

Why services cannot be the engine of growth for India

Chaitanya Talreja

Tata Institute of Social Sciences, India

Anirban Dasgupta

South Asian University, India

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Abstract

India's phenomenal service-led growth in recent decades has generated debate on the role of services vis-à-vis manufacturing as the engine of growth. With the rapidly increasing importance of Information and Communication Technology (ICT) in global production systems since the 1990s, there have been claims of services having developed a growth dynamism similar to manufacturing. This article examines the role of services in India's growth process using the concept of inter-sectoral linkages to make comparison with the role of manufacturing. Input-Output linkages and time series analysis reveal that services have been much less integrated in India's production structure than manufacturing. They were also less important in generating indirect employment spillovers through sectoral linkages, compared with manufacturing. Service sector growth is found to be autonomously driven by final demand and therefore less dependent on its interconnections with the rest of the economy from the production side. The findings also indicate that service sector growth has stimulated manufacturing growth but not vice versa. However, the impact of services on manufacturing from the demand-side is neither sustainable nor desirable going forward. India is in urgent need of strategically developing its manufacturing sector through integrating dynamic services like ICT and internalising productivity gains. At the same time measures to address India's inequality are critical to broaden the country's demand base and make the growth process more sustainable and inclusive. In this sense, inequality reduction is a prerequisite for growth and should not be seen as an alternative to it.

JEL Codes: OI, L60, L80

Keywords

Structural change, economic development, manufacturing services, inter-sectoral linkages

Corresponding author:

Chaitanya Talreja, Assistant Professor of Economics, Economics at Centre for Regulatory Policy and Governance, School of Habitat Studies, Tata Institute of Social Sciences, V.N. Purav Marg, Deonar, Mumbai 400088, India.

Email: chaitanya4092@gmail.com

Introduction

India's remarkable service sector growth since economic liberalisation in 1991 has been the subject of much discussion (Amirapu and Subramanian, 2015; Dasgupta and Singh, 2005, 2006; Ghani, 2010). The annual growth rate of value-added services between 1991 and 92 and 2014–2015 was 8.4%, much higher than that of the Indian economy as a whole, at 6.7%. During the same period manufacturing's growth rate was a moderate 6.9%.¹ A key point of deliberation in the literature on India's growth trajectory post-liberalisation is the possibility of services acting as a leading sector or the 'engine for economic growth' – a role typically conceived for manufacturing. Most contributors to this debate have conceded that advanced business services, including Information and Communication Technology (ICT) and related services, possess the same dynamic characteristics as manufacturing, with some, further arguing that services in conjunction with manufacturing act as an engine of growth (Dasgupta and Singh, 2005, 2006; Weiss and Jalilian, 2016). Others (Ghose, 2016) point to the uniqueness of manufacturing in leading the process of economic development and provide insights on why services cannot be expected to play this role in India. We contribute to this debate by analysing evidence on the key question of service – manufacturing inter-linkages in the Indian economy and the implications for the service sector to lead the growth process.

The structuralist approach to development economics considers the industrialisation of manufacturing to be the driver of wealth creation and diffusion in the economy (Hirschman, 1958; Kaldor, 1967; Kuznets, 1966). Detailed case studies of 20th century development experiences, such as Gerschenkron (1962) and Amsden (1989), support this view. Manufacturing was accorded the role of 'leading' the economy owing to its much higher labour productivity, compared to traditional sectors like agriculture, and its potential to rapidly increase this productivity over time. The manufacturing sector was also expected to have maximum linkages with other sectors of the economy (Weiss and Jalilian, 2016) thereby having the strategic capacity to stimulate growth and employment across the economy. Although empirical evidence has historically supported this hypothesis of manufacturing having the maximum inter-sectoral linkage, more recent data from some developed economies indicate the increasing importance of services in terms of linkage effects, typically at manufacturing's expense (Gabriel and de Santana Riberio, 2019). For developing economies, however, the status of manufacturing as the most interlinked sector has generally been retained.

This article uses the concept of intersectoral linkages to investigate the potential for services to be a leading sector for the Indian economy. It carries out an analysis of Input–Output linkages, focusing on the manufacturing and service sectors for a period of two decades since economic liberalisation commenced in 1991. Bivariate time series analysis is then used to capture the dynamic spillovers between these two sectors. Our main finding is that the service sector is much less integrated within the overall production structure of the Indian economy compared to manufacturing. Backward and forward linkage coefficients depict that the manufacturing sector's impact on stimulating production in the overall economy – as both an upstream and a downstream sector – has been much higher than services. In terms of employment, more than half of the indirect employment in the Indian economy has been generated from manufacturing activities during the post-reforms period, significantly more than from services. Our time series analysis also

strengthens the claim that India's service growth has been largely autonomous and independent of the expansion of manufacturing. Regression results show that service sector growth stimulated manufacturing's growth – but this is indicative of a demand side effect that is unlikely to be sustainable in the Indian context. Overall, the paper presents, for the first time, concrete evidence to refute repeated conjectures about services being the lead sector of the Indian economy in the post-liberalisation phase.

The paper is organised into four sections: section 2 discusses Input–Output analysis results, aiding understanding of the structure of services – manufacturing linkages in the Indian economy. Section 3 presents bivariate time series analysis using series of manufacturing and service sector output; and section 4 concludes with a detailed discussion of the key results.

Input–output analysis of manufacturing and services linkages in India

The basic methodology of input–output analysis is derived from Leontief's (1946) seminal work where the production and demand system of an economy is represented using Input–Output Transactions Tables (IOTTs). In an IOTT, different sectors of an economy are embedded in such a way that each sector's output can be traced as an input to other sectors. All sectors can be visualised within the one table as providing input to other sectors in the production structure, both upstream as rows and downstream as columns. Such systematic depiction of transactions between sectors provides the basis for computation and analysis of input–output linkages between sectors reflecting the production structure of an economy. IOTTs also provide information on usage of a sector's output outside the domestic production structure, that is, final use/demand. The final demand composition includes private final consumption expenditure (PFCE), government final consumption expenditure (GFCE), gross fixed capital formation (GFCF), change in stocks (CIS), valuables and net exports. An IOTT allows an analysis of both the production and demand structure of an economy.² Linkages between sectors in a vertical production structure can be described as upstream – input providing sectors – and downstream – input using sectors – thus enabling identification of important or key sectors in Hirschmanian lines (Hirschman, 1958), in terms of usage as inputs and due to the intermediate demand generated for other sectors. A downstream sector can *stimulate* production within upstream sectors by generating demand (backward linkage). An upstream sector can *support/stimulate* downstream production through provision of inputs (forward linkage). Through Hirschman's (1958) conceptualisation, IOTTs can be used to identify changes in the composition of interdependence along the course of structural changes in an economy (Temursho, 2016).

