore the service sector more at more detail in terms of its sub-sectors to

understand the exact dynamics of sector. This task is taken up in the next section.

IV. A DISAGGREGATED INVESTIGATION OF SERVICES

This section first takes a look at the distribution of various service sub-sectors in service value added and employment at single-digit classification of the National Industrial Classification (NIC; 1987, 1998, 2004). This is to understand the broad distributions of value and employment within the service sector across its sub-sectors. In the subsequent analyses of this section the paper also looks at double-digit classification for analyzing their linkages within the economy and their sources of demand. The analysis here begins looking at value added and employment distribution across various service sub-sectors in Table 9 and Table 10[12], respectively, spanning two decades of the post-reforms period.

Table 9

Value added distribution within service sector(as a percentage of total service sector value added)

S No.	*Service Sub-Sectors*	*1993-94*	*1998-99*	*2003-04*	*2007-08*	*2013-14*
1	Wholesale and Retail Trade	29.6	32.1	30.3	32.6	23.4
2	Hotels and restaurants	3.5	2.2	2.9	3.6	3.7
3	Transport and Communication	26.6	17.2	18.9	16.7	14.2
4	Financial Services (Banking and Insurance)	10.2	14.6	13.2	11.4	13.4
5	Real estate, Renting and Business Services (RRB)*	-	-	17.5	20.1	29.4
6	Education and research	5.9	10.2	8	7.6	7.2
7	Medical and health	3.6	2.9	3.9	3.3	3.4
8	Other Services excluding 5 (9-5)#	-	-	5.3	4.6	5.1

9	Other Services plus RRB (8+5)	20.6	20.8	22.8	24.7	34.6
10	Services (sum of 1 to 8)	100	100	100	100	100

Source: Same as Table 2.

*Includes real estate services related to commercial and residential buildings, legal services, computer-related services like software publishing, hardware consultancy etc., architectural and engineering services, business and management consultancy, advertising etc.

#Includes community social and personal services like laundry services, hair dressing, television broadcasting and services not elsewhere classified etc.

Note: Data on "5" and "8" is separately unavailable in 1993-94 and 1998-99 but data on "8+5" is available.

Table 10

Employment distribution within service sector (as percentage of total service sector employment)

S No.	*Service Sub-Sectors*	*1993-94*	*1999-00*	*2004-05*	*2009-10*	*2011-12*
1	Wholesale and Retail Trade	42.1	43.5	41.6	40.7	37.0
2	Hotels and restaurants	4.5	5.5	5.9	5.7	6.5
3	Transport and Communication	14.7	17.5	17.8	18.7	19.2
4	Financial Services (Banking and Insurance)	3.6	2.6	2.9	3.6	3.6
5	Real estate, Renting and Business Services (RRB)*	2.3	3.1	4.3	5.4	5.6
6	Education and research	11.5	10.3	11.2	11.0	11.8
7	Medical and health	4.2	3.4	3.5	3.4	3.7
8	Other Services excluding 5 (9-5)#	16.9	14.2	12.9	11.5	12.6
9	Other Services + RRB (8+5)	19.2	17.3	17.2	16.9	18.2
10	Services (sum of 1 to 8)	100	100	100	100	100

Source: Author's calculation using Employment data from Nayyar (2012) and Mehrotra et al. (2014)

*Includes real estate services related to commercial and residential buildings, legal services, computer-related services like software publishing, hardware consultancy etc., architectural and engineering services, business and management consultancy, advertising, legal services, renting of machinery and equipment etc.

#Includes community social and personal services like laundry services, hair dressing, television broadcasting and services not elsewhere classified etc.

On observing the evolution of value added shares and corresponding employment shares across service sub-sectors, some important patterns emerge. Wholesale and retail trade remained the single largest sector in terms of value added (except 2013-14) and employment shares during the post-reforms period. But the sector witnessed a continuous decline in its employment share since 1999-2000 and a steep fall in its value added share between 2007-08 and 2013-14. It continued to dominate in terms of employment share but it lost its importance in value added share. In case of hotels and restaurants the value added share was largely stable with moderate fluctuations, but saw moderate increase in employment share over the years.

A perverse pattern can be noticed for transport and communications where the value added share saw a decline over the entire period (except between 1998-99 and 2003-04), but witnessed a consistent rise in its employment share. Financial services saw moderate fluctuations in its value added share but was larger than 1993-94 in all subsequent periods. Its employment share continued to remain extremely low in comparison to its value added share during the entire period. RRB services saw steep rise in value added share and gradual increase in employment share, but the gap between its value added and employment shares broadened during this period. Its share in employment continued to remain relatively small. Education and research and medical and health services saw stable value added and employment shares. Other services (row 8) saw a stable value added share but a decline in its employment share. Its value added share continued to remain much smaller than its employment share over the period. The larger dynamics of the service sector depict a perverse pattern of employment and value added shares over the post-reform period, as services like finance and RRB which gained in terms of value added shares

contributed relatively much less to employment and at the same time services like wholesale & retail trade and transport & communications contributed relatively more to employment as compared to their value added shares.

