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Joining Global Production Networks: Experience and Prospects of India

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Abstract: Cross-border dispersion of different stages/slices of the production processes within vertically integrated global industries ('global production sharing') has been a key structural change in the global economy over the past four decades. This paper examines opportunities created by this phenomenon for developing countries for export expansion and India's experience with exploiting these opportunities from a comparative East Asian perspective. The analysis reveals that India has so far failed fitting into global production networks in electronics and electrical goods, which have been the prime movers of export dynamism in China and the other high-performing East Asian countries. The findings of this study provide further support to the case made in a number of influential studies for completing the unfinished reform agenda, encompassing both trade and investment policy reforms and 'behind-the-border' reforms. Tightening behind the border discipline is much more important for linking India into global production networks than for the expansion of the standard labour intensive products and other conventional exports. There is also a strong case, based on the experiences in East Asia and elsewhere, for combining further reforms with a proactive investment promotion campaign to attract multinational enterprises (MNEs) engaged in global production networks.

Key words: India, global production networks, global production sharing, export performance

JEL Codes: F13, F21, F23

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1. INTRODUCTION

Recent reviews of the outcome of India's historic policy reforms launched in 1991 have focussed on export performance as one of the areas where the reform outcome has not so far met the original expectations. India's export growth was sluggish during the first four decades of the post-independence era and by the time of reforms its share of world merchandise exports had fallen to a low of 0.6 percent. The rate of export growth has been much faster during the reform era, but India remains a small player in world trade compared to China and other dynamic East Asian economies. Moreover, unlike in these countries, the composition of manufacturing exports from India has continued to exhibit a bias towards capital- and skill-intensive products, a pattern that runs counter to the objective of achieving inclusive growth (Joshi 2017, Panagariya 2008 and 2013, Panagariya and Bhagwati 2013, Srinivasan 2011). An India-East Asia comparison seems to suggest that both the slower rate of export market penetration and the emerging export patterns largely reflect India's failure to well integrate into global production networks (Krueger 2012 & 2013; Joshi 2017).

Breakup of the production processes of an ever-increasing array of products into vertically-separated stages carried out in several countries ('global production sharing'[1]) has been a key structural change in the global economy in recent decades. Trade based on global production sharing, that is trade in parts and components, and assembled end products within global production networks (GPNs),[2] which we call 'GPN trade' in this paper, has been the prime mover

[1] The alternative terms used in the recent international trade literature include global production sharing, international production fragmentation, intra-process trade, vertical specialization, slicing the value chain, and offshoring.

[2] It is common in the recent literature to use the terms 'global value chian (GVC) and GPN as synonyms. But it is important to distinguish between the two terms for analytical reasons. GVC is a broader concept (popularised by economic geographers and international political scientist) that refers to the governance structure relating to the vertical sequence of activities from the production of a good to its final delivery to the consumer over geographic space and across national boundaries'. It is applied to both primary products and manufactured goods. GPN is specifically about interrelations among a set of firms specialising in different segments of the production process of a given product as a single economic group within vertically integrated global industries.

of the dramatic shift in manufacturing exports from developed to developing countries over the past four decades (Krugman 2005 and 2008). This process of international division of labour opens opportunities for countries to specialize in different slices (tasks) of the production process in line with their relative cost advantages. Trade theory postulates, and the East Asian experience illustrates, that in a labour abundant economy, tasks undertaken within global production networks tend to be relatively more labour intensive and hence help achieving the objective of inclusive (pro poor) growth.

The purpose of this paper is to examine India's export performance in the reform era focussing specifically on its emerging role within global production networks from a comparative East Asian perspective. It aims to address the following issues: (a) How Indian manufacturing fits into global production sharing compared to China and other emerging East Asian economies; (b) What are the implications of global production sharing for the performance and structural change in domestic manufacturing in India? (c) What are the policy options for effectively linking Indian manufacturing to global production networks? The focus of the paper is solely on merchandise exports.[3]

Global-production networks are not a homogenous phenomenon. In terms of the organizational structure of production sharing, production networks take two major forms: buyer-driven production networks and producer-driven production networks. Buyer-driven networks are common in diffused-technology based consumer goods industries such as clothing, footwear, travel goods, toys and sport goods. In these networks the 'lead firms' in the production networks are international buyers (large retailers such as Walmart, Mark & Spencer, H&M) or brand manufactures such as Victoria's Secret, Gap, Zara, Nike). Global production sharing in these networks takes place predominantly through arm's length relationships, with global sourcing companies (value chain intermediaries, such Hong Kong-based Li & Fung , Mast Industries Far East) playing a key role in linking producers and the lead firms. Therefore, there is room for local

[3] India's role in production sharing in the global software services industry has been extensively studied. See Arora (2008) and the works cited therein.

firms to directly engage in exporting through links established with foreign buyers (Gereffi 1999, Schmitz and Knorringa 2000).

Producer-centred production networks are common in vertically integrated global industries such as electronic, electrical goods, automobiles, and scientific and medical devices. In a producer-centred production network the 'lead firm' is a multinational manufacturing enterprise (such as Intel, Motorola, Apple, Toyota and Samsung). Global production sharing takes place predominantly through the lead firms' global branch network and/or its close operational links with established contract manufacturers (such as Foxconn, Flextronics) that undertakes assembly for these global corporations. In these high-tech industries production technology is specific to the lead firm and is closely protected in order to prevent imitations. Also, the production of final goods in these industries requires highly customized and specialized parts and components whose quality cannot be verified or assured by a third party. The bulk of global production sharing, therefore, takes place through intra-firm linkages rather than in an arm's-length manner. However, as the production unit (affiliated company) becomes well established in a given country and it forges business links with private- and public-sector agents, arm's length subcontracting arrangements with local firms can develop, leading to firm-level upgrading of technology and management capabilities of local firm.

Distinguishing between these two forms of production networks is important is assessing a country's success in export expansion through production sharing and formulating related policies. This distinction is built into the analysis of this paper, which is based on export data disaggregated at the 5-digit level of the Standard International Trade Classification.

The paper is structured as follows: Section 2 surveys India's export performance during the pre-reform period in order to provide the context for the ensuing analysis. Section 3 examines emerging patterns of world GPN trade and India's performance compared to the East Asian countries. Section 4 discusses policy options. Section 5 summarizes the key findings and policy inferences. The trade data classification system is discussed in the Appendix.