Post-reform research on inter-sectoral linkages using IOTTs in India

Research on India's post-liberalisation economy using IOTTs as an analytical tool has been considerable, with India's production and demand structure at the aggregate level of agriculture, industry (manufacturing plus non-manufacturing industries) and service sectors analysed in studies by Saikia (2011) 1968–1969 to 2003–2004, Sastry et al.

(2003) 1968–1969 to 1993–1994 and Das (2015) 1979–1980 to 1998–1999. A common finding of these studies is increased dependence on industrial inputs by agriculture over time but reduced dependence on agricultural inputs by industry, reflecting broad-based growth of the industrial sector. Services tended to be more strongly related to industry than agriculture over time. In contrast, Hansda (2001) and Bhowmik (2003) focus specifically on the importance of the service sector in inter-sectoral production and demand. Bhowmik (2003) analyses IOTTs for 1968–1969 to 1993–1994 to show that production intensity in services increased during the pre-reform period and that the metal products, machineries, trade and banking sectors had all been key recipients of service's intensity. Hansda (2001), examining 1993–1994, argues the importance of services to the Indian economy is due to its intensive use in production within other sectors. To date there is no research that analyses services – manufacturing inter-linkages, over an extended period, post India's liberalisation. Such analysis is attempted in this paper.

Data. The Central Statistics Office (CSO), Ministry of Statistics and Programme Implementation (MOSPI), Government of India publishes IOTTs for the Indian economy. It has published four since the economic reforms, for the years 1993–1994, 1998–1999, 2003–2004 and 2007–2008. More recently, the CSO published Supply and Use Tables (SUTs) for 2011–2012 and 2012–2013. While IOTTs are square matrices with an equal number of sectors in both rows and columns, SUTs can be rectangular matrices with an unequal number of rows and columns. Singh and Saluja (2016) have modified the 2012–2013 SUT to obtain the IOTT for 2013–2014. The number of sectors mapped in the IOTTs by the CSO has varied from 115 (1993–1994 and 1998–1999) to 130 sectors (2003–2004, 2007–2008 and 2013–2014), and sector classification has also varied within the published SUTs. Thus, for analytical purposes the classification was reduced to six major sectors, at an aggregate/broad level with sector concordance over time maintained by following classification guidance provided by the CSO. The IOTTs presented here focus on the following six economic sectors: agriculture and allied activities; mining and quarrying; manufacturing; non-manufacturing industry (construction, electricity, gas and water supply); services; and public administration and defence.

Analysis of input–output linkages. This section examines the inter-linkages between services and manufacturing, and linkages with the wider production system of India's economy through applying different input–output methods. To start, we examine the structural changes in output and employment during the post-liberalisation era as a backdrop to changes in services – manufacturing inter-linkages. Figure 1 displays the change in output composition and Figure 2, the change in employment composition.

These figures show a structural imbalance within the Indian economy in terms of sectoral output and employment composition coinciding with a pattern of general economic growth. In 1993–1994 – early liberalisation³ – agriculture and allied activities, manufacturing and services contributed 28%, 15% and 39% respectively, to India's gross value-added production. In 2013–2014 these shares were 14%, 15% and 55% respectively. The corresponding employment shares in 1993–1994 were 64%, 11% and 18%, respectively, changing to 45%, 11% and 28%, in 2014–15. While services' and manufacturing's value-added production had grown much faster than that of agriculture

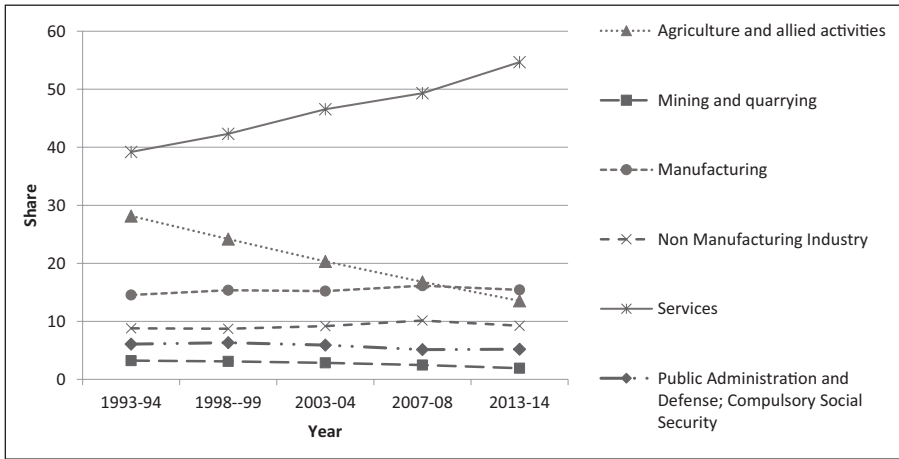


Figure 1. Change in value added shares across sectors (at 2004–2005 prices).

Source: Author’s calculations using KLEMS database (3rd Edition), RBI.

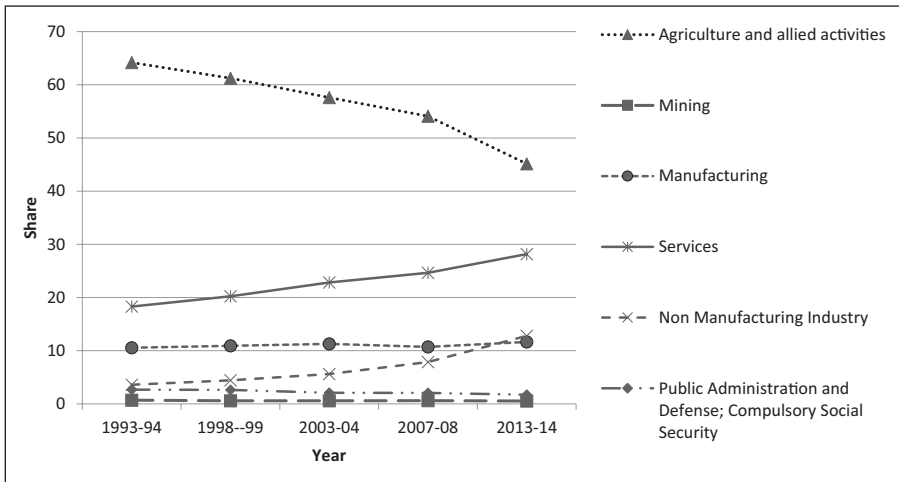


Figure 2. Change in employment shares across sectors.