Eichengreen and Gupta (2011b) in their analysis of advanced economies consisting of 15 European Union countries along with United States, Japan, South Korea and Australia between 1970 and 2005, suggest that service sector growth could be divided into two waves over time. The first wave involves growth of traditional services like wholesale and retail trade, storage and transportation and public administration and defence thereby increasing service sector share in the economy's GDP. The second wave post 1990 marks domination of service sector growth through modern sectors like banking & finance, Information and communication technology, business, legal and technical services and a hybrid of modern and traditional sectors like education, health, hotel & restaurants and community, personal and social services. Countries have moved from the first to the second wave in conjunction with increase in levels of per capita income. Also, according to them the second wave of service sector growth which occurs at higher levels of per capita income has witnessed a lowering of its threshold in terms of per capita income. They show evidence that this is subject to factors like democracy, urbanization, openness to trade and proximity with major global financial centres. Looking at the shares of RRB and financial services on one hand wholesale & retail trade and transport and communication on the other hand in Table 9, it seems that the pattern of service sub-sector GDP shares in agreement with the two wave pattern of service sector growth argument put forth by Eichengreen and Gupta (2011b). But the employment share data, as already discussed shows that direct employment generated by the modern services has not been consistent with the income growth of these services. The analysis of value added shares and direct employment shares of finance and

RRB services hints towards a lack of a broad-based character in the growth of these services.

To verify this, Table 11 looks at a comparison of all the available service-sub sectors in terms of their total backward linkages or demand stimulating potential on the economy, similar to Table 3.

Table 11

Ranks of service sub-sectors in terms of their total backward linkages

S No.	*Sector*	*1993-94*	*1998-99*		*2003-04*	*2007-08*	*2013-14*
		Total No. of Ranks-12			Total No. of Ranks-21		
1	Air transport	-	-		4	3	1
2	Water transport	-	-		7	7	2
3	Legal services	-	-		18	18	3
4	Communication	8	10		12	11	4
5	Supporting and auxiliary transport activities	-	-		5	5	5
6	Land transport including via pipeline	-	-		3	2	6
7	Storage and warehousing	6	6		6	8	7
8	Other services not elsewhere classified (n.e.c) {S No. 23 minus 3, 9, 10, 11, 13 &15)}	-	-		11	10	8
9	Real estate activities	-	-		16	16	9
10	Renting of machinery & equipment	-	-		21	12	9
11	Other community, social & personal services	-	-		13	15	10
12	Hotels and	2	2		2	1	12

	restaurants						
13	Business services				8	4	13
14	Railway transport services	4	3		1	6	14
15	Computer & related activities	-	-		14	13	15
16	Medical and health	1	1		9	9	16
17	Insurance	9	7		10	14	17
18	Wholesale and retail trade	7	8		15	17	18
19	Banking	11	9		17	19	19
20	Education and research	10	11		19	20	20
21	Ownership of dwellings	12	12		20	21	21
22	Other Transport	3	4		-	-	-
23	Composite Other services (Includes services S No. 3, 8, 9, 10, 11, 13 & 15)	5	5		-	-	-

Source: Same as Table 2

Note: The serial numbers of sectors follow the rank sequence of the year 2013-14 starting from the top ranked sector.

In Table 11 services have been ranked according to their total backward linkage on the rest of the economy. The backward linkages of the sectors on themselves have been subtracted from the total backward linkages to assess the demand stimulating impact on the rest of the economy which includes all the other sectors of the economy. The disaggregated data for services in rows 1 to 3, 5, 6, 8 to 11, 13 and 15 is only available from the year 2003 onwards in the IOTTS.

If we look at the finance and RRB services, we see that although these are leading sub-sectors in terms of value added shares, their growth inducing potential for the rest of the economy is much more modest. For example, the rank of banking remained among the bottom few in the entire

post-liberalization period with respect to backward linkage. The two of the largest components of RRB in terms of value added shares have been ownership of dwellings and computer & related activities. They together constituted around 2/3rd of RRB value added during the period since 2003 when the disaggregated data is available. It can be seen that the indirect output and employment stimulating impact of these services have been relatively limited. Legal services, real estate and business services and renting of machinery & equipment generated more demand for each unit of their final demands than the two major components of RRB, but as compared to other service sub-sectors their contribution during the decade between 2003-04 and 2013-14 was lagging. Although a massive jump in the rank of legal services can be seen in 2013-14, its value added share within RRB remained around 3.3 per cent. Simply put, the modern services including finance and RRB did not lead in stimulating the other sectors of the economy as they continued to grow rapidly during the post-liberalization era.