2. EXPORT TRENDS

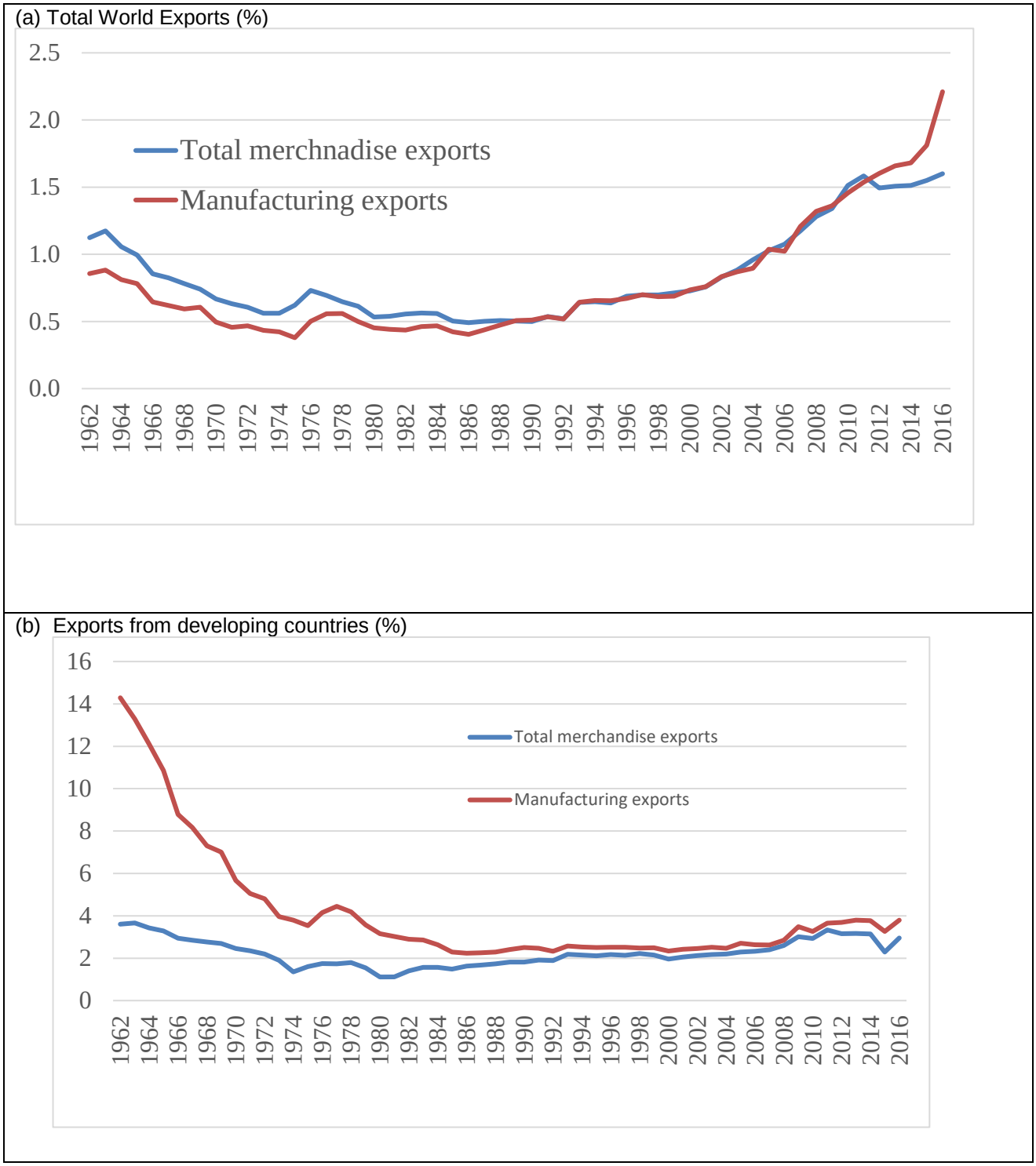
During the first four decades of the post-independence era India continued to remain an underperformer in world export markets, relative to both her own potential and the performance of many other developing countries. In 1948, India's share of world merchandise exports (2.2%) was five times of that of Japan (0.4) (Srinivasan and Tendulkar 2003, p. 2). During the next four decades India's export growth rates continued to remain below world trends. Consequently, by the time of historic reforms initiated in 1991, India's share in world merchandise exports had fallen to a mere 0.6 percent (Figure 1).

During this period India's share of total merchandised exports from developing countries[4] declined from 3.5% to 1.5%. India's failure to keep up with overall export performance of other developing countries was much more clearly visible in manufacturing trade. India accounted for about 14% of the total manufacturing exports from developing countries in the early 1960s. This had dropped to 2.2% by the late 1980s. In 1962 (the earliest years for which comparable country-level data are available) India was the second largest exporter of manufactured goods in the developing world, accounting for 14.2% of exports from developing countries after Hong Kong (19.8%). By the time the liberalization reforms began in 1991, India was the tenth largest exporter (2.6%) after the Philippines (2.9%). China's share (25.6%) was over10 times larger than that of India.[5]

[4] In this paper the standard United Nations country classification is used to identify developing countries. According to this classification 'developing countries' encompasses developing Asia (the member countries of the Asian Development Bank), Latin America, Africa and the Middle East.

[5] The data reported in this paper, unless otherwise stated, are based on the UN *Comtrade* database.

Figure 1: India's Share in Total World Merchandise Exports and Exports from Developing Countries, 1962-2016[1]



Notes: 1 Total merchandise exports net of oil and gas. 2 Developing countries are identified on the basis of the standard UN definition

Source: Data compiled from UN Comtrade database

India's overall export performance has improved following the liberalization reforms. By 2002, India's share in total world merchandise exports had recovered to the level of the early 1960s (about 1.2%) and it increased further to 2.2% in 2016. However, as yet there has not been any noticeable improvement in India's relative export performance among developing countries. India's share of manufacturing exports from developing countries increased from 2.5% in 1995 3.5% in 2010 and remained around that level during the ensuing years.