Source: Author’s construction using KLEMS database (3rd edition), RBI).

Note. The horizontal axis shows the time period and the vertical axis shows the magnitude of percentage of variance due to the concerned sector.

and allied activities, they were unable to absorb employment at commensurate rates. An overwhelmingly large share of India’s employment continued to be generated in agriculture and allied activities with nine of the 19-percentage point fall in employment share gained in the construction sector (increasing from 3% to 12%),⁴ providing a cushion to workers engaged in low productivity employment.

Table 1. Sectoral share of total input cost in the Indian economy (shares at current prices).

Sectors*	1993–1994	1998–1999	2003–2004	2007–2008	2013–2014
Agriculture and Allied activities	15	14	13	12	11
Mining and quarrying	7	6	8	9	13
Manufacturing	38	39	42	43	41
Non-Manufacturing Industry#	9	9	8	8	11
Services	30	31	29	29	23
Total Input Cost	100	100	100	100	100

Source: Author's calculations based on IOTTs. CSO for the years 1993–1994 to 2007–2008 and IOTT prepared by Singh and Saluja (2016) for the year 2013–2014.

#Construction, Electricity, Gas and Water Supply.

The sector 'Public administration and defence' contains '0' entries in all cases as it enters IOTTs only as a Final expenditure under the heading 'Government Final Consumption Expenditure'. It is therefore not shown in the table.

Table 1 maps India's production structure through usage intensity – the share of each sector's contribution to total economic production. Table 1 shows the sectoral shares for total input cost incurred – sum value of all intermediate use transactions for all upstream sectors – to produce the total gross output of India's economy over time. The sectoral shares are computed from the total intermediate use column of the IOTTs. The mathematical expression for total input cost and sector shares of total input cost have been provided in Supplemental Appendix A (Sage: Please hyperlink).

Table 1 shows that services and manufacturing have made the greatest contributions to India's total input costs, during the post-reforms period. Manufacturing's contribution to the total input costs of production has not only been much larger than services but increased over the post-reforms period. In contrast, services' share of input costs declined after 1998–1999. This finding is striking given that services' value-added share had grown rapidly during the same period. Why has intensity usage for services' inputs not increased then? The decline in services' share of input costs does not seem to be due to a fall in the relative prices for services vis-a-vis manufacturing. Supplemental Appendix Table A1 and Figure A1 show that the ratio of implicit deflators for both manufacturing and services had been stable, around 1 during the entire postreform period. Technological change may have improved productivity in services' contribution to inputs (increase in output produced per unit use of services) during this period, which is not being reflected in services' intensity of use or share in cost. Recent studies like Guerrieri and Meliciani (2005), Driemeier and Nayyar (2018), and Kucera and Jiang (2019) have shown that services' intensity of production, measured by input shares, has actually increased during the course of the last four decades, particularly in advanced economies. But between 1995 and 2011, in the eight emerging economies (EE) including India, the average share has been stagnant (Kucera and Jiang, 2019). Moreover, services' intensity of production/ input share was much lower in the EEs in contrast to G7 economies where input shares increased during the same interval. The non-increasing intensity of service use in India as depicted by Table 1 is consistent with these observations, confirming an absence of increased integration of services as an input in India's production structure. While in

Table 2. Distribution of total demand for manufacturing and services (as percentage).

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

Source: As for Table 1.

2009, India's service share in manufacturing production was much lower than that of the G7 economies, although India was a relatively better performer within the EEs with respect to intensity of services use. In general, this suggests that the importance of services in the production structure of EEs tends to be lower than in advanced economies, but the decline in the intensity of service use in India, observed in Table 1, needs further explanation.

The decreased monetary cost share of services as an input in production costs supports explanations by Eichengreen and Gupta (2011a) and Ghose (2015) who argue that the rapid growth of services in India has been largely driven by final demand as opposed to intermediate demand. Table 2 below shows the distribution of demand components for manufacturing and services.

The distribution of demand components of sectors is presented in the rows of an IOTT. Table 2 shows that intermediate and final demands were equally important to manufacturing during this period, but for services, the contribution of final demand to total demand was much greater than intermediate/inter-industry demand. Most recently, in 2013–14, the relative importance of final demand has only increased for services. Domestic consumption and exports have played a major role in driving India's service sector growth, not only does domestic private consumption and exports compose 90% of final demand for services but there has also been a sharp rise in services' share of total domestic private consumption and exports during the liberalisation era. Between 1993–1994 and 2013–2014 the service share of domestic private consumption increased from 39% to 51% and that of exports increased from 34% to 38%. (See Supplemental Appendix Table A2–A4).

Tables 3 and 4 depict the intensity with which both manufacturing and services use inputs from other sectors. These sectors have been provided for completeness while the focus of the analysis remains on manufacturing and services.

Manufacturing and services account for much larger input cost shares in each other's production compared to all other sectors. Services input cost share to manufacturing declined marginally by one percentage point from 1993–1994 to 2007–2008, with a major decline to 2013–2014 (See Table 3). The moderate declines in services input cost shares are consistent with the stagnant service shares in manufacturing production observed in the EEs during 1995 and 2011, discussed previously; while the sharp fall in

Table 3. Manufacturing's intensity of usage: share of sectoral inputs to manufacturing (sector inputs as % of total manufacturing input cost).

Sector	1993–1994	1998–1999	2003–2004	2007–2008	2013–2014
Agriculture and Allied activities	13.1	15.5	10.7	9.1	14.5
Mining and quarrying	9.0	8.6	12.9	15.9	24.1
Manufacturing	45.9	44.6	47.0	48.2	43.0
Non-Manufacturing Industry	5.5	6.0	5.3	3.5	5.2
Services	26.6	25.4	24.2	23.4	13.3
Total input cost of manufacturing sector	100	100	100	100	100

Source: As for Table 1.

services' input share in 2013–2014 coincided with important changes in India's manufacturing cost structure.