Guerrieri & Meliciani (2005) suggest that the ability of an economy to develop an efficient and dynamic service sector is associated with its linkages with the manufacturing sector. Their focus in this context is on producer services like financial services and real estate & business services (RRB) for economies like Canada, France, Germany, Finland, Spain, Italy, Japan, Netherlands, UK and USA for the period between 1992 and 1999. They argue that greater intensity of manufacturing sector's usage of these services tends to be associated with higher growth and export competitiveness of these services.

Table 12

Percentage share of service sub-sectors in manufacturing input cost

S No.	*Sector*	*1993-94*	*1998-99*	*2003-04*	*2007-08*	*2013-14*
1	Railway transport services	1.6	1.4	1.4	1.0	0.7

2	Other transport services	7.4	4.9	5.4	5.9	2.1
3	Storage and warehousing	0.0	0.0	0.0	0.0	0.0
4	Communication	0.7	0.6	1.2	0.8	0.2
5	Wholesale and retail trade	10.2	9.9	9.3	9.7	7.4
6	Hotels and restaurants	0.0	0.0	0.0	0.0	0.1
7	Banking	3.1	5.2	3.7	2.8	1.6
8	Insurance	0.8	0.6	1.1	0.7	0.1
9	Ownership of dwellings	0.0	0.0	0.0	0.0	0.0
10	Education and research	0.0	0.0	0.0	0.0	0.0
11	Medical and health	0.0	0.0	0.0	0.0	0.0
12	Business services	-	-	0.5	0.8	1.1
13	Computer & related activities	-	-	0.3	0.4	0.0
14	Legal services	-	-	0.0	0.1	0.0
15	Real estate activities	-	-	0.0	0.0	0.0
16	Renting of machinery & equipment	-	-	0.0	0.0	0.1
17	Other community, social & personal services	-	-	0.9	1.0	0.0
18	Other services not elsewhere classified (n.e.c) {19-(12 to 17)}	-	-	0.2	0.2	0.0
19	Other services (Sum of 12 to 18)	2.7	2.8	2.1	2.4	1.2
20	All Services	26.6	25.4	24.2	23.4	13.3

Source: Same as Table 2.

Note: Distributive services: 1 to 5; Producer services- Financial services: 7+8 and RRB: 9 and 12 to 16; Residual services: 6, 10, 11, 17 and 18

For India, we have already noted the consistent decline of aggregate sector service input cost share in manufacturing production earlier. But we see (Table 12) that the share of producer services remained lower than distributive services. The producer services have not integrated with the manufacturing sector production during the post-reform period in India as opposed to the pattern observed by Guerrieri & Meliciani (2005) for the set of advanced economies mentioned previously. For example, banking services input cost share in manufacturing decreased consistently after 1998-99, and the share of insurance services also saw a steep and consistent decline after 2003-04. In case of RRB services we see that important services like computer and related activities, real estate and legal services did not witness greater dependency from the manufacturing sector in terms of their share in input cost. Business service share increased consistently, but continued to remain small. Therefore, manufacturing dependency on finance and RRB services did not witness intensification during the post-liberalization period.

In the previous section, we found that a much larger share of service sector demand came from final demand vis-à-vis intermediate demand. To gain more insight at the sub-sector level Table 13 presents a disaggregation of the components of final demand as sources of service sector demand.

Table 13

Major components of service sub-sector final demands (as percentage of final demand)

S No.	*Component of Demand*	*Private Final Consumption Expenditure*					*Exports*				
	Sector/Year	*1993-94*	*1998-99*	*2003-04*	*2007-08*	*2013-14*	*1993-94*	*1998-99*	*2003-04*	*2007-08*	*2013-14*
1	Railway transport services	82	74.0	51.5	59.9	70.4	10	10.6	19.6	17.0	0.0

2	Other transport services	71	77.1	77.5	67.7	86.9	16	14.2	11.9	20.7	10.6
3	Storage and warehousing	0	0	0	0.2	0	0	0	0	0	0
4	Communication	63	69.5	78.1	52.9	89.7	1	1.4	0.5	25.9	10.3
5	Trade	73	71.2	77.5	69.0	70.0	15	15.7	13.4	19.0	17.4
6	Hotels and restaurants	80	86.6	87.5	96.8	100	17	10.7	11.1	0	0
7	Banking	63	90.8	80.9	87.5	84.2	0	0	3.2	0	15.8
8	Insurance	56	87.0	74.5	67.5	86.0	44	13.0	15.2	24.7	14.0
9	Ownership of dwellings	99	100	100	100	100	0	0	0	0	0
10	Education and research	51	53.7	64.8	63.8	43.9	0	0	0	0	0.8
11	Medical and health	66	79.6	83.2	83.6	67.7	0	0	0	0	0
12	Business services	-	-	23.7	4.9	24.9	-	-	54.8	82.0	75.1
13	Computer & related activities	-	-	0	4.7	0	-	-	83.9	90.7	86.6
14	Legal services	-	-	86.2	63.7	100	-	-	0	26.6	0
15	Real estate activities	-	-	100	100	100	-	-	0	0	0
16	Renting of machinery & equipment	-	-	33.5	78.9	100	-	-	0	0	0
17	Other community, social & personal services	-	-	64.3	73.6	93.7	-	-	0	0	0
18	Other services not elsewhere classified (n.e.c) {19-(12 to 17)}	-	-	24.4	10.8	25.8	-	-	54.1	78.8	51.8

