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**Services Contribution to Manufacturing Exports and
Value-Added: Evidence from India and China**

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Abstract

The importance of services inputs in enhancing manufacturing productivity and competitiveness has been well documented in the literature on global value chains and economic development. In this context, we investigate the nature and strength of the interlinkage between the services and manufacturing sectors in India and China, using value-added and exports data from the OECD Trade-in-Value-Added Database over 2005-15. Three principal observations emerge from our analysis. First, manufacturing value-added in exports is significantly overstated in conventional BOP statistics for both countries; it is much lower when we use the value-added approach. Second, China's services value-added contribution is concentrated in traditional services such as trade and distribution and transport services, reflecting the high demand from its competitive manufacturing sector. In contrast, services exports and value-added in India display a higher utilization of modern services, notably, information technology (IT). Third, in both the countries, services show potential for raising their value-added contribution to manufacturing exports, particularly in high-value sectors like IT services. The analysis suggests a need for further deregulation, liberalization, and diversification of the service sector along with greater policy recognition of the importance of services for spurring manufacturing as well as overall competitiveness.

Key words: Services, Manufacturing, Exports, Value-Added, Servicification, Productivity

JEL Classifications: F10, F61, L60, L80, O14

1. Introduction

Conventional trade models explain the basis and patterns of trade in final goods and services between countries, based on comparative advantage. With growing international fragmentation, however, such models have been superseded altogether or modified to accommodate the changing nature of trade. Production now involves decomposing a specific good into stages and outsourcing them to various locations around the world. Global production sharing in fact accounts for an extraordinarily large part of international trade: more than 50% of world manufacturing imports (covering primary goods, parts and components) are now in the form of intermediate commodities.¹

Production offshoring in the 21st century encompasses not just the manufactures of physical goods but also its necessarily attendant activities like R&D, designing, distribution, marketing. This has given rise to the broader concept of Global Value Chains, or GVCs, whereby the *value created* by a commodity covers the full sequence of tasks involved from inception to final assembly and delivery. The GVC framework is analytically useful because it allows us to understand the organizational structure of spatially connected industries and intra-industry firms, the nature and spread of their activities, and where economies across the world with varying cost and competitive advantages fall in the value continuum of a particular product. It accommodates an examination of how this division of “tasks” has allowed developing countries to locate very specific niches of specialization, such as Korea specializing in exports of integrated circuits or Tunisia in dashboard clocks.

In order to derive sustained gains from GVC participation, emerging and low-income economies must constantly seek out strategies to upgrade their economic competitiveness and find means to translate that competitiveness into broad-based benefits, such as increasing employment and lowering poverty and inequality. The historically dominant form through which this has occurred is rapid industrialization and subsequent capacity building of manufacturing exports, as seen in the early growth patterns of the East Asian Tigers and later, China. However, in recent decades, the analysis of trade-production networks and its relationship with economic development has expanded from a purely manufacturing lens to other dynamic sources of growth - most notably, the role of the service sector.

The primary focus of this paper is not to compare the relative importance of manufacturing and services in development, but to examine the contribution of services *in* manufacturing value-added and exports - a phenomenon known as the *servicification* of manufacturing - and its implications for *overall* economic competitiveness². Our analysis focuses on this exchange in two developing economies: China and India. The choice of these two economies is motivated by several stylized facts. India and China have been the fastest-growing large economies since the 1990s; over 1995-2017, China grew at an average rate of 13.9%, while India’s average growth rate was 9.7%. In 2017 PPP terms, China was the largest economy in the world, while India was the 3rd largest; China was the 2nd largest consumer market in the world and India was the 6th largest.³ It seems plausible to assume that a prolonged, high rate of growth in these two economies in the near future may in turn considerably influence global economic fortunes.

In light of the importance of sustained, robust growth in India and China, it becomes necessary to assess possible sources capable of contributing to that growth. China’s economic expansion can be traced

¹ Backer and Miroudout (2013): Mapping Global Value Chains.

² We fully acknowledge that our omission of the primary sector, i.e., agriculture, mining, quarrying, and other related sectors from our analysis may not be justifiable, considering that countries like India have more than 40% of their aggregate employment engaged in agriculture and agro-based industries. However, when it comes down to *productivity and growth*, manufacturing and increasingly, services, have represented larger sections of the value created in an economy, including developing economies.

³ GDP data and consumer market size taken from World Bank. (Accessed May 5, 2019)

<https://data.worldbank.org/indicator/NY.GDP.MKTP.KD.ZG>

<https://data.worldbank.org/indicator/NY.GDP.MKTP.PP.KD>

<https://data.worldbank.org/indicator/NE.CON.PRVT.CD>

mainly to the remarkable performance of its manufacturing sector. Over the last five years, however, a combination of rising wages and tremendous excess capacity has led to severe industrial moderation (Huang 2016). This has impelled China to seek out alternative sources of growth, such as the Belt and Road Initiative (BRI). As Huang (2016) points out, even if BRI provides newer sources of external demand, the structural slowdown in manufacturing suggests a need for the Chinese economy to transition from past models of labour-intensive and heavy machinery exports to a services-based model of development as seen in developed countries. It is in this context that servicification of manufacturing may have an important role to play.

India's manufacturing has also been witnessing muted growth, and as we shall explore in the following sections, its manufacturing exports have been expanding only incrementally. In 1995, India served 0.5% of world manufacturing exports; this rose to a mere 1.5% in 2017 (China's rose from 3.3% to more than 17%). Its share of manufacturing GDP has stagnated between 15-17% since the 1990s.⁴ At the same time, India's service sector has expanded rapidly, led by computer services⁵ and business process outsourcing exports, propelling average GDP growth to nearly 10%. It follows that for India to sustain an accelerated growth trajectory it must capitalise on its competitive advantage in services and this includes exploring novel ways of adding value to a stalling manufacturing sector, especially in view of the latter's employment potential.

Our work compares the differences and similarities in the nature of servicification across India and China. We view export trends and patterns through both a balance of payments (BOP) lens and a value-added (VAD) approach, using data from the OECD TiVA database for 2005-15. The purpose of this is to highlight the "embedded" role of services in production, through sectors such as designing, marketing, distribution, finance, legal services and many others. The contributions of these activities tend to be understated in conventional BOP statistics that simply record gross flows of imports and exports crossing borders. The VAD approach allows us to attribute the value of production activities to their source sectors, including services.

Our analysis reveals that in both India and China, services are considerably understated in the BOP approach, but not in the VAD approach. China's services exports are dominated by traditional services like transport and retail, while India's exports are more evenly balanced across traditional and modern services like IT and other business services (comprising professional services such as legal, accounting, engineering and other categories). In general, however, services show limited integration into manufacturing value-added in both countries. Information technology services, in which India is an internationally recognised supplier, exhibits a particularly weak link with manufacturing exports.

Using cross-country data from TiVA, we conduct an econometric analysis of the role of various factors aiding servicification of manufacturing, as suggested by the literature. The results seem to broadly confirm that regulatory factors, research and development and human capital play significant roles in the servicizing process. There seems to be considerable scope for India and China to make headway on these fronts, through liberalising their services regimes and by improving overall governance and business conditions.

The rest of the paper is organized as follows. Section 2 provides a brief literature review of the importance of services in manufacturing, competitiveness and GVCs, and our subsequent motivation for a service-sector comparison between India and China. Section 3 details this comparison at both the aggregate and subsectoral levels, covering sourcing trends of manufacturing exports from services as well as broader patterns at the aggregate level. Section 4 presents some possible causes and explanations behind the trends observed. Section 5 presents the econometric analysis of the role of various factors in

⁴ UNCTAD.

⁵ Throughout our analysis, we have used computer services and information technology services interchangeably, though their definitions somewhat differ. We recognize that this involves assuming a degree of liberty.

servicification at a cross-country level and draws inferences based on the findings. Section 6 lays out some policy recommendations and concludes.

2. Services and Servicification: A Brief Literature Review

Services inputs have been recognised as the indispensable “glue” enabling the smooth interoperability of different components of geographically dispersed production networks (Elms and Low 2013). Connecting services such as logistics and transport assume critical roles in anchoring the distribution sector and facilitating final delivery of products to consumers across states and borders; communication services such as IT help coordinate the transmission of important information regarding production, distribution and sales throughout the supply chain. Services inputs underpin international production networks, and easier access to them has become vital for domestic industries to participate in GVCs.

The role of services in manufacturing was first noted by Vandermerwe and Rada (1988), defining servicification of manufacturing as “the increased offering of fuller market packages or ‘bundles’ of customer focused combinations of goods, services, support, self-service and knowledge in order to add value to core product offering.” Bundling of goods with a services ecosystem produces the benefit of diversifying risk on the part of firms, extending the product life-cycle, retaining customer loyalty (Baines and Lightfoot 2013), amplifying pricing power from said loyalty and thereby reducing the reliance on solely manufacturing dexterity and innovation for higher-order growth in stock and shareholder value (Fang, Palmatier and Steenkamp 2008). A growing volume of studies has observed this reallocation of resources to services from manufacturing. Miroudot and Cadestin (2017) calibrate a share of nearly 40% services VAD in manufacturing firms across OECD countries, while Baldwin, Ito and Sato (2015) demonstrate that the majority of manufactured VAD in Asia now stems from services. Pilat and Wölfl (2005) show that Danish and Swedish firms attribute a rising share of revenue in manufacturing firms to services, similar to Breinlich and Criscuolo (2011) for UK firms. Neely, Benedittini, & Visnjic (2011), using a sample of 46,000 firms, show that by 2011, the percentage of manufacturing firms undergoing servicification was roughly 46% in Malaysia, 25% in Thailand and 22% in Indonesia.

A heterogeneous but expanding literature has documented the implications of servicification for employment, growth, productivity and competitiveness. Amity and Wei (2009) find that productivity of US manufacturing firms has risen in response to offshoring of services. Hoekman and Mattoo (2008) attribute this increased productivity and consequent economic growth to a greater availability of low-cost but high-quality producer services, while Lodefalk (2014), analysing servicification for Swedish firms, locates larger productivity and export levels for manufacturing firms using larger shares of in-house services. Lodefalk (2017) not only finds increased firm productivity and efficiency, but also links servicification to firms’ improved capacity to transition to high-end service jobs from low-end fabrication tasks. Anukoonwattaka et al. (2015) find a greater intensity of servicification in the Asia-Pacific region relative to the rest of the world, and show business, distribution and logistics services to be key factors behind the cost-efficient production of industrial exports. Regarding labour market effects, an interesting paper by Bernard et al. (2017) notes that Danish manufacturing firms adopting increased servicification employ a larger proportion of skilled workers relative to traditional manufacturing firms. Similarly, Boddin and Henze (2014) find that servicification in German manufacturing has raised the employment of high-skilled labour.

The importance of the service sector has been well-established in India, now globally recognised as a competitive supplier of IT services. India catered to 14% of world computer services exports in 2016, and services now form over 60% of its GDP.⁶ Nonetheless, such an expansion of services among developing countries is not unique to India. Chinese services exports have grown at a similar pace since

⁶ See the next section for details.

the 2000s, increasing its share of global services exports to 4.6% in 2018 from 2.9% in 2005⁷. If services growth in China did not attract a degree a similar degree of attention, it was because of its exceptional manufacturing sector growth.

Several papers have studied the evolution of services in India and China, but few seem to compare them directly and even fewer in the context of servicification. Gordon and Gupta (2003) studies the growth of the service sector in India in the 1990s and finds that economic reforms and growth of computer services exports played a key role in the accelerated expansion of the service sector. Chanda (2017) examines the Indian service sector at a detailed, disaggregated level and concludes that services in India are weakly linked to its manufacturing sector, functioning instead as isolated export enclaves. She finds that services such as R&D and business services have generated very little value in manufacturing, and also highlights the small and declining contribution of services such as transport and storage in overall exports (though their share in total value-added remains high). Qin (2006) examines the sources of productivity in China's tertiary sector and attributes its high growth to mainly the movement of labour from the primary into the service sector. Wu (2007) carries out a rare comparison of the service sectors in India and China and posits that the trajectory of services growth in India places it slightly above the world average for countries with similar levels of development, while China falls slightly below it.

Our work most closely parallels that of Chanda (2017) and Wu (2007) in spirit if not in content, investigating a few questions not raised in these papers. Are there commonalities between Indian and Chinese services contributions, in terms of exports, value-added and linkages into manufacturing? Have services exports in India indeed been growing rapidly, or is the growth merely due to a few sectors growing faster? To what extent have manufacturing firms in both countries been absorbing services? Thus, this paper aims to extend the existing literature by comparing the distribution of services in India and China and to infer the likely implications of existing patterns of servicification of manufacturing.