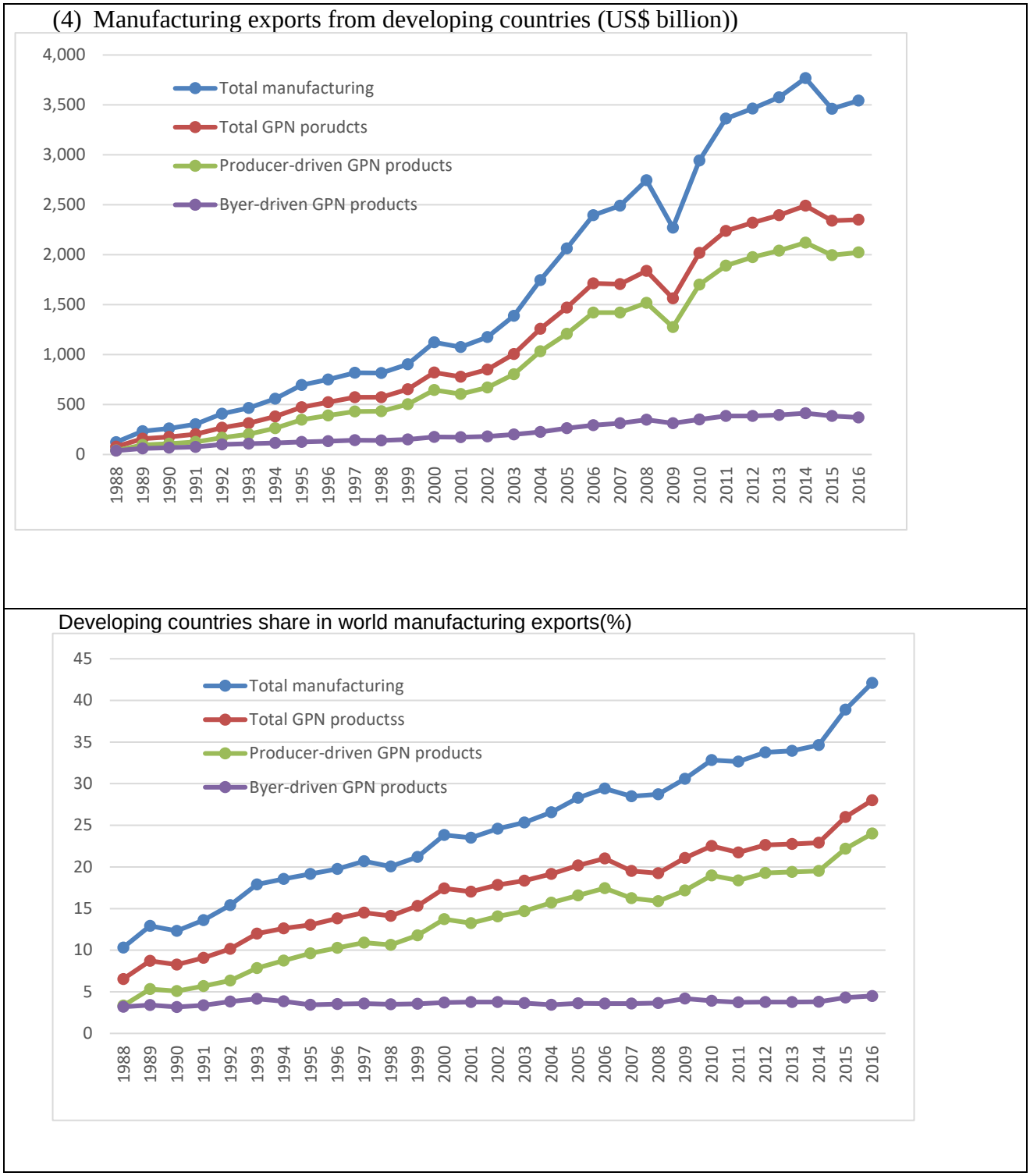
Over the past four decades, global production sharing has contributed disproportionately to the expansion of world manufacturing trade driven by global production sharing, or 'slicing of the value chain' in vertically integrated global industries (Krugman 1995 & 2008). This process resulted in a notable shift in the source country composition of network trade away from mature industrial economies and towards developing countries, first mostly to the newly industrialising countries in East Asia and more recently to China. As we will see in the next section, the main explanation for India's lacklustre export record compared to China and other East Asian countries lies in India's failure to cash in the emerging opportunities for international exchange within global production networks.

3. INDIA IN GLOBAL PRODUCTION NETWORKS

3.1. *Trends*

Manufacturing exports (in current prices) from developing countries increased from US$260 billion in 1990 to about 3.5 trillion by 2016 (Figure 2). Developing country's share of total world manufacturing exports recorded a four-fold increase (from 10% to 43%) between these two years. The share of manufacturing exports in total merchandise exports from developing countries increased from about 65% in the early 1990s to over 85% by the early 2010s.