From 2007–2008 to 2013–2014 there were sharp jumps in the shares of mining and quarrying, agriculture, and non-manufacturing industry to manufacturing's input cost. India faced multiple issues on the macroeconomic front during the post-2007–2008 global financial crisis period, such as high food and fuel inflation, and rapid exchange rate depreciation (Goyal, 2013; Lok Sabha Secretariat, 2013; Mohanty, 2013). Between 2011 and 2013 the global price of crude oil was at historically high levels (Ministry of Petroleum and Natural Gas, 2015). India meets most of its crude oil demand through imports and crude is a major import item for the economy (Lok Sabha Secretariat, 2013). Exchange rate depreciation, high oil prices and elevated food inflation not only led to high inflation generally but raised raw material costs and squeezed the profits of Indian corporations (Mohanty, 2013). The structural shift in manufacturing's input cost structure after 2007–2008 can be explained by the high costs of raw materials, fuel and energy during this period. These trends are also confirmed by the KLEMS (Capital (K), Labour (L), Energy (E), Material (M), Services (S)) database which shows that the energy and material shares in manufacturing's input cost rose steadily between 2007 and 2008 and 2013–2014.⁵

The decline in service input share of manufacturing during the liberalisation era is counter intuitive. International evidence suggests that service input intensity to manufacturing increases over the course of economic development, as observed in the cross country analyses by Park (1987), Park and Chan (1989), Guerrieri and Meliciani (2005) and more recently Driemeier and Nayyar (2018). According to Driemeier and Nayyar (2018) the share of embodied services – the share of services in gross value of manufactures' exports – has increased, globally, from 34% to 35% from 1995 to 2011, with this increase being more pronounced in the European region. Guerrieri and Meliciani (2005), based on analysis of several developed countries, suggest that an economy's ability to develop an export oriented competitive service sector is associated with services linkages with the manufacturing sector. In India on the other hand, while exports have become an important source of service sector growth, domestic manufacturing intensity of service use has declined.

Table 4. Service intensity of usage of inputs from other sectors (sector inputs as % of total services input cost).

Sector	1993–1994	1998–1999	2003–2004	2007–2008	2013–2014
Agriculture and Allied activities	7.0	6.1	6.4	7.5	3.1
Mining and quarrying	1.1	0.9	0.1	0.1	0.3
Manufacturing	34.2	34.1	39.3	38.5	32.1
Non-Manufacturing Industry	14.4	12.1	8.7	7.5	28.2
Services	43.3	46.8	45.5	46.3	36.3
Total input cost of service sector	100	100	100	100	100

Source: As for Table 1.

Table 4 shows that service sector input cost share was persistently higher than manufacturing input cost share in service production. This finding also stands out in contrast with the typically observed service production structures. Park (1987), based on his research of East Asian and Pacific Basin economies, shows that service sector production is much more dependent on manufacturing than on services,⁶ at relatively lower levels of economic development. The importance of services to service sector production is greater than manufacturing at higher levels of economic development, as depicted by the case of Japan and the United States in Park's (1987) analysis. India seems to have graduated to this stage rather uncharacteristically for its level of development. Like manufacturing, the sharp rise in the share of non-manufacturing industry total input costs to services between 2007–2008 and 2013–2014 can also be attributed to high fuel inflation in the Indian economy. The KLEMS database confirms that during the same period the energy share of service input costs doubled from 18% to 36%.⁷

India's manufacturing–services production linkages had weakened during a period of rapid service sector growth, especially in terms of manufacturing's use of service inputs. Further, services had used service inputs more intensively compared to manufacturing inputs.

Manufacturing and services impact on output and employment: A comparison

As discussed earlier, the seminal work of Hirschman (1958) provided the foundational understanding to view the economy as a system of inducement mechanisms where economic activity in one domain stimulates other economic activities. There are two important concepts here – backward and forward linkages. Backward linkages depict the demand stimulus a sector creates to induce production in other sectors by using inputs from these other sectors in the economy. Forward linkages capture the production stimulating/enabling impact a sector creates on the other sectors by being used as an input 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.⁸ IOTTs allow us to compute backward linkages through Leontief inverse matrices, and forward linkages through Ghosh inverse matrices, both

of which are derived from IOTTs.⁹ Further, inter-sectoral backward linkage coefficients allow us to compute the employment created in an upstream sector due to use in downstream sector production (See Miller and Lahr, 2001). Supplemental Appendix B for both mathematical exposition and explanation of computation of Leontief and Ghosh matrices and method to compute indirect employment. Tables 5–7, respectively, depict the backward linkages, forward linkages and indirect employment generation for manufacturing and services.

Each cell in Table 5 reflects the total direct and indirect demand generated for the sector placed in the row, in response to a unit of final demand generated by the sector named in the column, expressed as a fraction/multiple of one unit of final demand. For example, the first entry in row 6 shows that INR 1 of final demand for manufacturing generated INR 2.37 of output in the economy. These entries have been extracted from the Leontief inverse matrix calculated from India's IOTTs. It can be clearly seen here that the backward linkages of both manufacturing and services increased during the post-reforms period but manufacturing persistently stimulated more demand than services. Although services grew rapidly, it remained weaker in stimulating production in other sectors. This finding is similar to that observed by Tregenna (2008) for South Africa in 2005.

Each cell in Table 6 reflects the coefficient total direct and indirect supply generated for the sector placed in the row, in response to a unit of value added generated in the sector depicted in the column, expressed as a fraction/multiple of its one unit of its value added. These entries have been extracted from the Ghosh inverse matrix calculated from the IOTTs. The coefficients of forward linkages for manufacturing are much higher than that of services, indicating that every unit of value-added production by manufacturing has been associated with larger economic value creation in the onward supply chain compared to every unit of value-added production by services.

These findings are consistent with manufacturing's strong integration within an economy's production structure compared to other sectors. In India's case, these findings are important because they contrast the weaker integration of services with its growth dynamism and the deeper integration of manufacturing with its stagnant share in India's output.

Next, we compare the indirect employment impact of production in manufacturing and service sectors depicted in Table 7 below.

Row 6 of Table 7 shows total indirect employment generated in the Indian economy, as a percentage of the total (direct and indirect) employment, has been rising over time. Indirect employment has been calculated using employment intensity of gross output for each sector and a Leontief inverse matrix. Detailed mathematical explanation of the calculations are provided in Supplemental Appendix B. Indirect employment increased from 24% in 1993–1994 to 36% in 2013–2014 suggesting increased inter-connectedness between sectors resulted in employment creation during the post-reforms period. Manufacturing activities accounted for 55–60% of total indirect employment in India's economy, the largest across all sectors and almost 2.5 to 3 times higher than services. This occurred despite manufacturing's employment share stagnating during the post-reforms period.

Table 5. Manufacturing and service sector backward linkages.