3. Services: GDP, Exports and Value-Added

3.1. Services GDP

Services now account for the largest slice in global GDP today. As of 2015, the sector was responsible for roughly 70% of global output and nearly half of global employment. Over 2000-2017, services added US\$ 19.5 trillion to the world economy; manufacturing added just US\$ 2.6 trillion. This growth has also been accompanied by a rising share of services in world transactions. Over 2005-17, world trade in services has grown faster than trade in goods.⁸

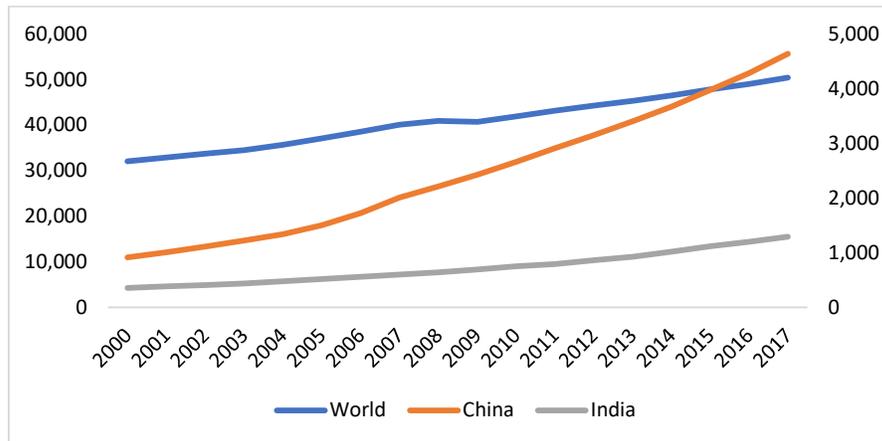
⁷ UNCTAD.

⁸ GDP and trade data taken from UNCTAD:

https://unctadstat.unctad.org/wds/ReportFolders/reportFolders.aspx?sCS_ChosenLang=en (Accessed June 25, 2019).

Employment data taken from World Bank: <https://data.worldbank.org/indicator/sl.srv.empl.zs> (accessed June 25, 2019).

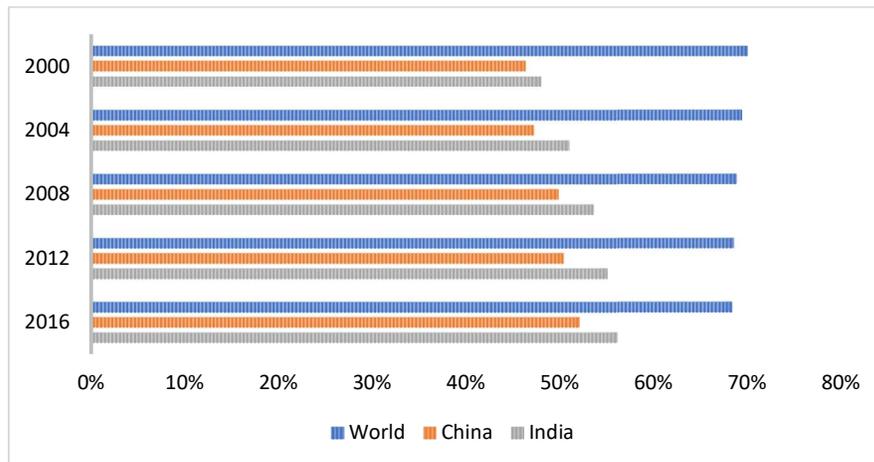
In this context, we note that service sector growth in India has not generated commensurate employment. Roughly 30% of the labour force in 2017 was employed in services in India. In China, services employment has grown a bit faster, accounting for 44% in 2017. Though the employment dimension of services is extremely important from the perspective of policy formulation and merits considerable scrutiny, our analysis here has mostly rested on the nature of exports and value-added.

Fig 1: Services GDP (US\$ bn)

Source: UNCTAD. Accessed June 21, 2019

https://unctadstat.unctad.org/wds/ReportFolders/reportFolders.aspx?sCS_ChosenLang=en

India and China are not exceptions to this trend. In both, services GDP has been rising faster than manufacturing and agricultural GDP and for the first time in its economic history, over half of China's output is now accounted for by services. This rapid growth of services in the Chinese economy has been relatively under the radar, unlike its Indian counterpart, mainly because it has been overshadowed by the rapid growth and scale of China's manufacturing sector. Services output in China has in fact been growing at faster rates than in India. Relative to World Share of GDP, however, services output shares are still low in both countries.

Fig 2: Share of Services in GDP (US\$ bn)

Source: UNCTAD. Accessed June 21, 2019

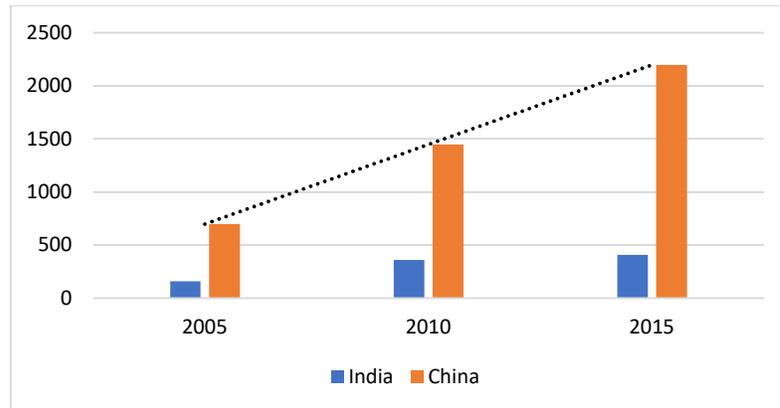
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In order to answer some of the questions we posed at the outset as well as to ease exposition, we concentrate on the production side of the two economies rather than their demand – specifically, Exports and VAD numbers from the OECD TiVA Database. It is to these features that we turn next.

3.2. Exports

A striking feature of the Chinese export sector is its persistently high growth rate (see Fig 3). Over 2005-15, Chinese exports grew at a compounded annual growth rate (CAGR) of over 12%, rising from US\$ 700bn to US\$ 2.2 trn (nearly equalling India's GDP).

Fig 3: Gross Exports (US\$ bn)

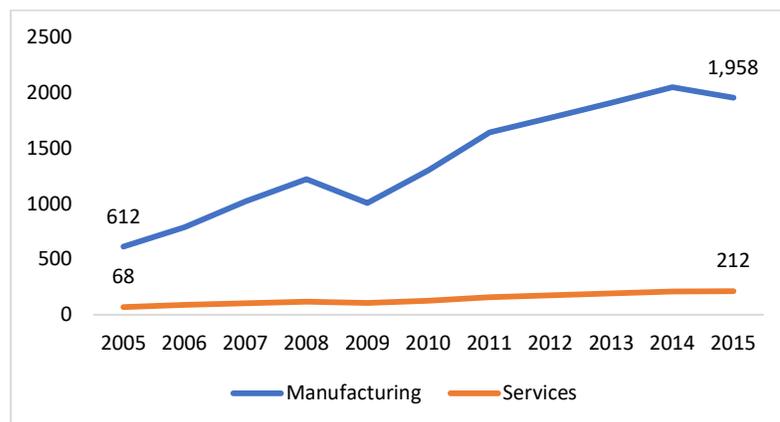


Source: OECD TiVA. Accessed June 24, 2019

<https://stats.oecd.org/index.aspx?queryid=75537#>

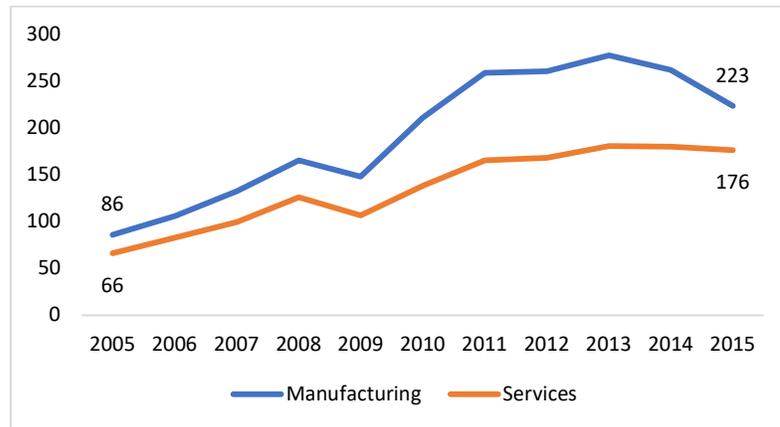
The gap between Indian and Chinese export levels – a loose measure of bilateral competitiveness – has swelled rapidly with each year. Assuming (hypothetically) that Chinese exports enter a sudden downturn and grow at a moderated rate of 8% till 2025, Indian exports would still need to grow by almost 30% each year to catch up in absolute value terms. India's gross exports in 2015 – US\$ 406bn, were substantially less than the *increase* in Chinese exports over each 5-year period (US\$ 750bn).

Fig 4: China's Gross Exports, Services and Manufacturing (US\$ bn)



Source: OECD TiVA. Highlighted points belong to 2005, 2015.

<https://stats.oecd.org/index.aspx?queryid=75537#>

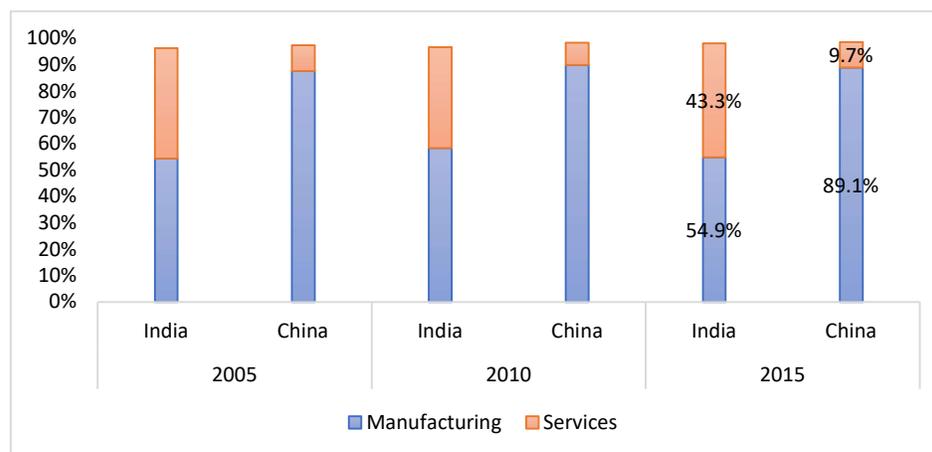
Fig 5: India's Gross Exports, Services and Manufacturing (US\$ bn)

Source: OECD TiVA. Highlighted points belong to 2005, 2015.

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One may be misled into interpreting these two figures as conveying essentially comparable growth rates. However, the trendline of exports in India is comparable only with China's *services* trajectory, lying at the bottom of Figure 4. The consistency behind Chinese export growth can be directly attributed to the remarkable expansion of its manufacturing sector, adding US\$ 1.5 trn over 2005-15.

China's exports are largely skewed in favour of manufacturing (see Figure 6), with services exports accounting for less than 10% and growing slowly. Indian exports show a more balanced ratio, with manufacturing ahead in gross terms and services having a median share of roughly 40%. In general, in both countries, the spread of exports between manufacturing and services has remained unchanged over time. As shown at the aggregate level (above), Indian exports, if desirous of attaining China-like levels in the future, would need to grow a lot faster than the CAGR of 10% over the 2005-15 period, particularly in manufacturing. Services exports, however, are comparable in absolute value terms across India and China.

Fig 6: Gross Exports, Manufacturing and Services

Source: Calculated from OECD TiVA. Accessed June 24, 2019.

The % figures do not add up to 100% due to the exclusion of agriculture, fishery, forestry, mining and quarrying.