19	Other services (Sum of 12 to 18)	75	52.8	26.4	21.9	32.4	18	30.9	50.5	66.9	57.1
20	All Services	74.7	74.3	72.8	65.2	68.2	14.0	10.4	13.5	22.2	20.0

Source: Same as Table 2.

Note: Distributive services: 1 to 5; Producer services- Financial services: 7+8 and RRB: 9 and 12 to 16; Residual services: 6, 10, 11, 17 and 18

Table 13 only presents the shares of private final consumption expenditure (PFCE or private consumption) and exports as a percentage of final demand. This is because other components of final expenditure whichare Government final consumption expenditure (GFCE), Gross fixed capital formation (GFCF) and Change in stocks remained minor through the entire period. Most of the service sector final demand share has been composed of PFCE and exports (see Table 13, row 20) during the entire post-reforms period. Therefore, this suggests that private consumption and exports have been important drivers of service sector growth during the post-reform period. Producer services like business services and computer & related activities (includes the ICT- services) have been highly export-oriented.

In terms of the aggregate service sector, these findings can be further corroborated by Table 14 and Table 15 below.

Table 14

Share of different sectors in PFCE of the Indian Economy

Sector	1993-94	1998-99	2003-04	2007-08	2013-14
Agriculture, Forestry and Fishing	38	31	26	24	17
Manufacturing	22	25	26	26	29
Services	39	42	47	49	51

Source: Same as Table 2.

Table 15

Share of different sectors in Total Exports of the Indian economy

Sector	1993-93	1998-99	2003-04	2007-08	2013-14
Agriculture, Forestry and Fishing	6.5	8.4	4.5	2.9	5.7
Manufacturing	57.2	56.8	53.7	42.7	55.3
Services	34.1	34.0	35.4	48.1	37.8

Source: Same as Table 2.

It can be seen from the two tables above that the share of services in aggregate private consumption of the Indian economy has increased rapidly during the reforms period. The share in exports also rose but less rapidly than private consumption over this entire period.

Park (1987) in his study showed that the share of services in private consumption tends to increase more during advanced stages of economic development. At less developed stages it is the private consumption of manufactured goods that increases more than other commodities in the aggregate private consumption share of an economy. In the Indian context, however, private consumption share of services has been not only larger than manufacturing but has also increased much more rapidly.

The analysis in this section suggests some important characteristics of India's service sector growth in the post-reform period that have not been looked at in the literature. The distribution of value added share within services across service sub-sectors shows that modern services like finance and RRB became more important compared to other service sectors. These sectors classified as modern services by Eichengreen and Gupta (2011b) conform to their finding of increased growth in finance and RRB services observed internationally after 1990. But at the same time their direct employment contribution in India remained extremely low. As stated previously, by 2013-14 financial and RRB services together stood at 42.8 percent of service value added but just employed 9.2 percent (2011-12) of service sector workforce. Even in terms of the indirect growth

inducing impact on the rest of the economy, observed through their backward linkages, these services remained less important.

Additionally, unlike Guerrieri & Meliciani's (2005) findings, in the Indian context, increased export orientation doesn't seem to have been a result of greater production linkages of modern services with the manufacturing sector. Computer and related activities which reflect the ICT services were highly export oriented with limited manufacturing sector dependence on these services in terms of input cost.

The service sector saw a rapid rise in private consumption share of the Indian economy, exceeding that of major sectors like agriculture, forestry & fishing and manufacturing sectors. This has been a distinct feature of post-reform growth as compared to India's level of development. As mentioned earlier, according to Park (1987) the share of services in private consumption exceeds manufacturing only at advanced stages of economic development and it is the manufactured goods that dominate the private consumption share of an economy up to a higher threshold of per capita income. For example, the study shows that in 1975 the share of manufactured goods in private consumption for economies like Indonesia and South Korea was 48 per cent and 52 per cent respectively and the corresponding figures for Japan and USA were 30 per cent and 29 percent. The shares of services in private consumption for the former two were 18 per cent and 17 per cent respectively and that of the latter two were 41 per cent and 46 per cent respectively.