Sectors	1993–1994		1998–1999		2003–2004		2007–2008		2013–2014	
	M	S	M	S	M	S	M	S	M	S
Agriculture, Forestry and Fishing	0.18	0.06	0.21	0.06	0.17	0.06	0.16	0.06	0.20	0.05
Mining and Quarrying	0.11	0.03	0.11	0.02	0.16	0.03	0.21	0.03	0.30	0.06
Manufacturing	1.60	0.23	1.58	0.24	1.67	0.26	1.74	0.26	1.65	0.29
Non-manufacturing Industry	0.10	0.07	0.10	0.07	0.10	0.05	0.08	0.04	0.13	0.15
Services	0.39	1.23	0.38	1.26	0.39	1.24	0.41	1.24	0.31	1.24
Lj (Total Backward Linkage = Sum of l to 6)	2.37	1.62	2.37	1.65	2.49	1.64	2.60	1.64	2.58	1.79

Source: As for Table 1.
 M: Manufacturing; S: Services.

Table 6. Manufacturing and service sector forward linkages.

Sectors	1993–1994		1998–1999		2003–2004		2007–2008		2013–2014	
	M	S	M	S	M	S	M	S	M	S
Agriculture, forestry and fishing	0.09	0.08	0.08	0.06	0.08	0.07	0.06	0.06	0.06	0.04
Mining and quarrying	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.03
Manufacturing	1.60	0.36	1.58	0.33	1.67	0.38	1.74	0.44	1.65	0.36
Non-manufacturing industry	0.16	0.12	0.15	0.11	0.20	0.13	0.23	0.15	0.28	0.19
Services	0.24	1.23	0.27	1.26	0.27	1.24	0.25	1.24	0.26	1.24
Gi (Total Forward Linkage = Sum of 1 to 6)	2.11	1.81	2.10	1.77	2.24	1.81	2.28	1.89	2.26	1.85

Source: As for Table 1.

M: Manufacturing; S: Services.

Table 7. Sectoral share of indirect employment in India (as a percentage of total indirect employment generated in the economy).

Sectors	1993–1994	1998–1999	2003–2004	2007–2008	2013–2014
Agriculture, forestry and fishing	5.8	4	4	3	1.8
Mining & quarrying	0.04	0.02	0.11	0.09	0.05
Manufacturing	57.1	60	59.7	55	61
Non-manufacturing industry	13.7	11	12.5	17.3	17
Services	23.3	25	24.6	24.2	20
Total indirect employment	100	100	100	100	100
Total indirect employment as a percentage of total employment generated in the economy	24	27	29	32	36

Source: Author's calculation using India KLEMS database and IOTTs, various years. Author's calculations using KLEMS database (3rd Edition), Reserve Bank of India (RBI).

Comparing the sectors from the perspective of their development potential, it is clear that manufacturing activities demonstrate a high level of inter-connectedness in the production structure of the Indian economy that contrasts sharply with services. In structuralist terms, manufacturing performed as a key or leading sector in stimulating output and employment in other sectors of the economy through greater inter-connectedness in both upstream and downstream production processes. Manufacturing activities were associated with much higher output and employment spillovers to other sectors compared to services. In contrast, the sectoral complementarities remained low for services despite the phenomenal growth of ICT and related sub-sectors in the post-liberalisation period – questioning the capacity of services to be the engine of growth for India.

Analysis of input–output linkages presented important evidence comparing the inter-connectedness of manufacturing and services within the production structure of the economy. However, there are two methodological limitations. First, the impact of various sectors within the production system works only through the channel of transaction-based linkages. Since sectors also tend to impact each other within an economy due to non-transactional spillovers i.e. externalities of production activities that affect other sectors positively or negatively are not captured by the I-O technique. For example, in the Kaldorian sense (Kaldor; 1967) manufacturing exhibits industry level economies of scale which has positive impacts on individual firms in creating increasing returns. This kind of positive externality cannot be captured just by looking at the static transaction coefficients between sectors. Secondly, the impact multipliers computed in the I-O framework assume that transaction coefficients between sectors are fixed for every round of production which does not allow for the dynamic production process to impact the coefficients. Time series methods can be used to capture the existence and strength of dynamic relationships between sectors allowing both transactional and non–transactional impacts on each other. This analysis is carried out in the next section.

Time series analysis of manufacturing–services inter-linkages

Time series techniques allow us to analyse the relationships between variables as they co-evolve over time. To date, there is no time series analysis for India that specifically analyses the evolution of manufacturing and services production linkages over the last three decades. The next section presents a bivariate time series analysis of inter-linkages between manufacturing and services value added between 1980–1981 and 2014–2015 using the India KLEMS database (3rd Edition) provided by the Reserve Bank of India.¹⁰

The methodology and analysis

The Augmented Dickey Fuller stationarity tests of manufacturing and services in their logarithmic form shows that they are both non-stationary in the level form but are stationary in the first difference (log difference) form that is both series are integrated of order 1 during the period under consideration (Supplemental Appendix Tables D1–D4). This allows us to perform the tests for co-integration between the two variables. We find that services and manufacturing are co-integrated by using the Johanssen's Co-integration

test (See Enders, 2010, pp. 401) results of which are presented in Supplemental Appendix Table D5. This shows the existence of a long-term relationship between the outputs of the two sectors. The presence of a co-integrating relationship between services and manufacturing allows us to follow a vector error correction model (VECM) that involves estimating a relationship between two time series variables which includes both short- and long-run relationships. In a VECM all the variables are endogenous.¹¹ The following equations represent the VECM for manufacturing and services value added time series in India based on the results obtained from the VECM:

$$\begin{aligned} \Delta Lser_t &= 0.0639 - 0.828 * (Lser_{t-1} - 1.3050 * Lmanu_{t-1} + 2.8495) \\ &+ 0.1433 * \Delta Lser_{t-1} + 0.03781 * \Delta Lmanu_{t-1} + \mu_{st} \rightarrow (1) \end{aligned}$$

$$\begin{aligned} \Delta Lmanu_t &= -0.0423 + 0.2369 * (Lser_{t-1} - 1.3050 * Lmanu_{t-1} + 2.8495) \\ &+ 0.2057 * \Delta Lser_{t-1} + 0.2039 * \Delta Lmanu_{t-1} + \mu_{mt} \rightarrow (2) \end{aligned}$$

Equations (1) and (2) above depict the estimated VECM for the logarithm of services and manufacturing value added – $Lser$ and $Lmanu$, respectively, capturing both long- and short-run dynamics. This system captures the impact of services and manufacturing value added on each other and with their own lagged values. The left-hand side (LHS) in both equations depict one period change in services and manufacturing value added in time t from $t-1$, respectively. The terms on the right-hand side (RHS) depict all the variables that impact the LHS in both equations, respectively. The terms on the RHS in both equations depict: the constant; the error correction term multiplied by the co-integrating equation shown in brackets; and the long run relationship between services and manufacturing value added, followed by the coefficients multiplied with the lag of first difference of services and manufacturing value added logarithms for the period $t-1$ and the error term, in that order. Supplemental Appendix Table D7 depicts the details of the estimated VECM.