<https://stats.oecd.org/index.aspx?queryid=75537#>

Disaggregation at the subsectoral level reveals that traditional services like trade, distribution and transportation dominate Chinese exports, totalling more than **90%**. Indian services exports are more diversified, with IT services (44%) leading the way, followed by transportation (16%), trade (14%) and other business services (11%) (see Fig 7-8). In absolute value terms, however, the increase in cumulative export earnings of all sectors other than information services over 2005-15 has been mild, as shown in the following table:

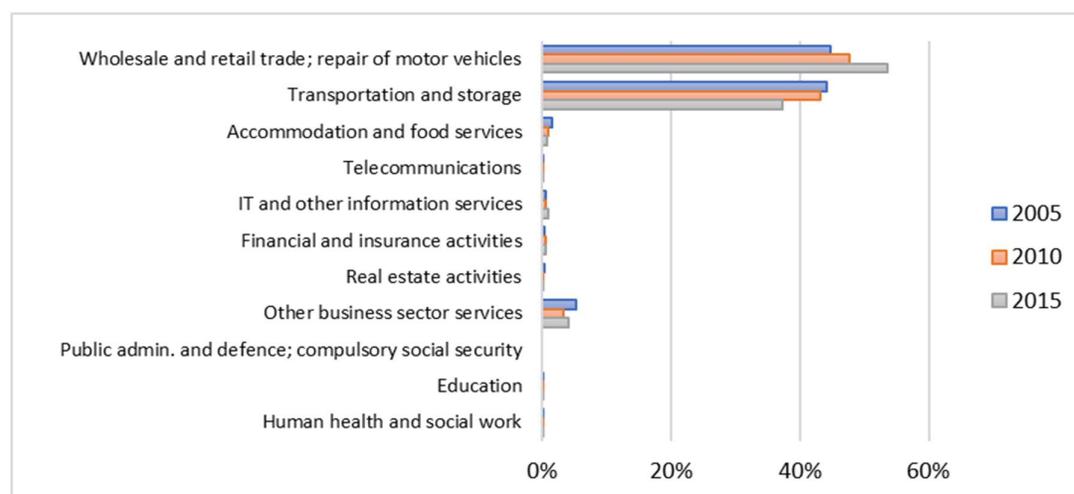
Table 1: Largest Service Export Sectors (US\$ bn)

Country	China		India	
	2005	2015	2005	2015
Wholesale and retail trade; repair of motor vehicles	30.4	113.7	7.3	24
Transportation and storage	30	79.5	14.1	28.1
Other business sector services	3.7	8.9	9.9	20
IT and other information services	0.4	2.1	24.3	78.5

Source: OECD TiVA. Accessed June 24, 2019

<https://stats.oecd.org/index.aspx?queryid=75537#>

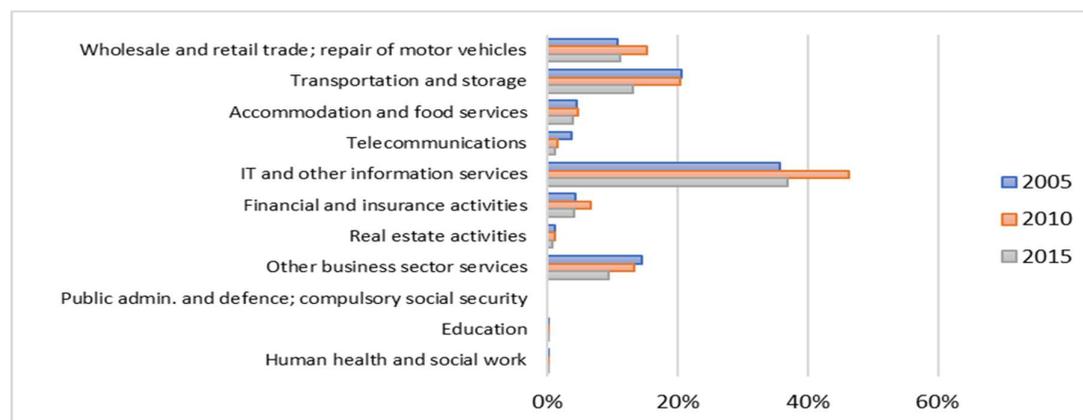
Fig 7: Decomposition of China's Services Exports



Source: Calculated from OECD TiVA. Accessed June 24, 2019

<https://stats.oecd.org/index.aspx?queryid=75537#>

IT services and distributive trade – the main services export sectors in India and China, respectively, – have continued to increase their shares over time (53.6% and 44.6%), while transportation has seen a decline in both countries. Notably, IT services do not feature as a prominent source of exports in China. China's services exports have grown faster over 2005-15, but the increase has been limited to just trade and transport services.

Fig 8: Decomposition of India's Services Exports

Source: Calculated from OECD TiVA. Accessed June 24, 2019

<https://stats.oecd.org/index.aspx?queryid=75537#>

The fastest growing sectors in India have been trade, IT and finance. Though the growth has been more equitable than in China (see Table 2 below), actual export earnings are still unevenly distributed, with wholesale and retail trade, transportation and storage, accommodation, food services and telecom exports *combined* having lower cumulative earnings than computer services (US\$ 562bn against US\$ 611bn). Other Business Services exports, which include R&D services, legal, accounting, architecture and engineering services, are minimal and have fallen over time in both countries. These observations have different implications and pose different challenges for the service sector in India and China. While China's overall growth rate of services exports has been impressive, **92%** of that growth has originated from just the trade and transport sectors. In 2015, all the other exporting sectors (as shown above) together contributed about one-third of transportation-storage exports, and less than one-fifth of wholesale-retail trade exports. Similarly, in India, none of the exporting sectors has managed to exhibit significant growth rates except computer services (see Table 2). Thus, services exports in both countries have not developed uniformly, being concentrated in traditional industries in China and computer services in India.

Table 2: Growth Rate of Services Exports in India (2005-15)

Exporting Sector	Growth Rate
Wholesale and retail trade; repair of motor vehicles	12.60%
IT and other information services	12.46%
Education	12.32%
Financial and insurance activities	11.78%
Accommodation and food services	10.47%
Human health and social work	10.34%
Real estate activities	7.99%
Other business sector services	7.31%
Transportation and storage	7.19%
Telecommunications	1.09%
Public admin. and defence; compulsory social security	-

Source: Calculated from OECD TiVA. Accessed June 24, 2019. Exports of public administration, defence and social security had zero exports in 2005 and 2015. <https://stats.oecd.org/index.aspx?queryid=75537#>

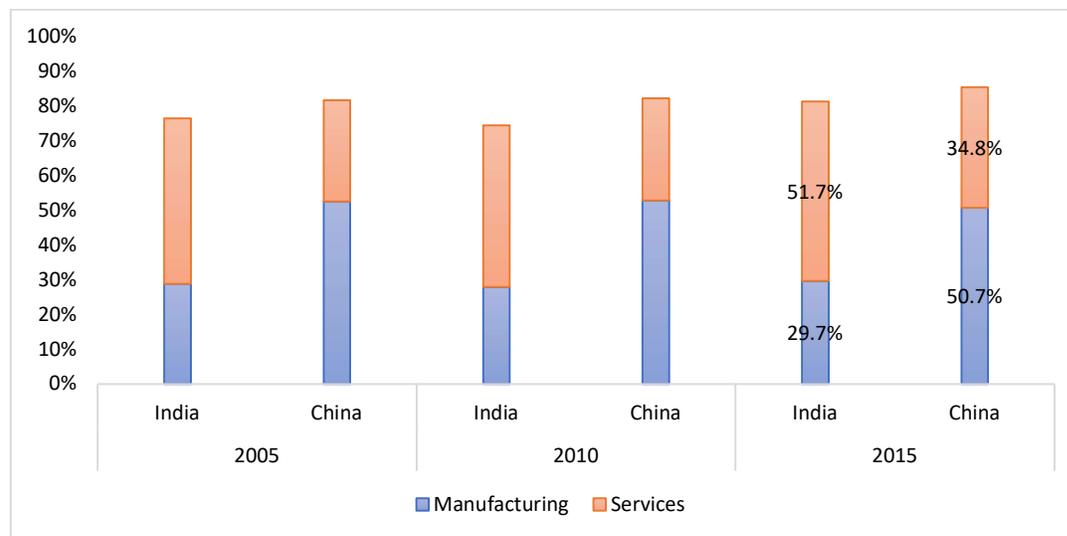
Note: Education, real estate and social work have very low absolute export values in Indian exports, so their growth rates may not be meaningfully interpretable. We haven't shown China's corresponding growth table since all sectors other than transportation, storage and trade generated export revenue of less than US\$ 0.5bn.

There is thus a need for India and China to diversify beyond their primary export sectors and attain specialization across a more comprehensive spectrum of services in order to exploit productivity gains from trade. This is particularly relevant in the context of India, where the share of computer services exports in the world market has been steadily declining.⁹ A greater focus on diversifying the services export basket would also eventually enable the integration of a larger share of the workforce into tertiary employment.

3.3. Value-Added

Conventional balance of payments statistics (i.e., Gross Exports) tend to understate the actual contribution of services at various stages of the production cycle.¹⁰ Production and trade of manufactured goods now increasingly require the gamut of communications services, financial services, distribution and transportation services, business services, among many others. This increased usage of services in manufacturing is difficult to capture through gross service flows. Moreover, gross trade statistics cannot distinguish the sources of value-added in terms of country and sector origin. The OECD TiVA database permits such a decomposition at the subsectoral level, which we exploit to trace the VAD levels of manufacturing and services in the exports of India and China.

Fig 9: Gross Exports VAD, Manufacturing and Services



Source: Calculated from OECD TiVA. Accessed June 11, 2019

<https://stats.oecd.org/index.aspx?queryid=75537#>

A comparison of Figures 6 and 9 highlights the important role of the value-added by services in Gross Exports. Services now dominate India's exports. This reallocation is more dramatic in the case of China, with the manufacturing share of exports decreasing from nearly 90% to 50%. The advantage of using VAD data is the precise reattribution of gross values to the source sectors (the absolute total of Gross Exports remains the **same**). This also explains why the aggregate shares of manufacturing and services

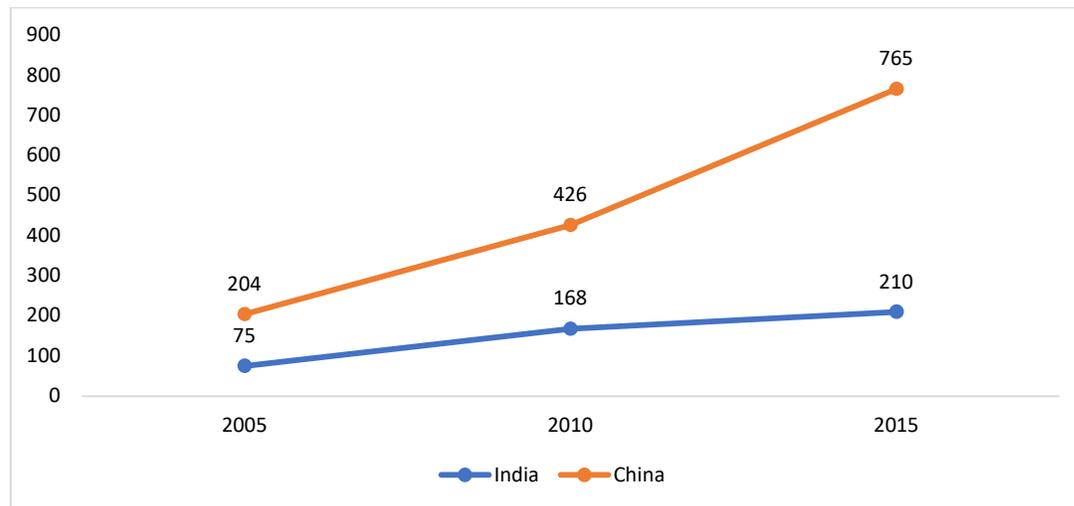
⁹ India's global share of computer services exports has declined from 15.3% in 2014 to 11.7% in 2018. https://unctadstat.unctad.org/wds/ReportFolders/reportFolders.aspx?sCS_ChosenLang=en

¹⁰ See Johnson (2014).

add up to smaller totals in the VAD approach, since gross figures understate the contribution of other sectors like agriculture and mining.

The share of services VAD in exports has been rising for both countries over time, and a closer look at the absolute totals reveals that the increase has again been faster in China. Post-2010, the gap between services VAD in India and China has widened, with Indian services growing at a much flatter rate.