These are crucial findings on the nature of India's service sector growth, its linkages with manufacturing and the rest of the economy, which depict various important features associated with the post-reform evolution of the country's output and employment structure. The analysis clearly depicts limited inter-sector integration of service sector as an input in manufacturing and the Indian economy as a whole. The absence of broad-based character (in terms of output and employment stimulating impact on the economy and the disproportional distribution of value added

and employment between modern services and traditional services) of the service sector alongside its rapid growth adds a crucial dimension to the debate on economic growth and structural change for India and other developing economies.

SUMMARY AND DISCUSSION

This paper has analysed the production and demand linkages of the manufacturing and service sector using the available IOTTS in the post reforms period in India. It was found that in terms of input cost share the contribution of manufacturing to the production of India's outputwas much more important than the service sector and the importance of service sector during this period declined by this measure. In terms of Hirschman-type demand inducement, manufacturing sector has been much more integrated with India's production structure as compared to services. For each unit of final demand generated for manufacturing it created much larger stimulus on output and employment of the sectors in the Indian economy as compared to services. This suggests that though service sector grew more rapidly than manufacturing during this period, its ability to stimulate growth and employment in other sectors remained limited. It was also found that manufacturing dependence on services for production in terms of its input cost share in manufacturing did not witness intensification over this period. At the same time manufacturing remained an important source of intermediate demand for services. Another finding of the paper is that modern/technology-intensive producer services rapidly increased their share of service value added but contributed much less in terms of employment. Therefore, the distribution of value added within the service sector was highly uneven across its sub-sectors and gains of technological progress seem to have been unequally distributed within the sector. These dynamic services also did not witness a greater integration with manufacturing. Some of these producer services like computer and related activities (ICT-related) and business services have been highly

export oriented during this period. The larger part of service sector demand during this period came from the final demand segment. Within final demand it was private consumption and exports that were the main sources of service sector demand. Also, service sector share in total private consumption grew rapidly and was much higher than all the other sectors of the Indian economy. This finding is particularly striking in comparison to the level of India's development.

Given the larger role of final demand as a source of service sector demand, it has been argued by Rakshit (2007), Nayyar (2012), Guha (2013), and Ghose (2015) that income inequality has contributed to rapid service sector growth. Nayyar (2012) and Guha (2013) have attempted to analyse the household expenditure on services in this context and find some evidence for an unequal pattern in India, but the channels through which income inequality fits into explaining the post-reform growth process in India have not been adequately analysed in the literature. In a recent study, Basu and Das (2017) analyse the household expenditure data to find a link between demand pattern and service sector growth in India. They suggest that the rise in share of service expenditure for the bottom 75 percent of the expenditure distribution during the post-reform period could be explained by increased dependence on private provisioning of various services which were publically provided previously. In absence of extensive empirical evidence in this area they suggest further research on this link between post-reform service-led growth in India and consumption demand pattern.

The findings of this paper also indicate a complex process through which income inequality may be connected to the production structure underlying the recent growth pattern in India. First, the distribution of value added between aggregate manufacturing and service sectors remained highly uneven as compared to their employment shares in the

economy. At the same time the economic gains from technologically-intensive sectors within services have been found to be much higher than the rest of the sub-sectors indicating high distributional inequality within services itself. These advanced services neither witnessed an increased manufacturing dependence on them nor were they leading services in stimulating output and employment indirectly in other sectors. Second, a rapid rise in share of services in private consumption expenditure seems to be a reflection of an evolving consumption pattern possibly linked with income inequality as such a rise does not seem to be commensurate with the level of India's per-capita income. This inequality in income and consumption in turn possibly feeds back into the production structure to create a self-reinforcing pattern. The results from this paper are strongly suggestive of such a process at work but a definitive demonstration of the same with adequate understanding of the causal channels will require further research.

V. APPENDIX

1. Appendix A

Table A1

Ratio of Implicit deflators

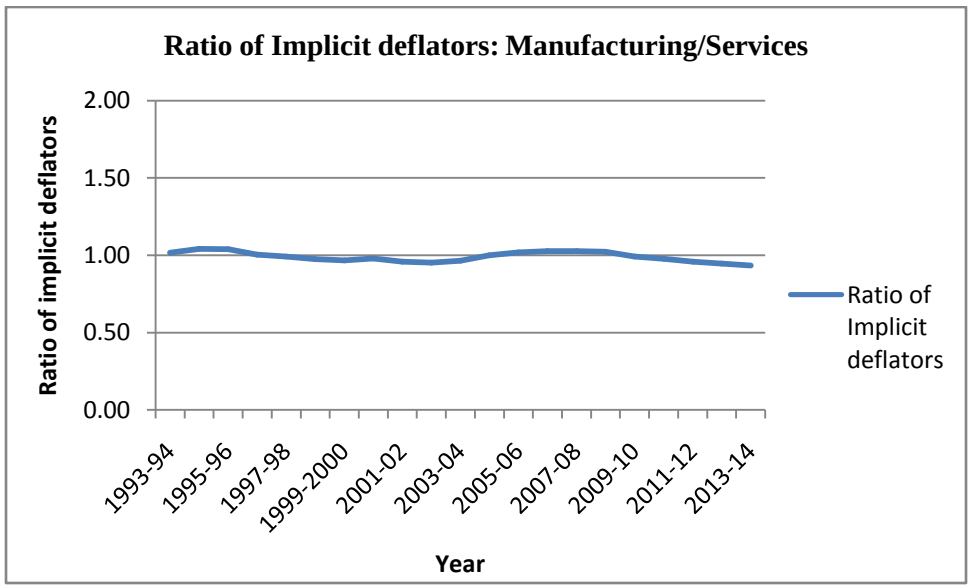
(Manufacturing/Services) at 2004-05 prices