Figure 2: Manufacturing exports from developing countries, 1988-2016

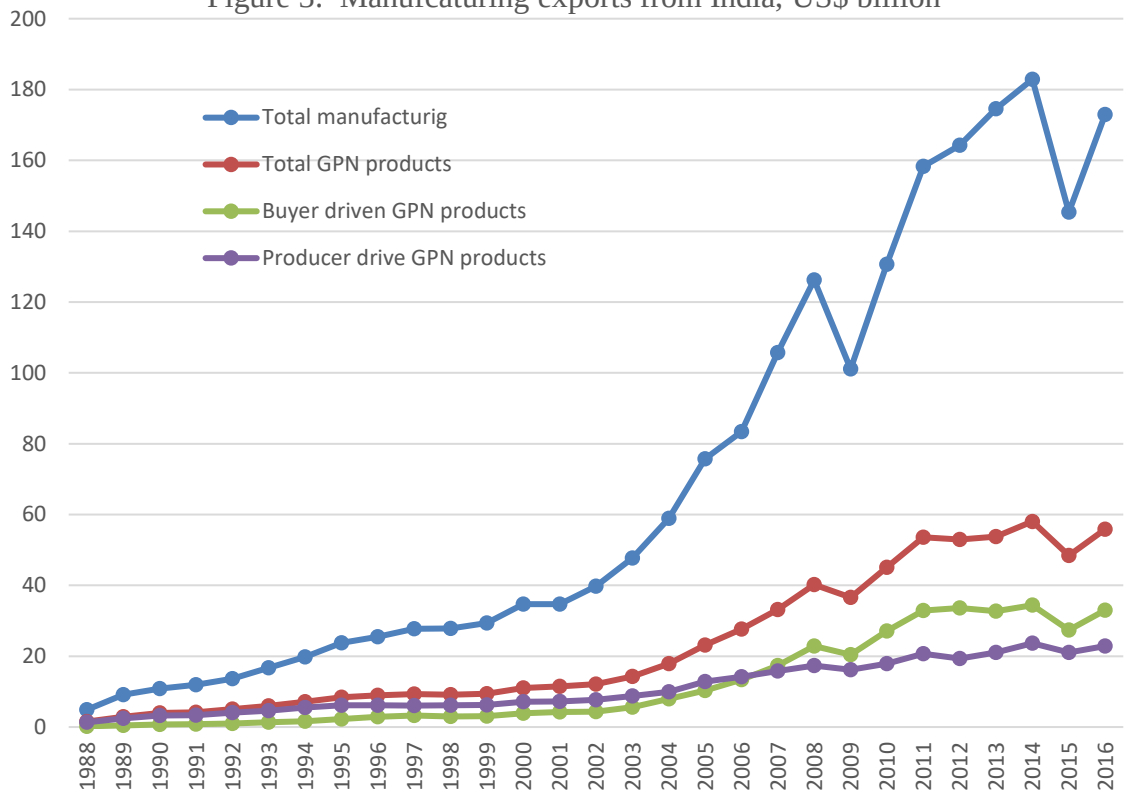


Notes: (1) Developing countries are identified on the basis of the standard UN definition

Source: Data compiled from UN Comtrade database.

Global production sharing played a major role in this dramatic expansion of manufacturing exports from developing countries. By the early 2010S, GPN products accounted for over 67% of total manufacturing exports from developing countries, up from about 45% in the early 1990s. Exports within producer-driven production networks have been by far the most dynamic component of GPN trade compared to trade within buyer-centred networks: the share of former in total GPN exports from developing countries increased from 62% in the early 1990s to 84% in mid-2010s.

Figure 3: Manufcaturing exports from India, US$ billion



In a comparison with the overall developing-country export patterns, there are two notable differences in India's engagement in global production networks (compare Figures 2 and 3). First, GPN exports account for a much smaller share of India's total manufacturing exports: about 33% in the mid-2010s compared to an overall developing-country average of 67%. Second, even though the share of exports within buyer-centred GPN has recorded a notable decline over the

time, they still account for over 40% compared to the developing-country average of 16%. In sum, India has lagged behind the East Asian countries in reaping gains form global production sharing, particularly in specialisation within much the more dynamic producer-centred production networks.

Selected indicators of export performance and engagement in global production sharing for India and East Asian countries are given in Table 1. The data clearly show the role played by the engagement in global production sharing in export expansion is China and the other East Asian countries (except Indonesia)[6] compared to India. On average GPN products have accounted for over 70% of total manufacturing exports from the East Asian countries (except Indonesia) during the period 1989-2016. By contrast, this share in Indian manufacturing exports has varied in the narrow range of 32% to 35%. China's share in world manufacturing exports increased from 1.8% in 1989-90 to 23.5% 2015-16, when GPN exports accounted for over two-thirds of total manufacturing exports.

[6] The 'outlier' status of Indonesia within East Asia in relation to its role in global production sharing is discussed below.

Table 1: Sleeted indicators of export performance: India and East Asian Countries (%)

	1989-90[1]	1999-20[1]	2009-10[1]	2015-16[1]
Manufacturing share in total merchandise exports				
India	72.6	73.5	59.9	71.9
China	78.9	91.7	83.0	82.7
Korea	92.6	88.7	69.4	66.5
Indonesia	51.6	68.7	47.6	53.8
Malaysia	58.7	85.9	81.5	79.5
Singapore	80.1	88.5	88.3	87.3
Thailand	60.5	76.4	65.1	68.6
Vietnam	12.9	66.0	70.6	72.4
Share of world manufacturing exports				
India	0.5	0.7	1.4	2.0
China	1.8	7.3	16.3	23.5
Korea	2.4	3.1	3.4	4.3
Indonesia	0.3	0.7	0.7	0.9
Malaysia	0.7	1.9	1.2	1.4
Singapore	1.1	1.5	0.8	0.9
Thailand	0.6	1.2	1.5	1.8
Vietnam	0.0	0.1	0.5	1.6
Share of developing-country manufacturing exports				
India	4.0	3.2	4.4	4.5
China	14.0	32.3	51.6	53.2
Korea	19.4	13.5	10.9	9.8
Indonesia	2.5	3.2	2.2	2.0
Malaysia	5.7	8.5	3.8	3.1
Singapore	8.7	6.9	2.5	1.9
Thailand	4.5	5.1	4.6	4.1
Vietnam	0.0	0.6	1.7	3.7
Share of GPN products in own manufacturing exports				
India	34.4	31.8	35.3	32.8
China	62.5	72.6	69.4	66.0
Korea	71.2	69.8	64.4	60.2
Indonesia	32.5	50.6	55.7	57.1
Malaysia	79.9	84.4	68.9	68.9
Singapore	87.3	90.1	79.7	75.3
Thailand	63.9	71.8	66.3	64.6
Vietnam	38.7	78.1	67.6	79.6
Share of producer-driven GPN in total GPN exports				
India	17.6	34.3	58.0	57.8
China	27.0	52.8	71.2	77.7

Korea	54.7	91.1	97.8	96.6
Indonesia	11.6	54.9	62.9	56.5
Malaysia	83.0	94.6	93.2	91.6
Singapore	93.4	98.8	99.0	97.9
Thailand	58.9	82.6	90.8	91.5
Vietnam	38.7	78.1	67.6	79.6
Share of parts and components in GPN exports				
India	15.1	27.5	40.3	41.4
China	12.3	32.5	41.8	51.4
Korea	32.4	68.0	55.3	55.4
Indonesia	9.4	39.3	39.2	33.4
Malaysia	59.1	80.4	68.0	68.0
Singapore	73.8	88.4	72.2	69.2
Thailand	46.0	64.6	61.7	59.4
Vietnam	5.8	15.3	25.7	46.0

Note: two-year averages

Source: Compiled from UN Comtrade database

The only major East Asian country whose experience resembles that of India is Indonesia. Indonesia's engagement in producer-driven global production networks has so far been limited mostly to low-end electronic assembly activities undertaken mostly by Singaporean subcontracting companies in the Batam economic zone and some exports by predominantly domestic market oriented automobile assembly plants. In the early 1970s, when labour and rental cost in Singapore started to increase rapidly, multinational enterprises that has already been stunning lucrative production plants there looked to neighbouring Indonesia for relocating low-wage segments of production processes. Two of major electronics MNEs operating in Singapore set up assembly plants there (Fairchild and National Semiconductor, established in 1973 and 1974 respectively), but both plants were closed down in 1986. The unfavourable business environment in Indonesia, in particular labour market issues, that hindered restructuring operations in line with global changes in the semiconductor industry, appears to be the major reason (Athukorala & Kohpaiboon 2014, Thee and Pangestu 1998). So far Indonesia has not been able to regain lost grounds.