Fig 10: Services VAD in Gross Exports (US\$ bn)

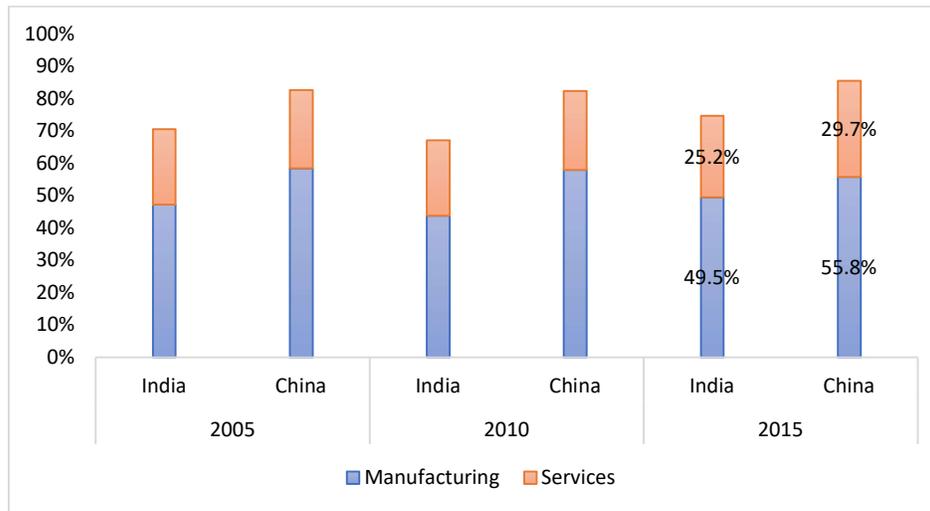


Source: OECD TiVA. Accessed June 11, 2019

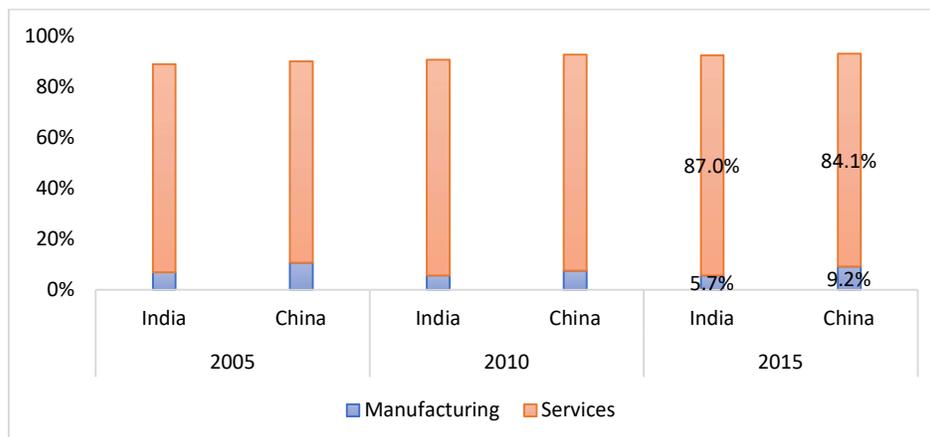
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Exports from India and China differ in the sense that India's exports derive their value largely from services, while Chinese exports correspondingly exhibit a majority manufacturing share. However, decomposing manufacturing and services exports separately reveals certain similarities as well (see Figures 11, 12). In both India and China, services exports derive almost all of their value from services only, while manufacturing exports have a substantial share of VAD originating from the service sector. This may be due to the nature of services itself – e.g., transportation, logistics, finance and communications services may have more scope to integrate into the manufacturing sector, especially if production is carried out across borders. Manufacturing inputs may not be able to identify a similar channel of entry into services, except for perhaps hardware and raw equipment being supplied to a firm subsequently using the equipment for delivering services.¹¹

¹¹ The low value-added shares of manufacturing in services exports seems to be generally true across developed and developing countries. In 2014, the corresponding shares for India, China, Japan, USA, Malaysia, Brazil, Mexico was 6%, 10%, 7%, 4%, 11%, 5% and 5%. Calculated from OECD TiVA.

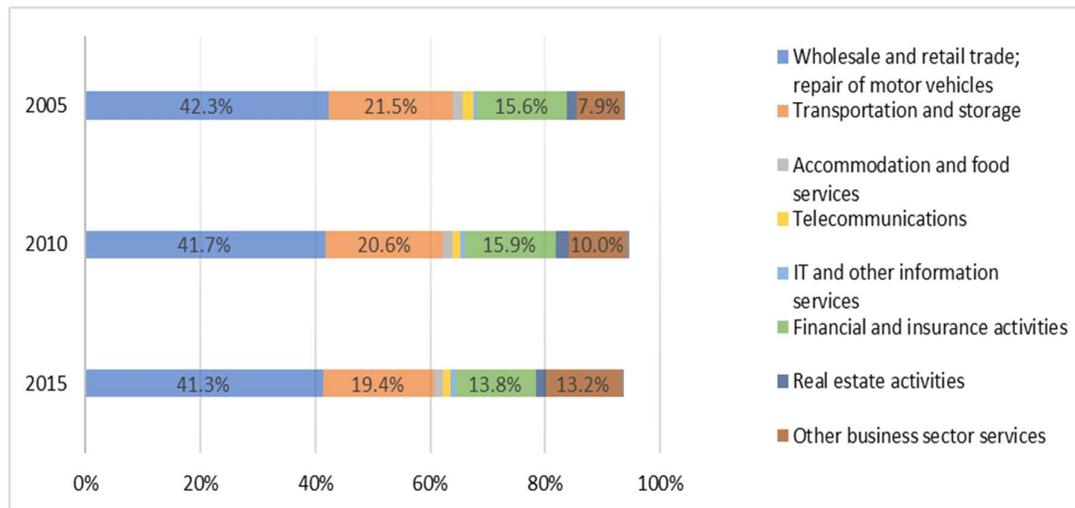
Fig 11: VAD Decomposition of Manufacturing Exports

Source: Calculated from OECD TiVA. Accessed on June 12, 2019
<https://stats.oecd.org/index.aspx?queryid=75537#>

Fig 12: VAD Decomposition of Services Exports

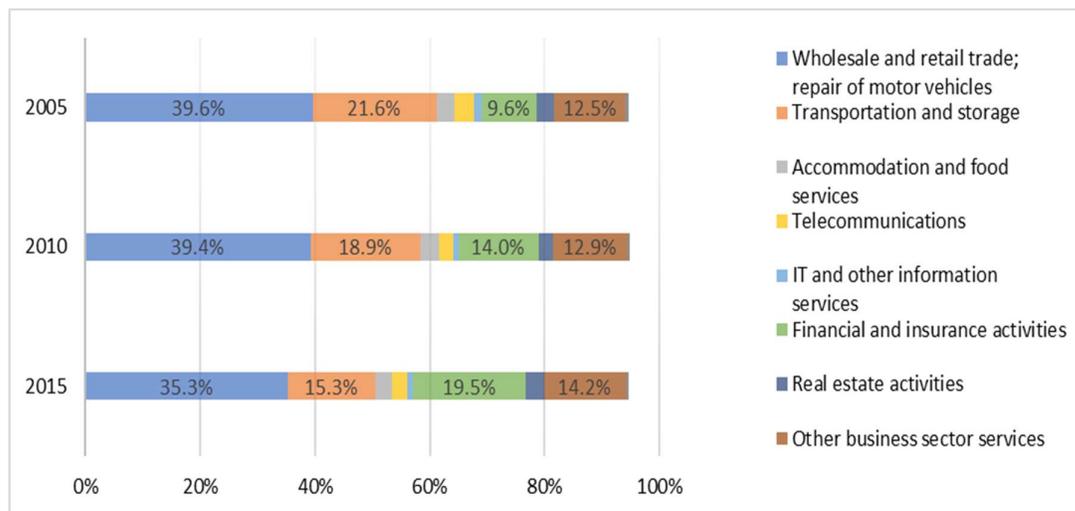
Source: Calculated from OECD TiVA. Accessed on June 12, 2019
<https://stats.oecd.org/index.aspx?queryid=75537#>

Disaggregating Figures 11 and 12 into service subsector contributions helps us assess whether the 50% or so value-added share of services observed in India's gross exports (35% for China in 2015) largely reflects its use within services itself or whether it reflects a strong and growing relationship with manufacturing exports over time (as seen in Figure 11). Figures 13 and 14 show the services-manufacturing linkage for India and China, respectively.

Fig 13: VAD Decomposition of Services in India's Manufacturing Exports

Source: Calculated from OECD TiVA. Accessed April 11, 2019.

<https://stats.oecd.org/index.aspx?queryid=75537#>

Fig 14: VAD Decomposition of Services in China's Manufacturing Exports

Source: Calculated from OECD TiVA. Accessed April 11, 2019

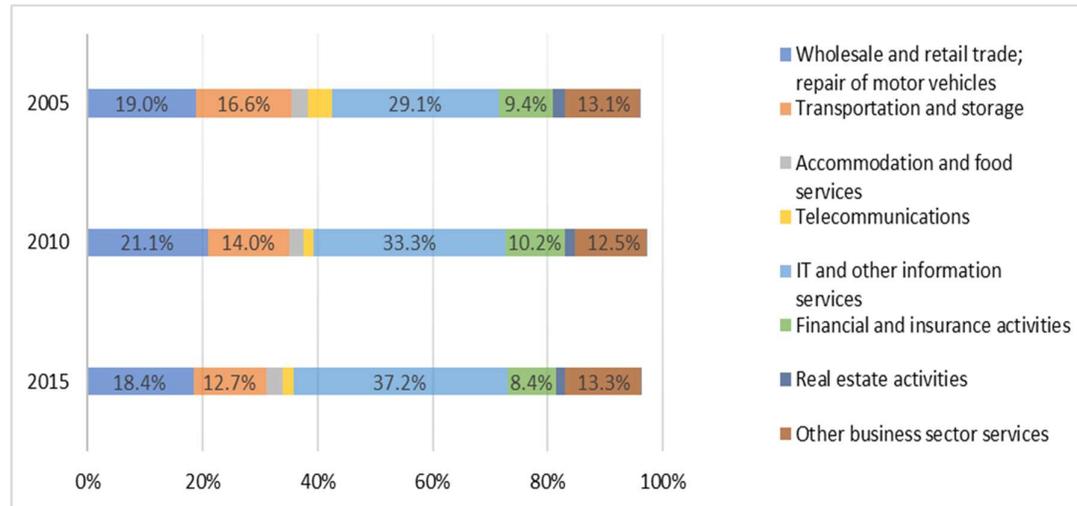
<https://stats.oecd.org/index.aspx?queryid=75537#>¹²

Manufacturing exports from both countries utilize modern services to a small degree, being dominated by traditional services such as distributive trade, transportation and storage. Even though the contribution of other business services (comprising R&D and professional services) has grown in importance in both economies' manufacturing exports, their value-added shares remain small, suggesting the overall absence of a strong linkage between modernizing and innovation-inducing services and manufacturing firms.

¹²In Figures 13-14, construction, education, public administration, defence and health services are not displayed due to extremely low shares in manufacturing exports.

The most striking similarity, however, is the extremely minor role of information technology services (not highlighted in the graphs). IT services exhibit one of the lowest shares in manufacturing exports - India had at its *highest* an input share of 0.5% (in 2015). The share of IT services in Indian manufacturing is lower than that of public administration and social security services and is comparable to education and accommodation services. Given that India's specialisation in services has been based on its emergence as a global centre for outsourcing information technology and other enabling services, this is a surprising finding. In China as well, computer services play virtually no role in manufacturing exports.

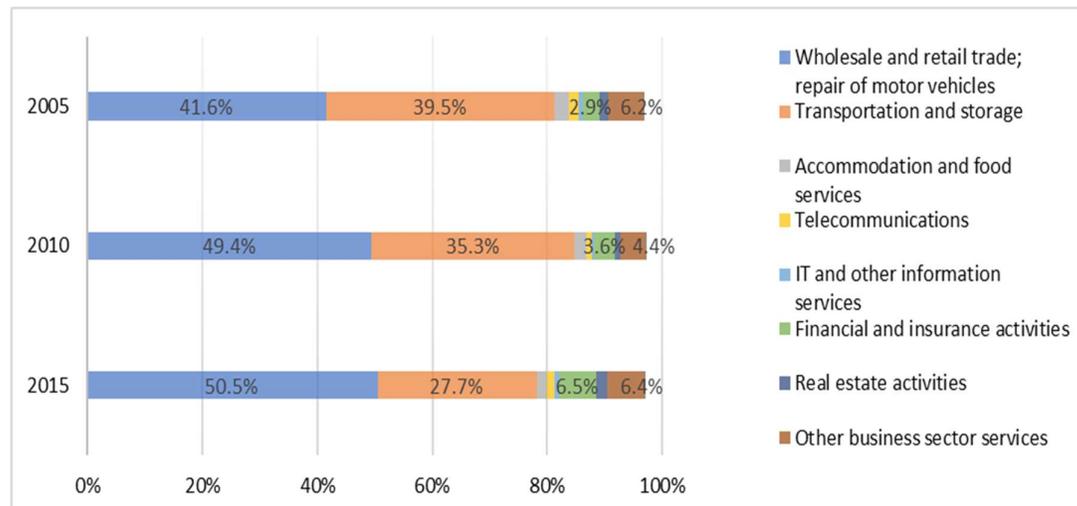
Fig 15: VAD Decomposition of Services in India's Services Exports



Source: Calculated from OECD TiVA. Accessed April 11, 2019.