Year	*Ratio of Implicit deflators(Manufacturing/Services)*
1993-94	1.02
1994-95	1.04
1995-96	1.04
1996-97	1.00
1997-98	0.99
1998-99	0.97
1999-2000	0.97
2000-01	0.98
2001-02	0.96
2002-03	0.95
2003-04	0.96

2004-05	1.00
2005-06	1.02
2006-07	1.03
2007-08	1.03
2008-09	1.02
2009-10	0.99
2010-11	0.98
2011-12	0.96
2012-13	0.95
2013-14	0.93

Source: Author's calculation using NAS back series 2011, and NAS 2017, CSO, GOI

Figure A1



Source: Same as Table A1

2. Appendix B

Production and demand linkages:

Park (1987) defines the dependence of a sector (downstream sector) on other sectors (upstream sectors) based on the input cost share of upstream sectors in the total input cost of the downstream sector. This can be obtained from the following mathematical expression:

$$Pij = Aij / \sum_{i=1}^{n} Aij$$

Where Pij represents production linkage/dependence of jth sector on the ith sector; Aij is the value of ith sector output used as input in jth sector and $\sum_{i=1}^{n} Aij$ represents the sum of values of inputs used in the production of jth sector's output in an economy with n number of sectors. Since dependence here is based on dependence on inputs for production, we can call it production linkage/dependence.

A sector is not only dependent on other sectors in terms of production but also in terms of demand for its output. Therefore, similarly we can also compute intermediate demand linkage/dependence as follows:

$$Dij = Aij / \sum_{j=1}^{n} Aij$$

Where Dij represents linkage/dependence of ithsector on the jth sector for intermediate demand; Aij is the value of ith sector output used as input in jth sector and $\sum_{j=1}^{n} Aij$ represents the sum of value of total intermediate demand of ith sector.

3. Appendix C

Backward linkages:

Mathematically in an Input-Output framework backward linkages (direct plus indirect backward linkages between sectors i.e. total intermediate demand and final demand generated for an upstream sector- input producing sector in response to a unit of final demand generated in the downstream sector-input using sector) are expressed in the following manner[13]:

$$AX + F = X \rightarrow (1)$$

$$A = \begin{pmatrix} a_{11} & \cdots & a_{1n} \\ \vdots & \ddots & \vdots \\ a_{n1} & \cdots & a_{nn} \end{pmatrix}; F = \begin{matrix} F_1 \\ \vdots \\ F_n \end{matrix}; X = \begin{matrix} X_1 \\ \vdots \\ X_n \end{matrix}; aij = Aij/Xj$$

$$F = (I - A)X \rightarrow (2)$$

$$(I - A)^{\dashv}F = X \rightarrow (3)$$

$$B = (I - A)^{\dashv}; B = \begin{pmatrix} b_{12} & \cdots & b_{1n} \\ \vdots & \ddots & \vdots \\ b_{n1} & \cdots & b_{nn} \end{pmatrix}$$

Here X is the column vector of gross outputs of n sectors in an economy and column vector F represents the final demand for each sector in the economy. Matrix A is also known as the coefficient matrix, where each aij represents the ith sector output used as input in the jth sector as a fraction of jth sector gross output. Matrix A is the basic matrix to understand inter-sectoral relationships in an economy in the Input-Output framework.
The matrix of our concern at the moment is matrix B also known as the Leontief inverse, where each bij represents the demand generated for the ith sector output as a fraction of Fj or a unit of final demand in the jth sector. Higher values of bij represent stronger backward linkage of jth sector with the ith sector. The relative integration of a sector within the economy based on its backward linkages with all the sectors in the economy is computed as follows:

$$Bj = \sum_{i=1}^{n} bij$$

Where, Bj represents the column sum of jth column in matrix B. This is nothing but the total backward linkage of jth sector with all the other sectors in the economy.

Using this technique, we try to find out the inter-sectoral integration of manufacturing and service sectors with the other sectors in the economy.