Supplemental Appendix Table D8 shows that both the error correction terms in respective equations (1) and (2) are statistically significant. The error correction term for equation (1) is negative showing that the deviations of the entire system between the short-run and long-run relationships between services and manufacturing value added are adjusted back to the long-run relationship. The coefficients of $\Delta Lser_{t-1}$ and $\Delta Lmanu_{t-1}$ in equation (1) are not statistically significant implying that short-run changes in services and manufacturing in the immediately preceding period do not have a statistically significant impact on the present change in service value added. The coefficient of $\Delta Lmanu_{t-1}$ in equation (2) is also statistically insignificant but the coefficient of $\Delta Lser_{t-1}$ is statistically significant. The short-run changes in the service value added in the immediately preceding period impacted manufacturing value added positively while manufacturing did not impact itself in the short-run in a statistically significant way.

The R square value is low for the VECM but the Wald test (Supplemental Appendix Table D9) shows that the joint explanatory power of the model parameters is statistically significant and the variations in the trajectory of services and manufacturing value added are explained by the explanatory variables in the system. The model shows that services

and manufacturing outputs have been in a stable long-term relationship and changes in service sector output impact manufacturing output in the short-run.

VECM also allows us to estimate the impulse response function (IRF) and variance decomposition (VD). IRF depicts the impact of a shock arising in variable i in time t on variable j in time $t+p$. The IRFs for services and manufacturing value added on each other and themselves are provided in Figure 3. VD decomposes the variance in variable i due to a shock that can be decomposed into the percentage contributions due to variable i and j , respectively. VD is used to compare the relative importance of the shocks emanating from different variables in the system, in addition to the trajectory of the shock in both contemporaneous and future time horizons. Figure 4 below shows the VD for services and manufacturing value added.

The upper panel in Figure 3 shows that over a 10 year period the impulse responses of service output to a shock in both services and manufacturing increases over time and then flattens but remains elevated. The service sector impacts itself much more than does manufacturing. The lower panel shows the impacts on manufacturing output. The impact of service sector shocks on manufacturing increases initially and then tapers but remains elevated towards the end of the period. The impact of manufacturing sector shocks on manufacturing gradually decays over time. Service sector shocks impact manufacturing more than manufacturing impacts itself.

The upper panel in Figure 4 shows that most of the shock related fluctuations in services are due to the service sector itself, although these marginally decline over time. At the same time manufacturing's shock related contribution to service sector fluctuations increased over time but stayed marginal. The lower panel shows that initially, manufacturing sector fluctuations are almost equally contributed to by shocks from both services and manufacturing. Over time the contribution of services increases steeply and that of manufacturing declines. Both IRF and VD depict that it is the service sector that has a much greater impact on both services and manufacturing output than vice versa. Further the Granger causality results in Supplemental Appendix Table D12 confirm that the services impact manufacturing output and not vice-versa.

Interpreting the results

The results of the bivariate time series involving VECM, Granger Causality, IRF, and VD tests in the previous section, all point out that service sector output growth has been self-driven and manufacturing sector output growth has not been an important determinant in this process. These results strongly support the results from the input–output analysis which show that service sector inter-connectedness with manufacturing has not intensified during the post-reforms period and remains weak. It is generally postulated in several studies like Park (1987), Park and Chan (1989), Francois and Reinert (1996), Guerrieri and Meliciani (2005), Driemeier and Nayyar (2018) and Kucera and Jiang (2019) that increased manufacturing use of services has been an important aspect of service sector growth globally. For India in contrast, both input–output analysis and time series analysis show that manufacturing has not been an important factor in determining the trajectory of service sector growth. Services have been driven more by factors outside the production system, that is, final demand, primarily through domestic private consumption and exports as shown in Section 2.

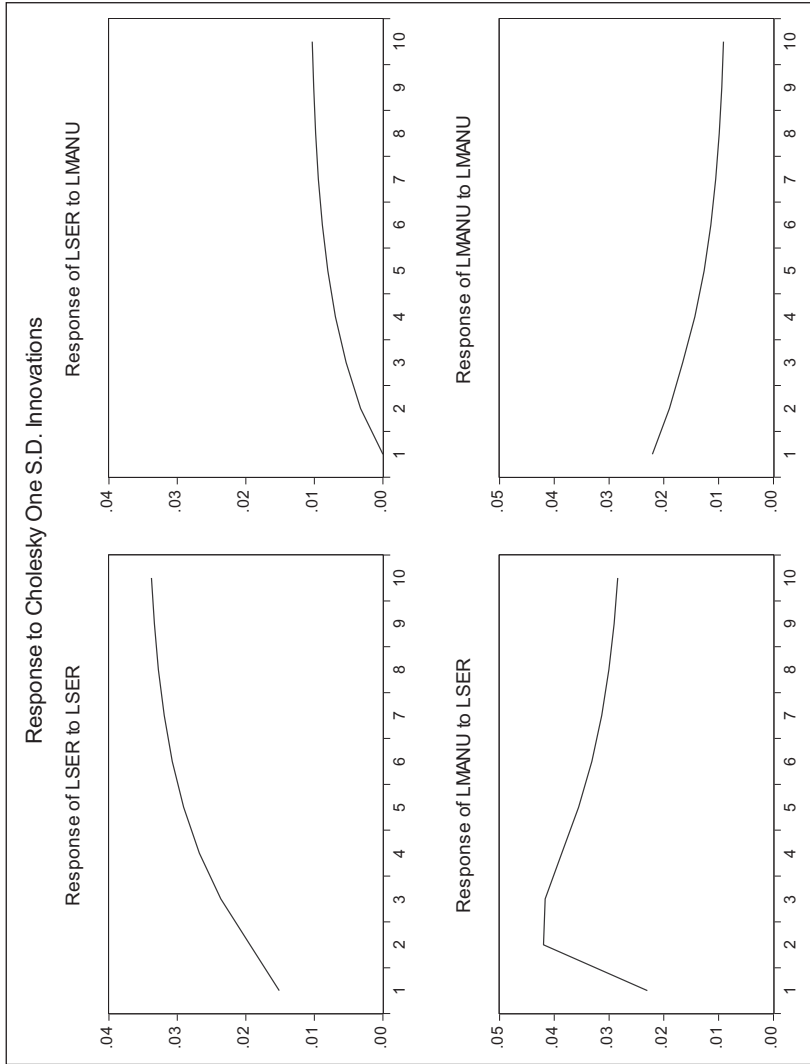


Figure 3. Impulse Responses of Services and Manufacturing to shocks from each other.