<https://stats.oecd.org/index.aspx?queryid=75537#>

Fig 16: VAD Decomposition of Services in China's Services Exports



Source: Calculated from OECD TiVA. Accessed April 11, 2019.

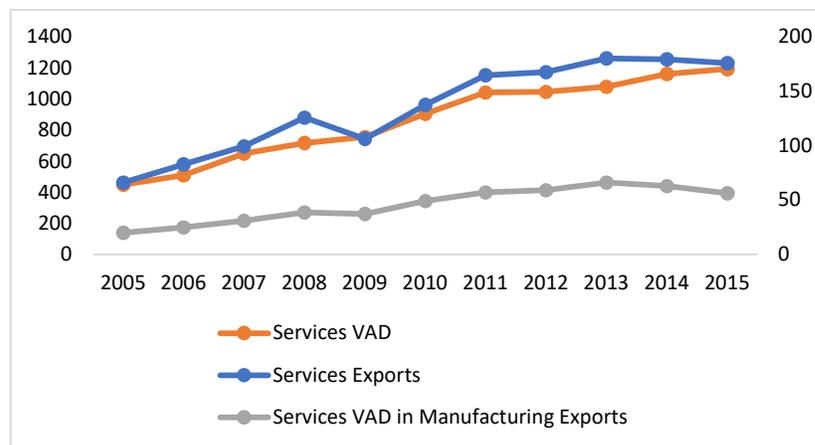
<https://stats.oecd.org/index.aspx?queryid=75537#>¹³

¹³ In both Figures 15 and 16, construction, education, public administration, defence and health services are not displayed due to extremely low shares in manufacturing exports.

Consistent with the pattern observed with Gross Exports, decomposition of services exports from India reveals the latter to be more diversified, evenly spread out across modern and traditional industries. The dominance of computer services in Indian services exports - while not contributing in any significant way in its manufacturing exports - indicates that this sector is largely operating in the form of direct exports. This suggests some degree of structural incompatibility between the two sectors. The low levels of utilization of IT services by manufacturing may stem from a combination of insufficient modernization, scale and fragmentation issues. It may also reflect how IT services themselves are oriented to respond better to changing international demand conditions but not the domestic one.

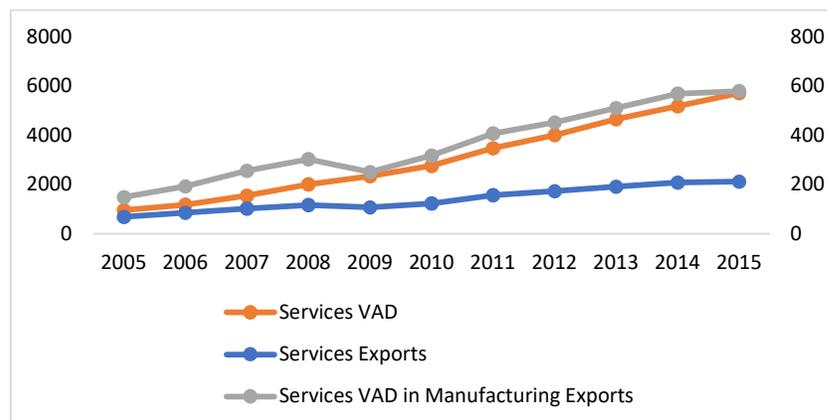
When we graph the evolution of services across 3 dimensions – total services VAD in the economy (Services VAD), gross exports of services (Services Exports) and total services VAD in *manufacturing* exports (Services VAD in Manufacturing Exports) – we notice a sharp difference in the pattern of services usage between India and China (see Figures 17-18):

Fig 17: Services Comparison in India (US\$ bn)



Source: OECD TiVA. Accessed June 12, 2019
<https://stats.oecd.org/index.aspx?queryid=75537#>

Fig 18: Services Comparison in China (US\$ bn)



Source: OECD TiVA. Accessed June 12, 2019
<https://stats.oecd.org/index.aspx?queryid=75537#>¹⁴

¹⁴In Figures 17-18, Services Exports and Services VAD in Manufacturing Exports shown on the secondary axis.

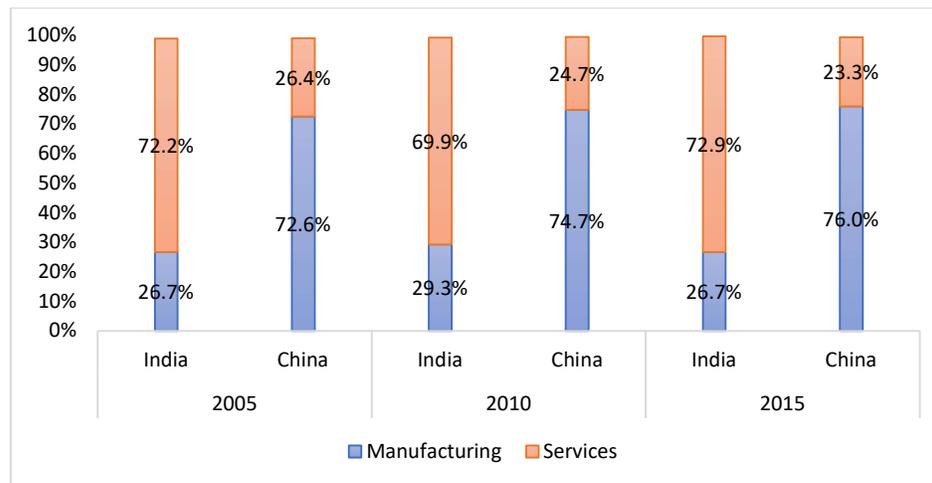
Services exports in China have grown much more *slowly* than the value added by services as a whole in the economy, while the value added specifically in manufacturing exports has grown the fastest. This directly contrasts with India, where the average increment in gross services exports per year has been much larger than the corresponding figure for services in manufacturing exports.

The gap between Services Exports and the Value Added by Services in Manufacturing Exports has continued to increase in India but has *decreased* in China over time. This indicates that services exports from China are primarily in the form of **indirect exports** through manufacturing, while in India the majority is exported **directly**.

The preceding observation about the medium of services exports in the two economies can be made more explicit if we examine their contributions from a forward linkage perspective. So far, we have viewed the trends and patterns from a backward linkage lens – i.e., how much value does Service Sector X generate in Export Sector Y, as a percentage of the total value embodied in Sector Y's exports? Forward linkage turns this definition around: as a percentage of total VAD by Service Sector X, how much of it has entered Export Sector Y? We ask if there is scope for deepening the services-manufacturing nexus, or whether services are already highly integrated.

Data at the aggregate level reveals a bilateral divergence consistent with our preliminary findings: of the total value added by services in exports, *the majority enters services exports in India, while in China the majority is used in manufacturing*.

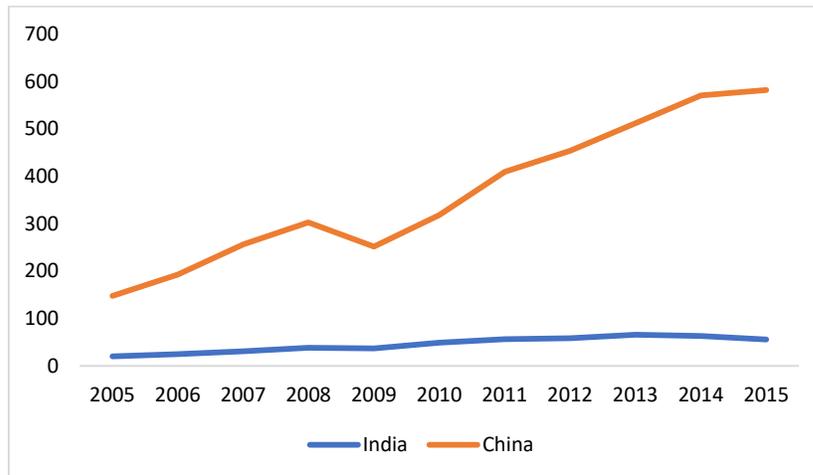
Fig 19: Services Forward VAD in Gross Exports



Source: Calculated from OECD TiVA. Accessed June 12, 2019.

<https://stats.oecd.org/index.aspx?queryid=75537#>

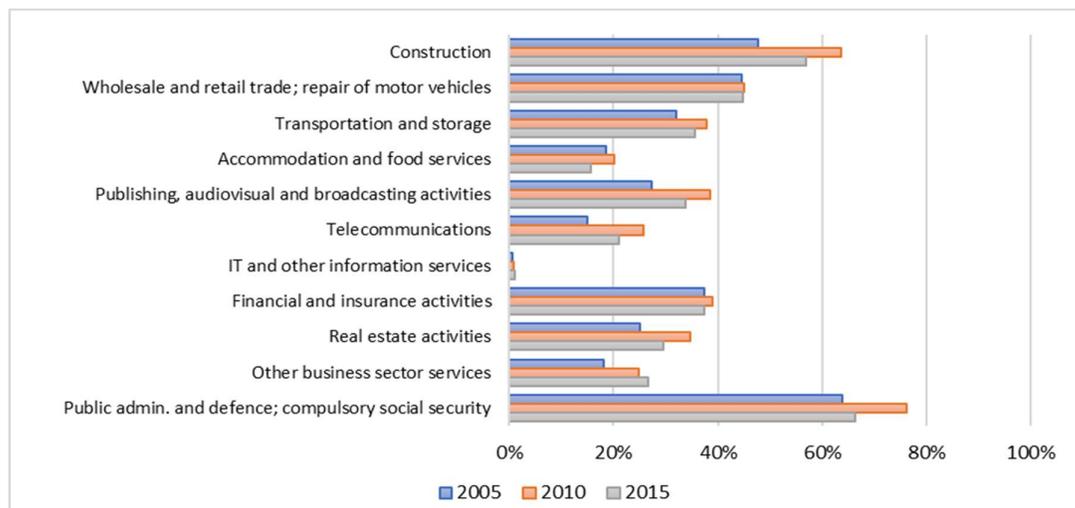
The pace of servicification across India and China can be loosely compared by the growth in services VAD in manufacturing exports. Over 2005-15, the service sector in India added US\$ 36bn in manufacturing exports. In contrast, the average *increase* in value added per year by Chinese services in its manufacturing exports was US\$ 43bn (see Figure 20).

Fig 20: Growth of Services VAD in Manufacturing Exports (US\$ bn)

Source: OECD TiVA. Accessed June 12, 2019.

<https://stats.oecd.org/index.aspx?queryid=75537#>

Forward disaggregation at the subsectoral level provides useful context to the servicification analysis from our backward lens (see Figure 21). For example, the VAD content from a competitive service sector such as IT services, besides being one of the lowest in terms of overall value added in the manufacturing sector, also contributes an extremely small percentage of its **total output** into manufacturing exports in India. As of 2015, **99%** of the total value-added by computer services in the Indian economy was in the service sector. Traditional services such as distribution, trade, transportation, public administration and emerging industries such as finance show much higher levels of integration with manufacturing exports.

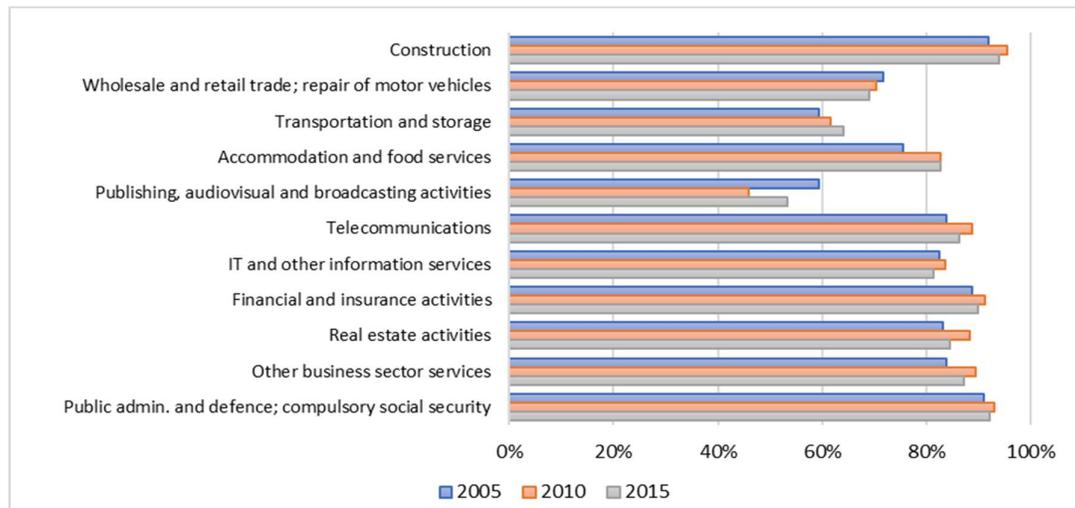
Fig 21: Forward Decomposition of Service Sector VAD in Manufacturing Exports, India

Source: Calculated from OECD TiVA. Accessed June 11, 2019

<https://stats.oecd.org/index.aspx?queryid=75537#>

Finance (38%), trade (45%) and public administration-education-health (36%) all show high (2015 numbers) and rising levels of forward interlinkage with the Indian manufacturing sector. The reason why **total services** show a low degree of manufacturing integration is because the absolute value added by these sectors in exports is relatively low. IT services, accounting for the largest share in overall services value created, account for less than 1% of total value in manufacturing exports, from both backward and forward perspectives. In this sense, the Indian economy exhibits a stronger services-manufacturing linkage than that apparent at the aggregate level, although the absolute levels of value addition have increased only incrementally per year, over 2005-15 (see Figure 20).