References:

Bagchi, A.K., (2005),"Keynes, Kaldor and Economic Development", in Jomo K.S. (eds.) *The Pioneers of Development Economics: Great Economists on Development*, Tulika Books, New Delhi, pp. 142-164.

Banga, R., and Biswanath Goldar, (2004), "Contribution of services to output growth and productivity in Indian manufacturing: pre-and post-reforms", *Indian Council For Research On International Economic Relations, Working Paper No. 139.*

Basu, D., and Debarshi Das, (2017),"Service Sector Growth in India from the Perspective of Household Expenditure", *Economic & Political Weekly* Vol. 52, No. 48,pp. 68-75.

Baumol, W. J. (1967), "Macroeconomics of unbalanced growth: the anatomy of urban crisis", *The American economic review*, Vol. 57, No. 3, pp. 415-426.

Bhattacharya, B.B. and Arup Mitra, (1990), "Excess Growth of Tertiary Sector in Indian Economy: Issues and Implications" *Economic and Political Weekly*, Vol. 25, No.44, pp. 2445-2450.

Bhowmik, R. (2003) "Service Intensities in the Indian Economy: 1968/9–1993/4", *Economic Systems Research*, Vol. 15, No. 4, pp.427-437.

Das, M., (2015), "Intersectoral Linkages in the Indian Economy during the Post-reform Period", in Prabhat Patnaik (ed), *Economics: Volume 3: Macroeconomics*, Oxford University Press, New Delhi, pp. 283-301.

Dasgupta, S. and Ajit Singh, (2006), "Manufacturing, Services and Premature De-industrialization in Developing Countries: A Kaldorian Empirical Analysis", *Centre for Business Research, University of Cambridge, Working Paper No. 327.*

Datta, M. (2015), "Stagnant Manufacturing and Baumol's Disease: Indian Economy since 1968-69" *ICRA Bulletin,Money and Finance* (July 2015), pp 69-97.

Dehejia, R. H., and Arvind Panagariya, (2014), "Trade liberalization in manufacturing and accelerated growth in services in India*", National Bureau of Economic Research, Working paper No.19923*.

Driemeier, M.H. and Gaurav Nayyar (2018), *"Trouble in the making? The future of manufacturing-led development"*, World Bank, Washington, DC.

Eichengreen, G. and Poonam Gupta, (2011a), "The Service Sector as India's Road to Economic Growth", National Bureau of Economic Research, *Working Paper No. 16757*.

---(2011b), "The two waves of service-sector growth", *Oxford Economic Papers*, Vol. 65, No. 1, pp. 96-123.

Ghani, S. E., Arti Grover Goswami and William R. Kerr (2016), "Spatial development and agglomeration economies in services--lessons from India" *The World Bank, Working paper No. 7741*.

Ghani, E., and Stephen D. O'Connell. (2014), "Can Service Be a Growth Escalator in Low Income Countries?",*Macroeconomics and Fiscal Management Global Practice Group, Policy Research Working Paper 6971*.

Ghose, A.K. (2015), "Services-led Growth and Employment in India", in Ramaswamy, K.V. (eds.) *Labour, Employment and Economic Growth in India*, Cambridge University Press, Cambridge, UK.

--- (2016) "*India Employment Report 2016: Employment Challenge and the Imperative of Manufacturing-Led Growth"*, Oxford University Press, New Delhi.

Guerrieri, P., and Valentina Meliciani, (2005), Technology and international competitiveness: The interdependence between manufacturing and producer services. *Structural change and economic dynamics*, Vol. 16, No. 4, pp. 489-502.

Guha, A. (2013), "The Service Sector Growth and Urban Consumption" *Institute of Rural Management Anand (IRMA), Vol. 249. Working Paper No. 8.*

Hansda, S. K. (2001), "Sustainability of Services-Led Growth: An Input Output Analysis of the Indian Economy", *Reserve Bank of India Occasional Paper,* Vol. 22, pp. 73-118.

Hirschman, A.O., (1958), *"The Strategy of Economic Development"*, Yale University Press, New Haven.

Jones, L.P., (1976), "The Measurement of Hirschmanian Linkages", *The Quarterly Journal of Economics*, Vol. 90, No. 3, pp. 323-333.

Kaldor, N., (1967), *"Strategic Factors in Economic Development"*, New York State School of Industrial and Labour Relations, Cornell University, Ithaca, New York.

Kochhar, K., Utsav Kumar, Raghram Rajan, Arvind Subramanian and Ioannis Tokatlidis, (2006),"India's pattern of development: What happened, what follows?", *Journal of Monetary Economics*, Vol.*53*, No.5, pp. 981-1019.

Kucera, D., and Leanne Roncolato, (2016). The manufacturing–services dynamic in economic development. *International Labour Review*, Vol. 155, No.2, pp. 171-199.