Source: Author's construction using KLEMS database (3rd edition), RBI.

Note: The horizontal axis shows the time period and the vertical axis shows the magnitude of impulse response in the concerned sector.

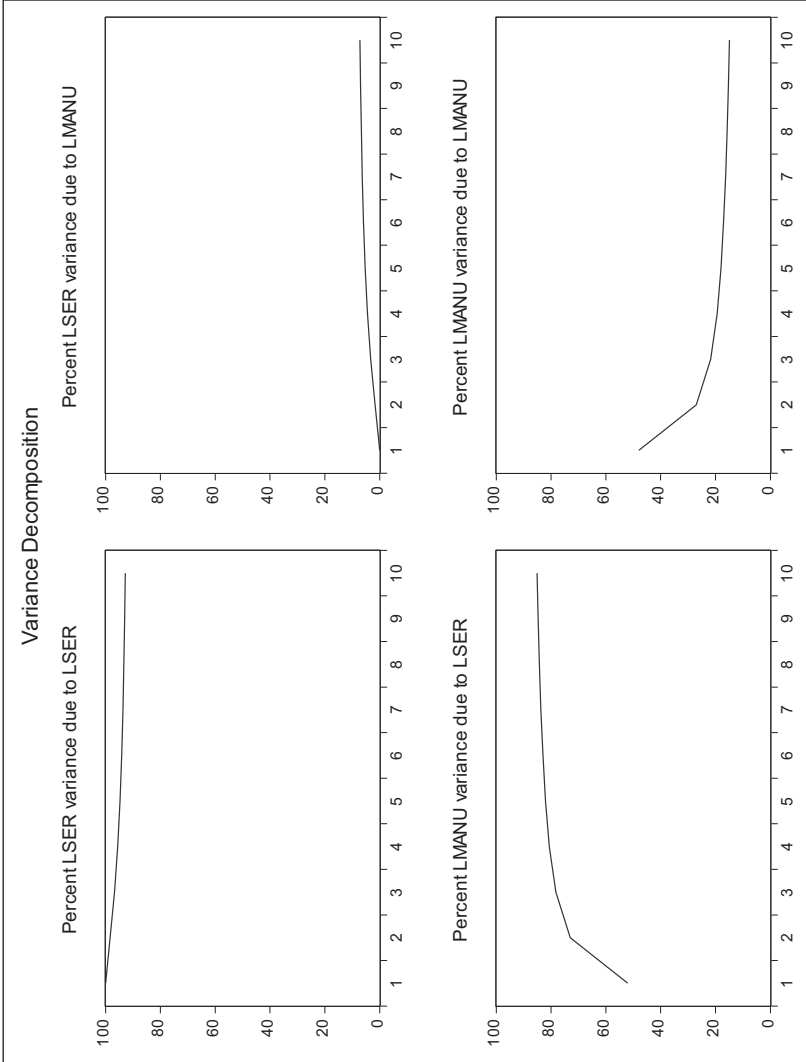


Figure 4. Variance Decomposition of shocks to services and manufacturing.

The time series analysis indicates that service growth has played a role in impacting manufacturing output growth, that is, the growth trajectory of manufacturing was responsive to the growth trajectory in services as far as the direction of statistically estimated causality is concerned. Together, the relatively low intermediate linkages between services and manufacturing and the disproportionate role of final demand in rapid service sector growth depicted by input-output analysis indicate that this responsiveness is an indication of a demand side impact.

There are reasons to believe that the demand side impulses of services on manufacturing is an outcome of certain aspects of the Indian growth process that are neither sustainable nor desirable in the long run. Ghose (2015, 2016, 2019a, 2020) argues that rapid service sector growth concentrated in certain specific sub-sectors like ICT and related services, has benefited a small section of the working population at the upper end of the income distribution. This in turn has influenced the demand patterns in the economy including those for manufactured commodities such that manufacturing growth during this period has been dominated by less labour-intensive and more skill-intensive and import-intensive industries.¹²

Evidence shows that India's top income deciles have experienced faster income growth than the bottom deciles during the post-liberalisation era (Banerjee and Maheshwari, 2020). For example, 52% of the overall increase in India's GDP between 1991 and 2011 accrued in the top 20% of the income distribution while the share for the bottom 20% was only 5%. Our own computations from the Consumer Expenditure Surveys of the National Sample Survey Office show that between 1993–1994 and 2011–2012 the ratio of monthly per capita expenditure (MPCE) of the top-most decile to bottom-most decile increased from 7 to 10 (See Supplemental Appendix Tables E1–E4 for categories of expenditure over different deciles). The concentration of income and consumption at the top ends of the respective distributions in India clearly depicts the narrow base of domestic demand. This is contrary to the massification of demand that is considered pivotal in sustaining manufacturing expansion due to the minimum scale requirements for efficient production (Chai, 2018). Broad-based domestic demand played a critical role enabling first tier East Asian industrialisers (Storm and Naastepad, 2005) and China (Ghose, 2019b) to build their manufacturing capacity in labour-intensive industries and helped them become major exporters in their initial phase of industrialisation.

The services driven demand stimulus on Indian manufacturing, based on a small section of the beneficiaries of ICT and related services boom, has possibly run its course. The significant slowdown in urban demand including those for high-end consumer goods were already evident from around 2015. Compounded by a crisis in the agricultural sector, the Indian economy was battling significant demand deficiency and consequent growth deceleration before Covid-19 derailed the growth process completely (Dev and Sengupta, 2020).

Conclusion

This study was motivated by the vibrant debate around the role that services can play in India's growth process. The phenomenal growth of services in the first two decades post-liberalisation riding on the export boom of ICT and related services, raised optimism

regarding the capacity of services to replace manufacturing as the main engine of growth. Services also gained importance in the international context, as globally, manufacturing output and employment shares for economies have been peaking at lower levels of per capita income and with lower peak shares since the 1970s (Rodrik, 2016; Tregenna, 2015); and services have emerged as increasingly important in generating both income and employment (Eichengreen and Gupta, 2011b; Ghani, 2010).