Fig 22: Forward Decomposition of Service Sector VAD in Manufacturing Exports, China



Source: Calculated from OECD TiVA. Accessed June 11, 2019

<https://stats.oecd.org/index.aspx?queryid=75537#>

While traditional services like wholesale-retail trade and transport dominate China's overall manufacturing exports, it is the grouping of more modern industries such as finance, telecom, IT services and other business services that supply a greater part of their **overall output** as inputs into final manufacturing (in excess of 80% of their total output). This is in line with the overall trend of China's backward services value-added in exports slowly shifting in favour of financial and professional services (see Figures 14, 16). In general, relative to India, a much greater share of the aggregate value-added by services in the economy gets realised in manufacturing exports in China.

Certain insights can be crystallised from our preceding breakdown of value-added contributions and exports of India and China, across manufacturing and services. First, the phenomenon of rapid services growth in a developing economy is not unique to India. In terms of both exports and value-added, the sector has in fact grown much *faster* in China than in India over 2000-2017. Services accounted for 52% of GDP in China and 56.5% in India in 2017. The reason this has not attracted a similar degree of attention as the Indian growth story may be because a large part of the services produced in China does not get directly exported, but through the manufacturing sector.

Second, both Indian and Chinese gross exports are dominated by manufacturing, China much more so (close to 90% in 2015). The rise in China's export revenue has been several times higher than that of India over our observed time-period of 2005-15, with the gap widening each year. This magnification can be traced directly to the large year-on-year increase in China's manufacturing exports, pulling its

aggregate exports upward. Services exports, on the other hand, have generated similar levels of revenue in India and China.

Third, the preponderance of manufacturing in Aggregate Exports gets replaced by a more balanced division between manufacturing and services when we switch our analysis to **Value-Added in Exports**. In the VAD approach, services form a large part of Indian exports (over half), as well as more than one-third of aggregate Chinese exports. In both countries, the total value added by services has been gradually shifting in favour of modern services.

Fourth, services exports across both economies derive a large part of their value from services only, while the value added in manufacturing exports comes from both manufacturing and services. The same set of industries generate the most value from services in manufacturing exports in India and China: wholesale and retail trade, transportation and storage, finance and insurance and other business services. The most surprising finding, however, is the insignificance of IT services in manufacturing exports for China as well as India: *computer services accounted for just 1% of the total value added in manufacturing exports*. In India's services exports, however, IT services play a dominant role, contributing to nearly two-fifths of total VAD in 2015.

Fifth, India's services exports are more reliant on modern services such as professional services, information technology and finance while traditional services dominate China's service exports. At the same time, the Indian export basket is also much more diversified relative to China. In 2015, computer services accounted for the biggest share in India's service exports, followed by transportation-storage, other business services and distributive trade. Chinese service exports primarily comprise transportation and trade (more than 90%). The fastest growing service sectors in Indian exports have been distributive trade, IT services and finance. Notably, the value-added by transportation services has been declining in importance in the exports of both India and China, perhaps reflecting a combination of declining competitiveness alongside increasing demand for information-based services capable of being transmitted over the internet.

Finally, most of the services output exported in India takes the form of direct services exports, while in China the majority is embodied in manufacturing exports. The share of services feeding into manufacturing is much smaller in India, perhaps signifying a mismatch between the services produced in India and the capacity of manufacturing firms to absorb them. It may be a matter of concern that the sectors exhibiting the greatest interlinkage with manufactures in India are mostly low-value traditional industries. In China, however, while modern services such as finance, computer and telecom form a very small part of total manufacturing value-added, a larger percentage of their total output is channelled into manufacturing exports relative to traditional industries.

The key takeaway that emerges from these observations is that both economies harbour rich potential in terms of servicification of manufacturing, but the nature of the sectoral interlinkage is considerably different. In China, a very large part of overall services output ultimately realised for exports is being absorbed by manufacturing. Moreover, this contribution has come from both modern and traditional services, indicating that servicification in China may be constrained more by its own services output than by manufacturing. Regulatory restrictions and an overall emphasis on industry in China may be impeding services from contributing further, in the form of both value-added and direct exports.

India's lack of services integration with its manufacturing sector seems to be more structural, reflecting manufacturing's inability to absorb services as well as an orientation of services not suited to the current manufacturing architecture. The fact that modern services are functioning largely in the form of isolated export enclaves and low-value traditional services are more connected with the manufacturing sector, along with stalling manufacturing, suggests that the current composition of manufacturing production, characterized by weak competitiveness and growth, may be partially responsible for the low pace of servicification. It also signifies massive potential for Indian services to contribute more comprehensively to its manufacturing, aided by improvements in basic infrastructure and an easing of

regulatory restrictions that influence the operation of both services and manufacturing. The central difference between the nature of servicification in India and China is that Chinese manufacturing is absorbing services, including modern services; India's is not.

4. What drives Servicification?

The generally low degree of servicification of manufacturing seen in India and China may have different underlying causes that impact the capacity of manufacturing firms to absorb services and the performance of the service sector itself. Intuitively, overriding variables affecting services value-added in manufacturing should be related to country-specific macroeconomic and developmental factors such as per capita income (reflecting the elastic income demand of services), human capital (investment in education, skilling or health), or infrastructural quality (such as the strength of transportation, technology and communications). A final indicator that's been emerging as increasingly important for servicification is the role of institutions – specifically, economic regulatory quality and the effectiveness of governance.¹⁵ Proper regulation and governance are critical for optimizing the sectoral allocation of productive resources, leveraging complementarity of policies across trade, investment and industry and sustaining international competitiveness. We examine how India and China are placed globally in terms of these possible determinants of servicification. We find that India's share of services VAD in *aggregate* manufacturing exports in 2015 was in fact higher than many countries with similar levels of development (Appendix A, Figure 23)¹⁶. Philippines, Vietnam, Indonesia all had lower servicification shares, with India surpassing even more advanced economies like Argentina and Brunei. It's servicification was marginally lower than that of Israel and Korea, but interestingly, *much* lower than for developing economies like Brazil, South Africa, and Malaysia (Figure 25). China's share of services in manufacturing was higher with respect to its income, exceeding that of Thailand, USA, Japan, Korea and comparable to that of Germany.

We find a similar pair-wise relationship when we look at servicification with respect to infrastructure (broadband connections per 100 people) and the share of employment in services separately (Figure 25, 26), with India and China again being positive outliers (above the fitted line). The positive correlation indicates that if the share of employment in services and ICT penetration were to rise in the future, then we could expect the extent of servicification to be higher in both countries.

Regulatory quality, as measured by the Regulatory Quality Index,¹⁷ and investment in research and development as a percentage of GDP (a proxy for technical progress) show interesting interactions with servicification in India and China, with India performing particularly poorly. Countries like Romania, Chile, Colombia, Thailand show much higher shares of servicification than India after incorporating the share of GDP devoted to R&D (Figure 27). With a share of 2%, China's investment in R&D is comparable to that of developed countries; however, it has not been able to as effectively leverage this investment towards servicification, lagging behind many advanced and comparator economies (e.g., Latvia, Spain, Poland, Cyprus, Malta, Chile). It fares better in terms of regulatory quality (Figure 28), though its negative score indicates a high degree of regulatory inefficiency prevailing in the economy. India's regulatory barriers are steeper, with a score close to -0.5. The strong positive relationship between regulation and servicification indicates that both India and China may need to reassess their regulatory regimes to facilitate a greater movement of services into manufacturing.

¹⁵ See the subsequent analysis and section for more information regarding governance and regulation.

¹⁶ India and China highlighted in red, selected other economies in black.

¹⁷ The Regulatory Quality Index, from the World Bank, "reflects perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development." Scores lie in the range of -2.5 (weak governance) to 2.5 (strong governance).

We formalize the above observations through a cross-country econometric analysis of broad factors that may be plausibly expected to influence the levels of servicification. Our dependent variable is the logarithm of absolute values of services VAD in manufacturing exports at the *country* level, for which we use value-added data from OECD TiVA, for 63 economies, over 2005-15. Our set of independent variables are closely related to Thangavelu et al. (2017), which aim to isolate proximate determinants of servicification across countries in the OECD TiVA database, for 1995-2011.¹⁸ We include a measure of technological development (the investment share of R&D for each economy); country-specific human capital and infrastructural variables such as the percentage of labour force employed in services and the number of broadband connections per 100 people; a measure of institutional governance captured by the Regulatory Quality Index; and a variable influencing the demand for services in a servicifying economy, represented by the growth rate of manufacturing exports.¹⁹ Data for manufacturing exports are taken from TiVA; all others are from the World Bank. Additionally, we incorporate country fixed-effects and cluster across countries to control for cross-country heterogeneity. The empirical model thus becomes:

$$SVAD_{it} = \beta_0 + \beta_1 mexgr + \beta_2 rnd + \beta_3 regqty + \beta_4 servempl + \beta_5 broadband + \mu_i + \varepsilon_{it},$$

where μ_i represents the country-fixed effects.

Baseline results from the above regression (Appendix B) conform to economic intuition. R&D expenditure and broadband penetration have statistically significant effects on servicification, indicating that technological upgradation and quality improvements of general infrastructure as embodied in ICT penetration, are important for expanding the overall reach of services into the economy. A higher percentage of investment in research and development, buttressed by high-quality infrastructure, induces scientific innovation, which may indirectly translate into an increased capacity of manufacturing firms to absorb modernizing services across finance, information technology, intellectual property, among others.

Regulatory quality exerts the largest *ceteris paribus* effect on services VAD in manufacturing, followed by R&D investment while broadband penetration and regulatory quality turn out to have the highest levels of statistical significance. The regulatory variable, from the World Governance Indicators of the World Bank, captures the extent to which individuals have confidence that their governments would implement sound policies. It is thus an indicator of institutional efficiency and accountability. Foresighted and holistic policies that internalize externalities across various sectors of the economy – such as the positive spillovers from services liberalisation to manufacturing sector productivity – are likely to be reflected in an improvement in the regulation index.

Services employment and growth of manufacturing exports, though highly significant, have the weakest effect on servicification levels. This suggests that absorption of services depend not so much on manufacturing growth as it might on the orientation of services produced and whether policies are in place to incentivise manufacturers to utilize services for the purpose of value creation.

The literature on causal determinants of servicification of manufacturing is nascent, and to our knowledge only one paper has tackled this issue directly. Using data from OECD TiVA over 1995-2011, Thangavelu et al. (2017) regress the share of domestic and foreign services in manufacturing

¹⁸ Thangavelu et al. (2017) explicitly target the identification of causal determinants of servitization. An important difference between our approach and theirs is that we instead try to highlight macroeconomic drivers that should *generally* affect the quantity of servitization. Thus our analysis is more *exploratory* than explanatory, omitting variables important in the latter approach such as the strength of GVC participation of countries and their position in GVC networks.

¹⁹ Since our dependent is the level of services VAD and not the share, we do not include per capita income or aggregate manufacturing exports as a regressor capturing size of the economy, since that would induce endogeneity.

exports, separately, on several control variables spanning economy size, institutional factors, infrastructural variables, among others.²⁰ Their findings are similar to ours, with regulatory quality and government effectiveness²¹ having significant and large effects on the domestic and foreign shares of services VAD respectively. Interestingly, institutional efficiency mattered more for developing Asian countries relative to OECD economies in their study, perhaps indicating a higher prevalence of services policy barriers in this region.

An important limitation of our exploratory analysis is that it does not permit a definitive isolation of which precise factors (at the firm, industry and country levels) may be directly responsible for spurring servicification. That requires, among others, more granular data regarding the distribution of services usage, the nature of manufacturing firms displaying a more intensive integration of services (in terms of innovation capacity and technology embedded in production methods) and industry-specific characteristics that may be enabling a greater use of producer services. Compounding the difficulty in undertaking such an analysis is the current paucity of data sources capturing sectoral time-series measures of policy variables like services regulations at a cross-country level. A much more rigorous empirical assessment beyond the scope of this paper is required to pinpoint which combination of these factors has been driving the overall shift towards servicification of manufacturing.