Lewis, W. A. (1954), "Economic Development with Unlimited Supplies of Labour", *The Manchester School*, 22: pp. 139–191.

Mehrotra, S., Jajati Parida, Sharmistha Sinha and Ankita Gandhi, (2014), "Explaining Employment Trends in the IndianEconomy: 1993-94 to 2011-12", *Economic and Political Weekly,* Vol. 49, No. 32, pp. 49-57.

Miller, R.E. and Peter D. Blair., (2009), "*Input-output analysis: foundations and extensions"*. Cambridge University Press, Cambridge, UK.

Nagaraj, R. (2009),"Is services sector output overestimated? An inquiry" *Economic and political weekly*, Vol. 44, No. 5,pp. 40-45.

Nayyar, G. (2012),*"The Service Sector in India's Development"* Cambridge University Press, Cambridge, UK.

Papola, T.S. (2006), "Emerging Structure of the Indian Economy: Implications of Growing Inter‐Sectoral Imbalances", *Indian Economic Journal*, Vol. 54, No. 1.

Park, S.H. (1987), "Linkages Between Industry And Services And Their Implications For Urban Employment Generation In Developing Countries", *Journal of Development Economics*, Vol. 30, pp. 359-379.

Park, S. H., and Kenneth S. Chan, (1989),"A cross-country input-output analysis of intersectoral relationships between manufacturing and services and their employment implications" *World Development*, Vol. 17, No. 2, pp. 199-212.

Rakshit, M. (2007), "Services-led Growth: The Indian Experience", *Money and Finance*, Vol. 3, No. 1, pp. 91-126.

Rodrik, D. (2013),"Structural Change, Fundamentals, And Growth: An Overview", *Institute of Advanced Study.*

Saikia, D. (2011), "Analyzing inter-sectoral linkages in India", *African Journal of Agricultural Research* Vol. 6, No. 33, pp. 6766-6775.

Sastry, D. V. S., Balwant Singh, Kaushik Bhattacharya and N. K. Unnikrishnan, (2003), "Sectoral linkages and growth prospects: Reflections on the Indian economy", *Economic and Political Weekly*, Vol. 38, No. 24, pp. 2390-2397.

Singh, K. and M.R. Saluja, (2016), "Input–Output Table for India: 2013-14" *National Council of Applied Economic Research, Working Paper No. 111.*

Targetti, F. (2005), "Nicholas Kaldor: Key contributions to Development Economics", *Development and Change*, Vol. 36, No.6, pp. 1185-1199.

Tregenna, F. (2008), "Sectoral Engines of Growth in South Africa: An Analysis of Services and Manufacturing", *UNU-WIDER Research Paper No. 2008/98*.

ENDNOTES

[1]The paper refers to the Lewis (1954) dual economy approach which divides the economy into traditional and modern sectors. In brief, the movement of labor from less productive traditional sector to more productive modern sector leads to economic growth in this approach.

[2] See Hirschman (1958). pp. 116-117.

[3]National account statistics, 2004-05 prices, EPWRF.

[4]Nayyar (2012) argues that India's service sector growth in the post reforms period is real and not notional. This means that it's not the greater relative prices of services vis-a-vis industry that reflects its higher share in output. This is based on his assessment of the movement implicit price deflators of agriculture, industry and services in the post-reforms period.

[5] Incomes of those associated with service production.

[6] Economies not explicitly mentioned.

[7]Since the IOTT for the year 2013-14 prepared by Kanhaiya and Saluja (2016) is not the official IOTT but derived from official SUTs, its results need to be read with care.

[8] See Appendix B for a mathematical representation of production and demand linkages calculated through IOTTS.

[9]See Appendix C for a detailed exposition of the methodology.

[10]The decline in service input cost share does not seem to be due to fall in relative prices of services vis-a-vis manufacturing. Baumol (1967) and on similar lines Datta (2015) have argued that relative prices of services tend to rise.In such a situation the rise in service value added share and fall in its input cost share is peculiar. This may be due to evolving production structure and technological progress but we are unable to separate the reasons of such an outcome. Also, see Appendix A, Table A1 and Figure A1 for the ratio of implicit deflators of manufacturing and service sectors which show that this ratio has hovered around 1 during the entire post reform period.

[11]See Park (1987) p. 366.

[12]The value-added shares and employment shares in Table 9 and Table 10 respectively, do not have exact concordance in terms of years. This is because employment data sourced from studies has been extracted from NSSO which is for specific NSSO rounds and the value added data for the same disaggregation is provided in IOTTS which differs from exact years in NSSO rounds. This does not seem to distort the broader trends in value added shares and employment shares across service sub-sectors as the corresponding years for both the shares differ only slightly.

[13] For a discussion on the methodology of computing backward linkages see Jones (1976) and Miller &Blair (2009).