It is widely held in some policy circles that India (and Indonesia, for that matter) has 'missed the boat' to join the electronics production network given the MNEs' long-standing attachment to the existing production bases and China's emergence as the premier assembly centre

in the world. This view is, however, not consistent with the on-going developments in global production networks in East Asia. For instance, in recent years, the East Asia production networks have begun to spread to Vietnam and Cambodia. From about the late 1990s part and component assembly within regional production networks began to emerge, mostly with the involvement of small- and medium-scale investors from Taiwan and Korea, with only one major global player, Hitachi from Japan. However, starting with the arrival of Intel Corporation in 2006 a number of large players in electronics industry have set up assembly plants in Vietnam (Athukorala and Tien 2012). The share of manufacturing in total merchandise exports from Vietnam increased from 13% in 1989-90 to 772% between 1989-90 and 2015-16. Vietnam's share in total developing country exports of manufactures increased from near zero to 3.7 between these two time points. This impressive export performance was underpinned by an increase in GPN products in total manufacturing exports from 39% to nearly 80%. There are also early signs of regional production networks expanding to Cambodia (Athukorala & Kohpaiboon 2014). Some MNEs with production bases in Thailand have begun to relocate some segments of their production process in Cambodia.

3.2 *Product composition*

As regards the composition of GPN exports, a striking common feature of East Asian countries' engagement in global production sharing is the heavy concentration of production within the broader commodity group of machinery and transport equipment (SITC 7). Within this product group information and technology (IT) products (telecommunication and sound recording equipment, semiconductors and other electrical machinery and equipment) account for the lion's share of total network exports (Tables 2). Buyer-centred GPN products accounts for only a tiny share of total GPN exports from these countries, other than Indonesia where apparel and footwear account for almost half of total GPN exports.

India's GPN product mix is dominated by two product groups, apparel and clothing accessories (SITC 84) automobiles (SITC 78). IT products account for a much smaller share (26%) of GPN exports from India compared to exports from the East Asian countries.

Table 2: Product composition of exports within global production networks (GPNs): India and East Asian countries, 2015-16[1]

Products/product groups[2]	India	China	Indonesia	Singapore	Korea	Malaysia	Thailand	Vietnam
Producer-driven GPN	58.9	78.2	56.8	98.9	97.9	92.2	92.6	57.4
Chemicals (5)[3]	0.6	0.5	0.3	0.8	0.9	0.8	0.2	0.1
Resource-based manufacturing (6)[3]	2.4	1.4	1.0	1.2	2.3	0.9	1.8	0.9
Power generating machines (71)[3]	6.0	2.4	2.5	6.6	3.7	0.8	4.1	1.3
Specialized industrial machines (72)[3]	2.0	1.0	1.7	4.4	1.9	2.4	0.6	0.3
Metal working machines (73)[3]	0.4	0.2	0.2	0.4	0.4	0.1	0.2	0.0
General industrial machinery (74)[3]	8.8	3.7	2.9	4.7	4.5	2.7	6.4	1.1
Automated data processing machines (75)	0.8	17.6	2.4	21.5	6.2	20.9	21.5	7.7
Telecomm & sound recording instruments (76)	1.3	21.6	7.6	5.6	12.0	12.8	8.3	34.0
Electrical machinery (77)	10.7	18.4	18.3	26.2	17.7	35.4	15.8	7.1
Road vehicles (78)	20.5	4.2	13.7	1.5	28.2	2.7	26.2	1.8
Other transport equipment (79)	1.4	1.0	2.0	8.7	4.9	1.3	0.2	0.3
Professional and scientific instruments (87)	2.7	3.2	2.1	14.6	12.7	9.0	4.1	1.3
Photographic apparatus (8)	0.8	2.0	1.3	2.5	2.1	1.8	2.6	0.5
Miscellaneous[4]	0.6	1.0	0.8	0.2	0.7	0.5	0.7	1.0
Buyer-driven GPN	*41.1*	*21.8*	*43.2*	*1.1*	*2.1*	*7.8*	*7.4*	*42.6*
Textiles (656 to 657)	1.3	0.9	0.8	0.1	1.0	0.3	0.7	0.7
Travel goods (83)	2.6	2.2	1.0	0.2	0.2	0.1	0.4	3.0
Apparel & clothing accessories (84)	30.8	11.9	25.5	0.5	0.6	6.9	4.6	22.6
Footwear (85)	5.9	3.8	15.2	0.1	0.1	0.1	0.8	15.7
Toys & sport goods (894)	0.4	3.0	0.7	0.2	0.2	0.3	0.8	0.5
Total GPN products	100	100	100	100	100	100	100	100
US$ billion	52.1	1229.7	40.0	50.6	205.8	77.2	99.8	108.5

Note: (1) Two-year average. (2) Standard International Trade Classification (SITC) codes are given in brackets. (2) These items comprises parts and components used in the other products classified under SITC 7: machinery and transport equipment. (3) Parts and component classified under SITC 8: miscellaneous manufacturing.

Source: Compiled from Comtrade database using the classification system described in the Appendix.

The global landscape of the apparel industry is being profoundly transformed following the termination of the Multi-Fibre Arrangement (MFA) with effect from 1 January 2005. In the MFA-era of over 30 years, country-specific import quotas imposed by the major importing countries determined both the level and patterns of apparel exports from each exporting developing country. Following the MFA abolition, international buyers are now free to source apparel from any country, subject only to the system of tariffs. According to various predictions made in the lead up to the MFA abolition, large apparel producing countries such as India, whose exporting capacity remained constrained by MFA quotas, were expected to gain market shares at the expense of countries where apparel industry had grown under quota protection despite their limited production potential (Yang et al. 1997).