This paper used the concept of intersectoral linkages to investigate the potential for services to be a leading sector in the Indian economy by focusing specifically on manufacturing's and services' linkages with each other and the rest of the economy in the post-reforms period.

The analysis reveals an important imbalance in India's production structure. The service sector grew rapidly, driving India's economic growth but service growth had largely been autonomous and did not lead to integration of the sector with the larger production structure including manufacturing. The input-output tables show that the importance of service transactions as an input in the production system did not increase. Even in manufacturing, the importance/share of services inputs in terms of economic value declined over the post-reforms period. In international literature, intensive usage of services as inputs in domestic manufacturing is shown to be an important determinant of growth in services. In contrast, for India, final demand has been the major source of service sector demand with a relatively minor role played by demand for services as an intermediary.

The manufacturing sector has been much more integrated in terms of the value of inter-industry transactions. Backward and forward linkage coefficients also depict manufacturing's impact on stimulating production in different sectors of the Indian economy, both as an upstream and downstream sector, has been much higher than services. In terms of employment, more than half of India's indirect employment has been generated due to manufacturing activities during the post-reforms period – much higher than what has originated from services. Overall, the faster growth of services has had a low impact on the rest of the economy due to weaker inter-sectoral linkages.

The time series analysis also depicts services growth as self-determining as an output series. Although services growth did impact the growth process in manufacturing, the reverse did not happen during the liberalisation era. This result combined with the results of the input-output analysis, suggests that service growth did not stimulate manufacturing growth from the supply (production) side but any impacts on manufacturing are likely to have been mediated through demand. This conclusion is consistent with Ghose (2015, 2016, 2019a, 2020), who considers the particular trajectory of import-intensive manufacturing in India, in recent years, to be a function of unequal demand patterns resulting from inequality in service sector incomes. To the extent that service induced manufacturing demand is generated by a small section of service workers whose incomes have increased rapidly as part of the ICT related service boom – as has been argued by Ghose (2016) and Ghatak et al. (2020) – this stimulus is both unsustainable over time and detrimental for the purposes of an inclusive growth process.

The main message of the paper is unambiguous – with its present features, services cannot be depended upon as the engine of growth for India. This is despite the remarkable rate of growth witnessed by the sector, driven by the international boom in ICT and

related services. The analysis also has relevance for the policy orientation of the Indian economy going forward. The self-propelling nature of service sector growth in India implies that the gains of the technology-based service revolution have not been adequately internalised within the larger production system, possibly holding back productivity and competitiveness in the overall economy. This perverse development, despite services' rapid growth and increased importance in global production, needs to be corrected. To a large extent, prioritising manufacturing and realising manufacturing's capacity in value creation and employment generation in other sectors of the Indian economy can bring about this correction. The findings in this article show that manufacturing is highly inter-connected with India's production system and that potential gains can be realised in other sectors through manufacturing's expansion generated through strong output and employment inter-linkages. But it is also important to increase the synergies between manufacturing and services particularly by internalising the potential of ICT-based innovations carried out in India to increase the competitiveness of the domestic manufacturing sector. Towards this goal India urgently needs a strategic Industrial Policy which has been missing in India's post-reform policy ecosystem (Mehrotra, 2020).

India also needs to focus on broadening the demand base by addressing inequality. The slowed growth experienced by the Indian economy from the mid-2010s has been attributed to saturation of domestic demand with a narrow base, an outcome of service-led growth and an inability to compete in global markets for manufactured goods (Ghatak et al., 2020). Therefore, expanding domestic demand can play a crucial role in sustaining India's growth, as potential demand at the bottom sections of the income distribution have remained untapped. Treating growth and inequality reduction as alternative policy choices is misguided in this regard (Ministry of Finance, 2021: Chapter 4, Economic Survey 2020–21). Given the presently inadequate demand base, reducing inequality is a prerequisite to sustain India's growth. This should not be considered as a politically contingent redistribution unrelated or detrimental to economic growth, as often claimed by commentators.

The analysis carried out in this paper strengthens the long-held hypothesis that no country can expect to develop by bypassing a manufacturing-based industrialisation process. Strictly speaking, the results of this paper are valid for India in the two decades after economic liberalisation and as such cannot be generalised. But given the prominence that the Indian experience of service-led growth has gained in the growth and development literature, this paper serves as an important reminder against any hasty conclusion about the ability of services to be the new engine of growth. This is notwithstanding the recent global patterns of premature deindustrialisation and service dominance.

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Notes

1. Authors' calculations using the KLEMS (Capital (K), Labour (L), Energy (E), Material (M) and Services (S)) database (3rd Edition), Reserve Bank of India (RBI).
2. See Supplemental Appendix A for a mathematical exposition.
3. The benchmark years chosen here from the KLEMS are to maintain consistency with the benchmark years of the IOTTs.
4. Included as a part of the non-manufacturing industry.
5. Author's calculations based on 3rd edition KLEMS India database, RBI.
6. See Park (1987) p. 366
7. Author's calculations based on 3rd edition KLEMS India database, RBI.
8. See Hirschman (1958). pp. 116–117.
9. An important limitation of the computation of backward and forward linkages is that they are static in nature, i.e., the chain reaction in these processes is based on the assumption that for every round production stimulated through these linkages the coefficients from the Leontief Matrix and Ghosh Matrix remain the same. Basically, the same coefficients keep on multiplying for every round of production. But they serve as a good approximation for assessing and comparing the different sectors in terms of their economic importance in the production system.
10. The choice of time period here is 1980–81 to 2014–15. For a detailed discussion on the choice of the time period see Supplemental Appendix C.
11. Detailed explanation of the VECM and its general form are presented in Supplemental Appendix D.
12. The industries which were highly intensive users of imported-inputs for domestic production and also industries where there was greater import penetration in the domestic market depicted by large net imports (Ghose (2016)).

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Author biographies

Chaitanya Talreja is Assistant Professor of Economics at the Centre for Regulatory Policy and Governance, School of Habitat Studies, Tata Institute of Social Sciences, Mumbai, India. His main areas of interests include strategies of economic development, structural change and inclusive & environmentally sustainable growth.

Anirban Dasgupta is Associate Professor in the Faculty of Economics, South Asian University, New Delhi, India. His main areas of interest are development theory, agrarian studies and structural transformation in the global South. He is the lead author of recent ILO studies 'Employment Scenario in Afghanistan from 2007 -08 to 2013 -14' (2019) and *Agriculture-led employment in Afghanistan: A strategy for long-term development and peace* (2021).