5. Possible Causes and Explanations

Though higher than in many countries, the generally low degree of industrial servicification seen in India and China may have different underlying reasons that impact the performance of both services and manufacturing. These may reflect institutional and infrastructural challenges constraining the two sectors, domestic and external liberalization, or a lack of harmonization with existing international standards of quality and capacity. Existing trade and FDI policies that directly shape the domestic environment in which services operate, may play an important role.

Amongst these factors, policy and institutional reforms – broadly aggregating into “regulatory efficiency” - have received the largest attention. Fernandez and Paunov (2012) analyse the impact of easing FDI restrictions in services for Chilean manufacturers over 1992-2004 and attribute a 5% increase in manufacturing TFP to FDI reforms.²² This point is reinforced by Hoekman and Shepherd (2017), stating that FDI reforms, by conducting technology and knowledge spillovers, comprise the main channel through which services liberalization affects manufacturing exports. Arnold et al. (2016) examine procompetitive reforms in India across banking, telecom, transport and insurance and their impact on Indian manufacturing performance. They find a significant impact of services liberalization on Indian manufacturing, with transportation and telecommunications services enjoying the largest productivity increase of 19%, and 9.8%, respectively. This is perhaps not surprising, since services like logistics and communications lower coordination costs across various parts of the production process. At the same time, greater availability of financial services can help manufacturing firms expand the range of products offered and diversify their sources of revenue.

Since assessing the operational efficiency of services in India and China is difficult, we draw upon certain economic indicators that provide objective evaluations of competitiveness, governance and regulatory restrictions encumbering the service sector in these countries. The indices reveal that India

²⁰ Other variables include indices of GVC participation and position, excluded from our analysis.

²¹ Government effectiveness, from the World Bank, “measures the quality of public services, civil service, policy formulation, policy implementation and credibility of the government's commitment to raise these qualities or keeping them high.” We used only regulatory quality, since the two were highly correlated.

²² Dugga, Rahardja and Varela (2013) replicate this finding for Indonesian manufacturing firms, locating an 8% rise in manufacturing productivity to services FDI over 1997-2009. The improved output was strongly correlated with relaxation of foreign equity caps and screening procedures. See Arnold et. al (2011) for a related analysis involving Czech firms.

and China both perform poorly on several broad and subsectoral parameters that may be important for improving the performance of services as a whole and towards servicification of manufacturing.

The 2018 OECD STRI Index, a composite indicator quantifying restrictions on services spanning labour mobility, competition barriers and regulatory transparency, projects the service sector in India and China to be much less liberalized relative to their developing peers when it comes to enabling services such as transportation, logistics, accounting and legal services (Appendix, Figure 28). Services in India in particular appear to be highly restricted,²³ especially in transportation, accounting, engineering and legal services. China also exhibits restriction scores higher than other BRICS countries in general, but to a lesser extent than India. India's poor logistics performance in the STRI Index is reflected more clearly in the Logistics Performance Index, where its rank within 160 countries declined to 44 in 2018 from 39 in 2007. In the sub-index of infrastructure, its rank fell from 42 to 52. The Global Innovation Index, an index partly measuring the quality and capacity of R&D services in an economy, placed India at the 57th position (out of 126 countries) in 2018, below that of Mongolia and Qatar (China was ranked 17th).²⁴

In light of the documented importance of services liberalization in productivity outcomes of manufacturing firms, we surveyed the 2018 OECD FDI Regulatory Restrictiveness Index, capturing restrictions in foreign equity limitations, screening or approval mechanisms, foreign employment regulations and operational restrictions.²⁵ The foreign investment regime in India and China was found to be considerably more prohibitory than the OECD average, especially in the service sector (Figure 29). A high regulatory burden on services may make it harder for the tertiary sector to comprehensively integrate into the manufacturing sector, in the sense that it might restrict servicification to only a few manufacturing industries or by only a few services.

A sectoral breakdown of FDI restrictions again shows that India and China have considerable scope to liberalize their service sectors (Figure 30). Business services operations are extremely restricted in India, implying that the high competitiveness of this sector in world markets can be scaled up even further under efficient regulatory regimes. China's communications services are virtually closed, while its transportation sector also displays significant barriers to trade. A high degree of restrictions in China's transport services may be responsible for the observed declining share as a provider of inputs into China's manufacturing exports. The incidence of liberalization in India and China in core service sectors is seen to be much less than the OECD average.

India and China also fare poorly when it comes to their overall business environments, summarized by the 2018 Doing Business Index (see Figure 31).²⁶ India's score is especially low beside comparator countries in starting a business, enforcement of contracts and insolvency resolution, though the recent introduction of the Insolvency and Bankruptcy Code may have improved the situation. While the rankings of both India and China have both improved over time, they remain difficult places to conduct business in.

In summary, the Indian and Chinese service sectors remain plagued by a multiplicity of restrictions that are impinging on their efficiency and ability to integrate into the manufacturing sector. Service industries in both countries face a much wider set of regulatory barriers relative to the OECD average. India's low rank in the innovation index may reflect its underinvestment in grassroots research and development (Figure 26), leading to a weak innovation ecosystem that has not been conducive to manufacturing growth and competitiveness. China's performance has been better in terms of

²³ The STRI index assumes a score from [0,1], with 1 being the most restrictive.

²⁴ Logistics Performance Index: <https://lpi.worldbank.org/international/global>; Global Innovation Index: <https://www.globalinnovationindex.org/analysis-indicator>.

²⁵ The FDI restriction index varies from 0 (open) to 1 (closed).

²⁶ The efficiency of the business environment increases with the score.

servicification, innovation and foreign investment, but there too, services continue to be much more closed than manufacturing, perhaps reflecting its longstanding industry bias.

6. Conclusion

This paper studies the nature of the service sectors in India and China, in terms of exports and value-added. It shows that the rapid expansion of services seen in India is *not* unique to India: China's service sector has expanded at a similar pace over time. In both countries, services account for more than half of their GDP.

While a relatively large share of exports from India in value-added terms are services exports, most of it resides in the form of direct exports. Manufacturing export growth has been muted since at least the 1990s and a robust manufacturing-services interlinkage has not developed. In China, manufacturing exports have continued to expand at a CAGR of more than 12% a year over 2005-15, permitting a greater degree of integration with the services sector.

A striking commonality between the growth performance of India and China is the disconnect between modern services and manufacturing exports. India is an internationally recognized exporter of information technology and communications services exports. However, less than 2% of its aggregate value-added is utilized in the form of intermediate inputs in manufacturing exports, indicating that IT in India largely functions as isolated export enclaves. In China, where information technology has not emerged as a globally competitive exportable commodity, a much larger share of its production gets realised in the manufacturing sector, reflecting both its lack of competitiveness in world markets as well as China's greater thrust on manufacturing.

The findings suggest that policies to promote manufacturing can no longer be independent of services. Raising the productivity and exports of manufacturing firms in the face of increased international competition requires a holistic recognition of the interrelationship between manufacturing and services, especially business services. This is particularly critical in the case of India, because unlike China, India's manufacturing sector has not shown the dexterity to adapt to an evolving international consumer base. At the same time, information technology, accounting for the largest share of services exports, has seen its competitiveness steadily erode in world markets. This indicates a need to reduce the dependence on any particular service sector for the purpose of overall growth in India, as well as accelerating efforts to revive its halting manufacturing trajectory. The scale of manufacturing is minuscule when placed beside China, which may be affecting its ability to viably utilize commercial and modernizing services capable of fostering innovation. There is a compelling need to tackle issues that may be plaguing the Indian manufacturing sector (such as archaic labour laws, investor unfriendliness, lack of a coherent exporting strategy, etc). China, on the other hand, in order to transition to a services-based model of development, must develop global competitiveness in direct exports of modern services like IT, finance and business processing services. Its services are dominated by traditional sectors like transportation and retail, which are generally not conducive to rapid technological upgradation and spillovers into the rest of the economy.

At the same time, the preceding analysis suggests considerable scope for the services of both countries to generate more value-added in their manufacturing sectors. In order to actualize this unexploited potential, policymakers from India should focus on developing basic infrastructure (such as uninterrupted electricity) and traditional services such as transport and logistics that directly enhance efficiency and enable last-mile connectivity. Policymakers from China must aim to further develop its modern services, perhaps capitalizing on the growing participation of its financial sector. Such an approach on the part of both countries would necessitate a concerted effort to ease the plethora of restrictions and regulations encumbering the service sector as a whole and dragging down overall economic productivity. A robust value-added interlinkage between manufacturing and services, both

backward and forward, would not only strengthen each country's external competitiveness but also operate as a critical new source of demand by expanding the reach of services to untapped sectors of the economy. A vibrant manufacturing sector generates newer sources of demand that can buffer the service sector from fluctuations in world markets and broaden both its scale and content. Over time, such a structural transformation has the potential to induce sustainable increases in aggregate economic productivity, raise employment, reduce regional inequality and bolster macroeconomic fundamentals.

China has the advantage of relatively advanced infrastructure (in the form of roads, ports, rail networks) that may facilitate a continued expansion of its large manufacturing sector as well as enabling a broader linkage between manufacturing and services than is present yet. India, on the other hand, has the advantage of being globally competitive in knowledge and skill-intensive services that have proven to be resilient to financial crises and adaptable to changing consumer preferences. India needs to leverage this specialization more effectively than it has done so far and to achieve this its growth orientation must accommodate a parallel restructuring of its manufacturing and service sectors instead of one at the expense of the other. In both India and China, the continued development of these two main sectors offers a promising route for millions employed in less productive occupations to migrate to a more sustainable one.

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Appendix A

Fig 23: Share of Services VAD in Manufacturing Exports against Per Capita Income, 2015

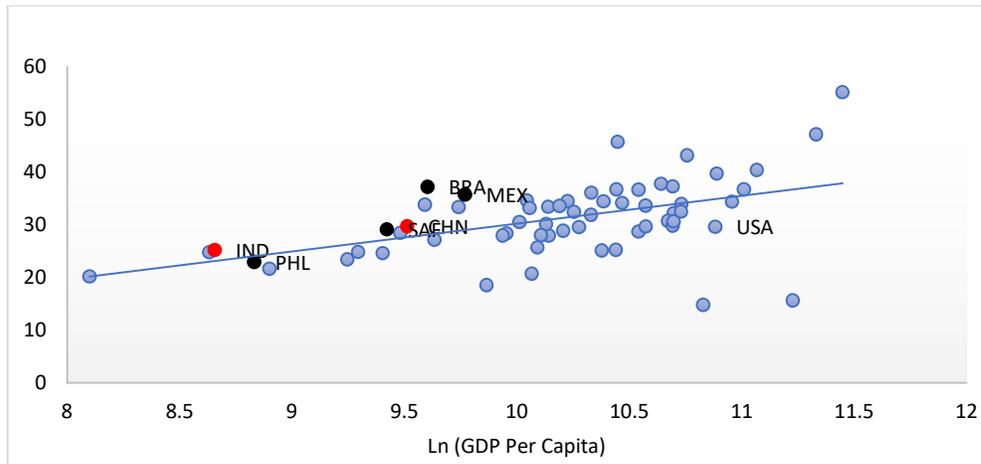


Fig 24: Share of Services VAD in Manufacturing Exports, Selected Countries, 2015

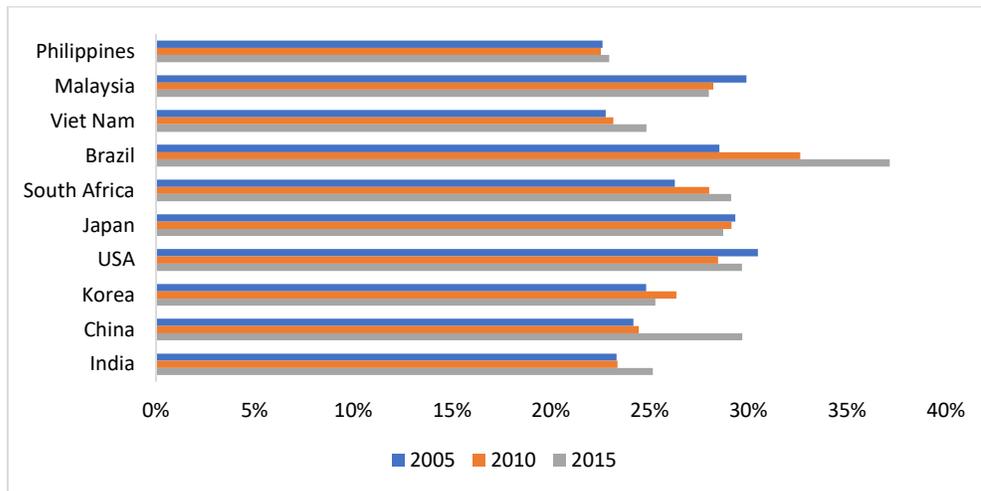


Fig 25: Share of Services VAD in Manufacturing Exports against Services Employment, 2015