India's share in world apparel exports has increased following the MFA abolition, but the rate of market penetration has not been impressive when viewed against the early predictions. Chania's share of total apparel exports jumped from 27.4% during the five years before MFA abolition to 40.6% during 2010-14. The comparable increase in India's market share was from 2.8% to 3.9%. Interestingly the market share of neighbouring Bangladesh (5.9%) in now much larger compared to India (Table 3).

Table 3. Export market share of apparel: Indonesia and seleted Asian countries (%)[1]

	1990-94	1995-99	2000-04	2005-09	2010-14
India	2.6	2.7	2.8	3.7	3.9
Indonesia	2.6	2.1	2.2	1.9	1.9
Bangladesh	1.1	1.8	2.6	3.6	5.9
China	17.2	22.6	27.4	37.8	40.6
Sri Lanka	0.9	1.1	1.2	1.2	1.2
Vietnam		0.7	1.2	2.4	4.1

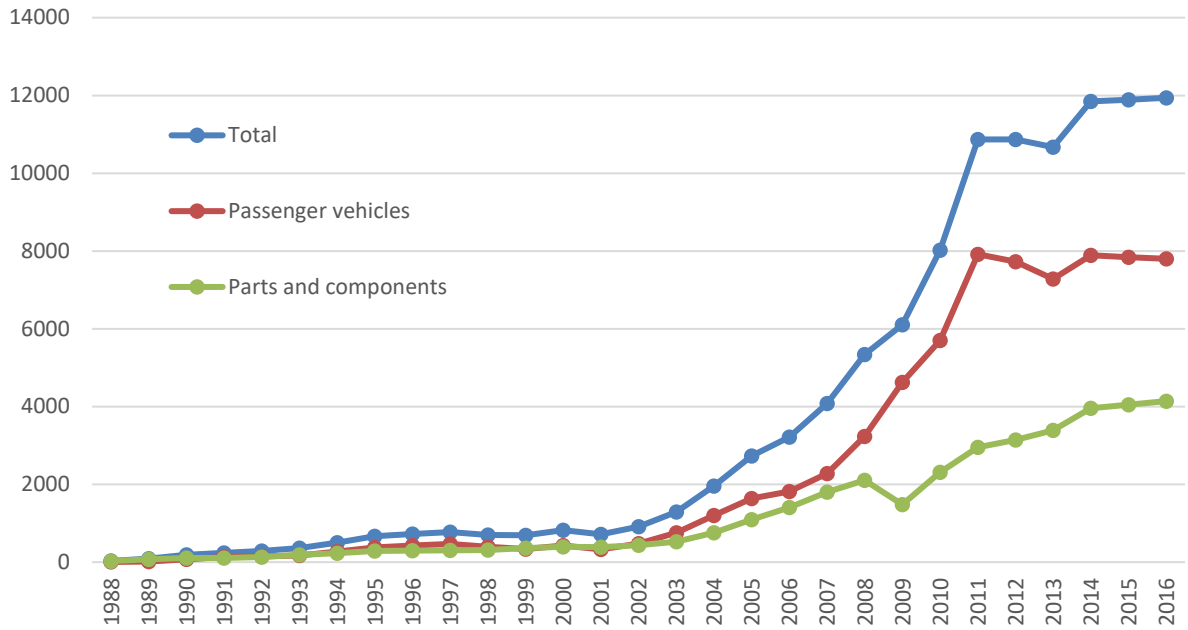
Note: 1. Five-year average

Source: Compiled from UN Comtrade database.

4.3 The unique case of automobiles

As notable feature of the commodity composition of producer-driven GPN exports from India is the dominance of automobiles, in particular passenger vehicles. Exports of passenger vehicles from India increased for US230 million in the early 1990s to 1.2 billion in the early 2010s (Figure 4). Over the past decade or so, exports of auto parts and components also have increased notably showing global integration of the Indian automobile industry. Passenger vehicles accounted for over a fifth of total Indian network exports in 2015-16, compared to 4.2% of China and an East Asian regional average of 14% (Table 2).

Figure 4: Automobile exports from India, 1988-2016, US$ million



A number of leading automakers and auto part suppliers have established assembly plants in India and some of them have already begun to use India as an export platform within their global production networks (Humphrey 2003, Saripalle 2016, Veeramani and Athukorala (2017). For example, Toyota Kirloskar Auto Parts, a joint venture between Toyota and a local manufacturer is exporting gearboxes from India to assembly plants in various countries including Thailand, South Africa and Argentina. Toyota Indonesia, which is specialising in multipurpose

vehicles has integrated its production system with its operations in India, importing engine components from Indonesia and exporting gearboxes and auto parts. Suzuki India has developed a two way sourcing network encompassing its plants in China, India and Indonesia. Hyundai has its largest overseas production base in India (Park 2004). Almost all companies now export assembled cars (completely built units), mostly smaller cars, to both regional and extra-regional markets.

What explains the rapid growth of automobile exports compared to electronics and other machinery exports? [7] In the case of automotive industry, the government policy has always been more accommodative, even during the heydays of import substitution, to permit participation by MNEs and private sector firms. In the case of electronics, in contrast, the major role was assigned to the public sector and small scale sector with little recourse to foreign capital and technology until the 1980s. Foreign collaborations were not allowed in the field of electronic consumer goods, except in the case of 100 per cent export oriented units. Organised private sector was not given any significant place during the import substitution period (Narayana and Joseph 1993).

A long history of relatively more market confirming policies in the automobile sector, as opposed to electronics, provided the setting for the expansion of the India automobile industry following the removal of restrictions on the entry of foreign automotive producers and significant trade liberalisation as part of the liberalization reforms (Humphrey 2003). But it is necessary to look into peculiarities of automobile production in order to understand its export performance record.

Unlike in electronics and electrical goods, automotive are bulky and 'low-value-to weight' goods, and hence transport cost is a key determinant of market price. There is also a need to design the product to suit the taste and affordability of the consumer. Therefore there is a natural tendency for car assembly plants to be located in countries with large domestic markets. Once auto makers choose to set up assembly plants in a given country, parts and component producers follow them because of two reasons. First, and perhaps more importantly, most auto parts also have low value-to-weight ratios, which make it too costly to use air transport for the

[7] For details on the history of the automobile industry in India and the emergence of India as a significant production hub within the global automobile networks see Veeramani and Athukorala (2017).

timely delivery required for just-in-time production schedules of the final assembler (Hummels 2007).[8]

Second, there is an asymmetrical market power relationship between component makers and auto makers within the global automobile industry; products of many auto part manufacturers are used in the vehicles made by a handful of car makers. This is different from electronics parts like integrated circuits and semiconductors that are used in many industries. Thus there is incentive for the part makers to set up factories next to the assemblers in order to secure their position in the market (Kohpaiboon and Jongwanich 2013, Klier and Rubenstine 2008, Chapter 3). Once a complete production base (involving both final assembly and component assembly/production) is established in a given (large) country, exporting to third countries becomes a viable option for automakers. Scale economies gained from domestic expansion makes exporting of both parts and components and assembled vehicles profitable as part of their global profit maximisation strategy. Adaptation of products to suit domestic demand conditions and lower transportation cost compared to exporting from the home base also become important drivers of exporting to regional markets from the new production base.

4. DETERMINANTS OF GPN PARTICIPATION

Production sharing enables countries to specialise at a given slice of the production process since parts and components, capital and production technology are mobile within global production networks. It may be that workers in a given country tend to have different skills from those in another country, or the skills required in each production block differ (as in the Ricardian model). Alternatively, it may be that the production blocks differ from each other in the proportion of different factors required, enabling firms to locate labour intensive production blocks in countries where productivity-adjusted labour cost is relatively low (as in the Heckscher-Ohlin model). Given that capital and also material knowhow and technology are mobile within production

[8] Air shipping is the mode of transport for over two-thirds of electronics exports from Singapore, the Philippines, Thailand, and Malaysia to the USA (estimate based on U.S. Trade Commission data on trade by mode of transport between 2000 and 2005).

networks relative wages of production workers is the key determinant of a country's participation in production sharing.

However, successful participation in global production sharing will occur only if the costs of 'service links' associated with production sharing outweigh the gain from the lower costs of the activity abroad. Here the term service links refers to arrangements for connecting/coordinating activities into a smooth sequence for the production of the final good. Service link cost relate to transportation, communication, and other related tasks involved in coordinating the activity in a given country with what is done in other countries within the production network. Just in time production and inventory systems have become an integral part of GPN. This means that the system of parts and components, and subsystems are required to respond rapidly and flexibly to changing market conditions. .The organisation of production must be remarkable well connected to respond to the new challenges.

The policy regime and the domestic investment climate also need to be conducive for involvement in production sharing. The decision of a firm to outsource production processes to another country—either by setting up an officiated company or establishing an arm's length relationship with a local firm—entails 'country risks'. This is because supply disruptions in a given overseas location could disrupt the entire production chain. Such disruptions could be the product of shipping delays, political disturbances, or labour disputes (in addition, of course, to natural disasters).

How does India meet these preconditions required for successful participation in global production sharing within global production networks?

4.1 *Labour market conditions*

Allowing for other factors (discussed below), presumably these 'international' wage differences are a significant determinant of India's attractiveness as a location within production networkers. India's average manufacturing wage is much lower compared to China and other major East Asian countries, even though it is slightly higher than that in Vietnam (Table 4) works. As labour cost is rising sharply in China, India does have an opportunity to make inroads into global production networks. As the Chinese experience clearly demonstrates, availability of a large labour pool is

an advantage particularly for final goods assembly within global production networks, which require production in factories that employ large number of workers.

Assembly processes within production networks (particularly in producer-driven networks) require much more middle-level (supervisory) workforce (in addition to the availability of trainable low-cost unskilled labour) than the traditional labour-intensive manufacturing.[9] Under global production sharing, developed countries normally shift low-skill-intensive parts of the value chain to developing countries. But, the least skill-intensive activities in the developed country can be more skill-intensive than the most-skill-intensive activities in the developing country (Feenstra and Hanson 2003). Judging from the successful case of software industry, India has the capacity to meet this requirement.

Industry reservations that was a major constraint on the expansion of labour intensive manufacturing in India have been drastically pruned in recent years. But. As has been well documented in several recent studies, still there are many obstacles, including rigidities in labour laws that inhibit labour intensive production (Joshi 2017, Hasan et al. 2017, Panagariya 2008, Hoda and Rai (2014); Rai and Hoda 2014).

Worker hostel systems used in Chian to meet regular supply of workers for large assembly lines does not accord with India's social mores, particularly for women. The solution seems to lie in improving transport structure to facilitate transportation of workers from long distances in large numbers (Joshi 2017, p 72).

[9] See also Steve Jobs' discussion with President Obama on Apple's assembly operations in China in Isaacson (2011), p. 546. 'At that time, Apple had 700,000 factory workers employed in China, and that was because it needed 30,000 engineers on-site to supervise those workers. If you could educate these engineers, he said, we could move more manufacturing plants here'.

Table 4: Annual Average compensation of manufacturing workers in selected countries (US$)

	2010	2014
Germany	75519	78895
Netherlands	73816	75216
Sweden	---	78050
M United Kingdom	61958	70400
USA	77055	87021
Czech Republic	---	24863
Poland	23605	24088
Brazil	32590	36735
Mexico	16021	16675
China	15508	16287
India	14039	14708
Indonesia	19048	18771
Japan	65643	66339
Korea, Republic of	46293	60039
Malaysia	17726	21899
Philippines	10998	9526
Singapore	54997	66852
Taiwan	29307	31845
Vietnam	---	10652

Notes: 1. Data for USA relates to US Affiliates of foreign MNEs in US manufacturing. For other countries, foreign affiliates of US MNEs

--- Data suppressed to avoid disclosure of data of individual companies.

Source: US Bureau of Economic Analysis ttps://www.bea.gov/international/ai1.htm#dius (2014).

4.2. *Determinants of Service link costs*

It is not possible to come up with a single indictor of service lick cost associated with global production sharing. However, the business climate and logistic performance indicators summarised in Tables 5 and 6 provides a comprehensive coverage of the determinants of service link cost in a given country (Golub, Jones and Kierzkwski 2007). In terms of these Indicators, India ranks well below China and other East Asian countries (other than Indonesia).[10]

[10] For details on trade-related logistics in India, see Hoda and Roy (2015) and Singh and Katuria (2016).