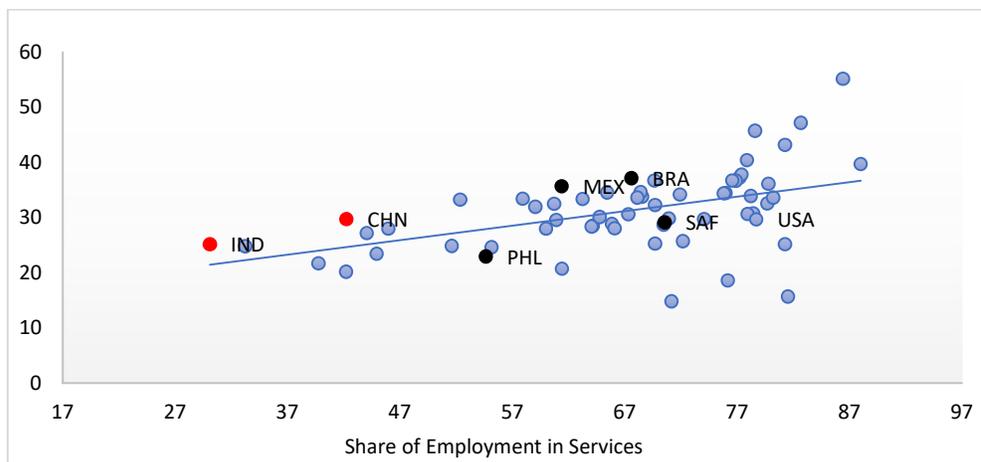


Fig 26: Share of Services VAD in Manufacturing against Research and Development, 2015

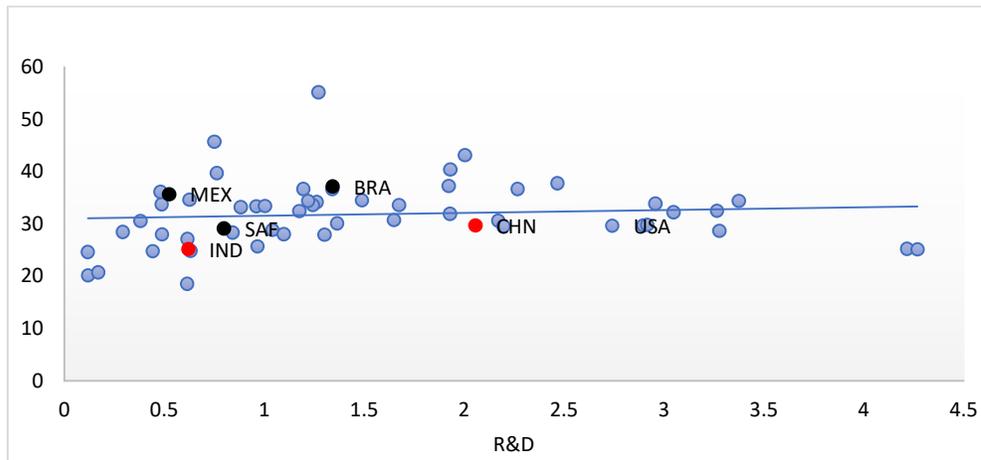
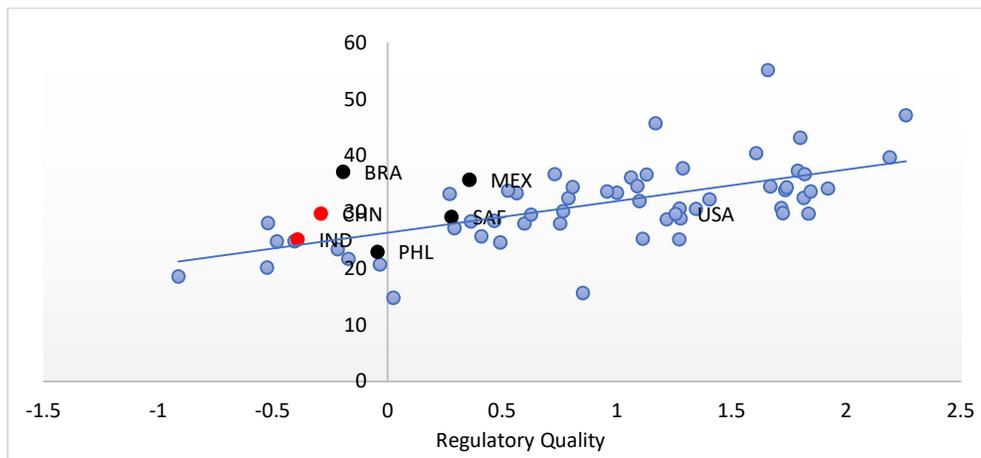


Fig 27: Share of Services VAD in Manufacturing against Regulatory Quality, 2015



Source: Services Value-Added data taken from OECD TiVA.²⁷

<https://stats.oecd.org/index.aspx?queryid=75537#>

²⁷ Data for GDP Per Capita, Services Employment, R&D Investment, Broadband Connections (per 100 people), Regulatory Quality Index taken from World Bank.

Appendix B

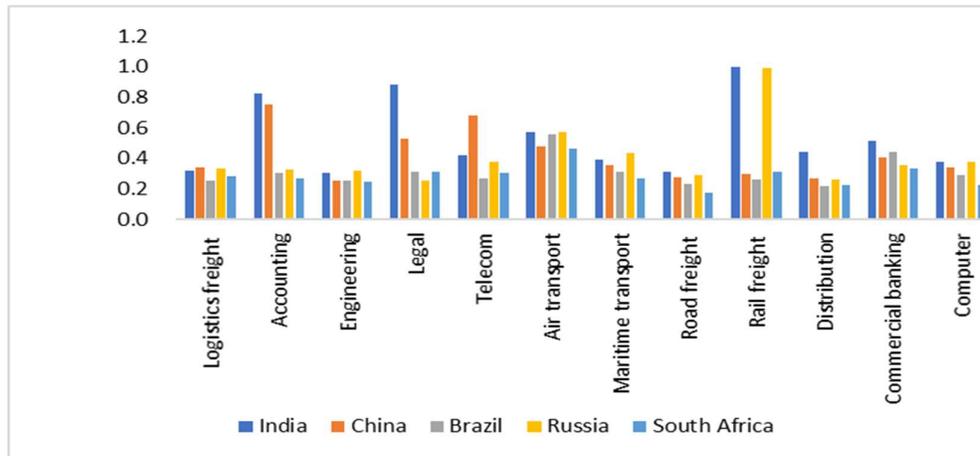
Table 2: Baseline Regression Results

	(1) Log (SVAD in Manufacturing Exports)
Manufacturing Export Growth	0.00453*** (0.000309)
R&D	0.157* (0.0711)
Regulatory Quality Index	0.234** (0.0864)
Services Employment	0.0196* (0.00908)
Broadband Connections	0.0217*** (0.00463)
Constant	7.530*** (0.562)
Country-Fixed Effects	Yes
N	548

Standard errors in parentheses. ***, **, * indicate significance at the 1%, 5% and 10%, respectively.

Appendix C

Fig 28: 2018 OECD STRI Index



Source: OECD STRI Database. Accessed July 2, 2019
<https://stats.oecd.org/Index.aspx?DataSetCode=STRI>

Fig 29: 2018 OECD FDI Regulatory Restrictiveness Index

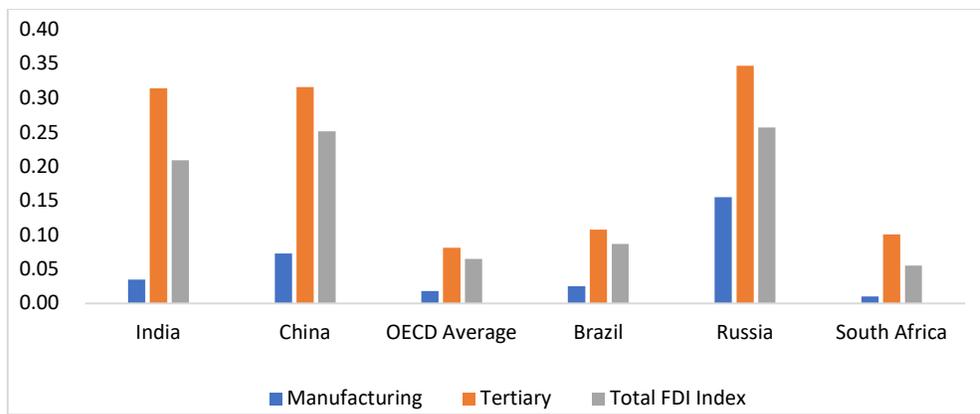
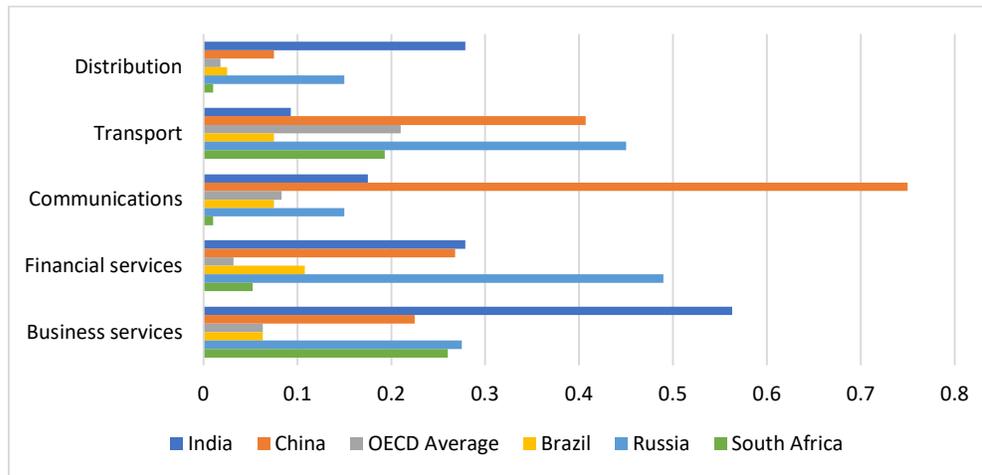
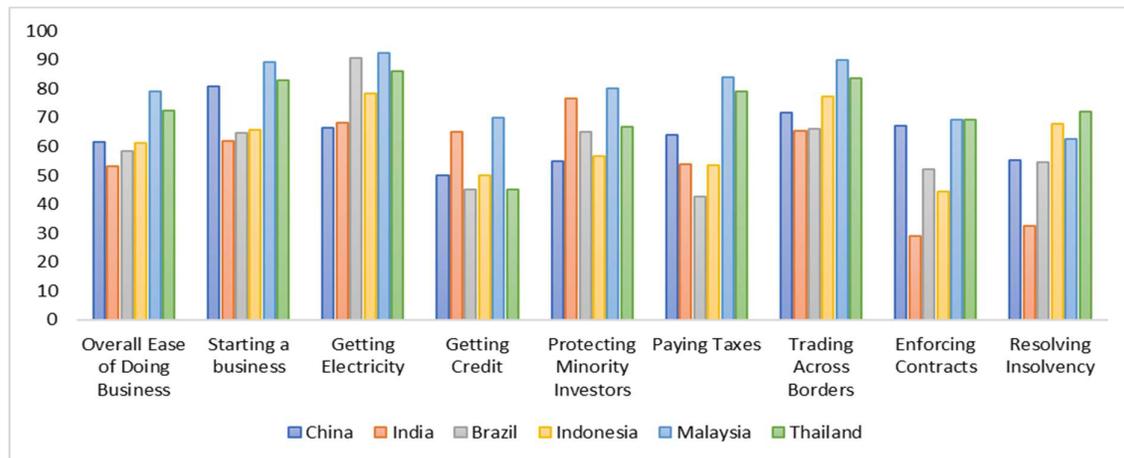


Fig 30: 2018 OECD FDI Regulatory Restrictiveness Index, Sector-Wise



Source: Fig 31, 32 from OECD FDI Restrictiveness Index Database. Accessed July 2, 2019
<https://stats.oecd.org/Index.aspx?datasetcode=FDIINDEX#>

Fig 31: 2018 Doing Business Index



Source: Doing Business Index Database. Accessed April 1, 2019
<https://www.doingbusiness.org/en/custom-query>