Table 5: World Bank's Ease of Doing Business Distance to Frontier Measure (DIF)[1]

	India	China	Indonesia	Malaysia	Thailand	Vietnam
Overall	60.8	65.3	66.5	78.4	77.4	67.9
Staring business	75.4	85.5	77.9	83.8	92.3	82.0
Dealing with construction permits	38.8	47.3	66.1	82.2	74.6	79.0
Getting electricity	85.2	68.8	83.9	94.3	91.0	78.7
Registering property	47.1	71.2	59.0	76.1	68.8	70.6
Getting credit	75.0	60.0	65.0	80.0	70.0	75.0
Protecting minority investors	80.0	43.3	63.3	80.0	73.3	55.0
Paying tax	66.1	62.9	68.0	76.1	76.7	72.8
Trading across border	58.6	69.9	66.6	82.8	84.1	70.8
Enforcing contracts	40.8	78.2	47.2	66.6	67.9	60.2
Resolving insolvency	40.8	55.8	67.6	62.5	75.6	35.2
Memo item						
Overall raking among 190 countries2	100	78	72	24	26	68

(1) DIF measure shows the distance to the 'frontier', which represents the best performance observed on each of the indicators across all economies in the Doing Business sample since 2005. Any economy's distance to frontier is reflected on a scale of 0 to 100 where 0 represents the lowest performance an 100 represents the frontier.

(2) The ranking rages from 1 to 190.

Source: http://www.doingbusiness.org/rankings (accessed on 20 March 2018)

Table 6: Ranking by the quality of Logistic Performance, Liner shipping connectivity and Air Connectivity: India and East Asian countries[1]

	Logistic performance index (LPI)	Linear Shipping Connectivity Index (2011)	Air Connectivity Index 2007
India	48	22	88
China	27	1	46
South Korea	23	6	55
Indonesia	59	45	122
Malaysia	26	7	83
Philippines	58	62	114
Singapore	2	3	74
Thailand	35	28	75
Vietnam	53	20	126

Note : 1. On all three indices, countries are ranked from 1, the best performing country.

Sources:
Arvis and Shepherd 2011 (air connectivity index), rank among 211 countries)
Arvis et al (2014) (logistic performance index (rank among 155 countries)
UNCTAD (2011) (Linear shipping connectivity index, rank among 162 countries

4.3 *Foreign direct investment regime*

Global production sharing has gone beyond the production outsourcing practices initiated by large MNEs. A firm does not have to be big to think internationally, in the limit it can become international at the moment of birth: new production niches can be found and exploited. However, there is clear evidence that MNEs are still the leading vehicle for developing countries to enter global production networks. This is because the production of final goods require highly customized and specialized parts and components whose quality cannot be verified or assured by a third party (and it is not possible to write a contract between the final producer and input supplier which would fully specify product quality). This is particularly the case when it comes to setting up production units in countries that are newcomers to global production networks. As the production unit becomes well established in the country and it forges business links with private- and public-sector agents, arm's length subcontracting arrangements for components procurement could develop, but this would depend very much on the domestic business climate.

There has been a notable increase in foreign direct investment (FD) in India following the liberalisation reforms. However, unlike China so far India has not successful in attracting major global players to set up production bases in the country (other than in software industry). Some electronics and electrical goods producing MNEs (eg. Nokia, Samsung, LG) have set up production bases in India, but they are predominantly involved in production for the domestic market.

In most East Asian countries Special Economic Zones (SEZs) (until recently known as free trade zones (FTZ) or export processing zones EPZ) have proved to be an effective vehicle for integrating domestic manufacturing into global production networks in these global industries. In these countries SEZs provided an investment climate, characterised by free trade conditions, a liberal regulatory framework and high-quality infrastructure. In India has a history of setting up SEZ dating back to 1965. By 2005 there were 17 SEZs in operation (Aggrawal 2012). But these SEZs never took off because of several reasons, such as their relatively limited scale; the government's general ambivalence about attracting FDI, and unclear and changing incentive packages attached to the zones. Moreover, unlike in the East Asian countries, where SEZs were an integral part of an overall export-led industrialisation strategy, in India SEZs had to operate in the context of a highly restrictive trade and investment policy regime. It was difficult to insulate the zones from this unfavourable external investment climate (Aggarwal 2013).

Inspired by the notable success of SEZs in China, the Indian government announced a revamped approach to SEZs as part of the Foreign Trade Policy of 2000-01 (Panagariya 2008). This was followed by the enactment of the SEZ Act of 2005 to provide the overall legal framework within which the SEZs operate. The new regime envisages a single window for all clearances exemption from all internal taxes. The Act which became operational in February 2010 provides for setting up of SEZs by the private sector, in addition to state governments and the central government, and gives the Indian States some flexibility for the relaxation of labour laws and offer specific incentives to the investors (Hoda and Rai 2014).

The past ten years have seen a rapid proliferation of SEZs in India: by early 2016, 637 SEZs had been formally approved and, of them, 214 had begun operations.[11] The share of exports

[11] Ministry of Commerce & Industry, Department of Commerce, http://sezindia.nic.in/cms/operational-sezs-in-india.php (accessed on 8 April 2018).

by SEZ enterprises in total exports from the country increased from 9.1% in 2006-07 to 32% in 2014-15. However so far there has not been a significant presence of foreign firms in electronics and other vertically integrated global industries. Electronics and electrical goods account for only tiny share of exports (2.2%). It could be that, despite significant recent reforms, in the eyes of foreign investors, India's foreign investment regime still reflects the tension between the traditional aversion to foreign investment and the current recognition of its importance to economic development.

Smooth functioning of SEZs has also been constrained by the controversial issue of land acquisition and unresolved issues relating to the relaxation of labour laws for the SEZ firms (Panagariya 2008, 271-73). The other problems impacting on the lacklustre performance of SEZ include unpredictable taxation policies, poor connectivity of SEZs to ports and airports, power shortages and cumbersome customs controls (Hoda and Rai 2018).

5. CONCLUDING REMARKS

Although the overall export performance has improved significantly during the reform era, India still lag well behind China and most other East Asian countries. At the disaggregated level, no particular commodity category—even the traditional labour intensive products in which India has considerable un-tapped potential— stands out for faster growth compared to the major the East Asian countries. However, the comparative analysis in this paper suggests that by far the most important reason for India's lacklustre export performance is its failure to cash in on the rapid expansion of network trade and the dramatic shift in trade within production networks from developed to developing countries.

India comparative export performance has been particularly weaker in electronics and electrical goods, which account the lion's share of total world network exports. Some large electronics and electrical goods producing MNEs have set up production bases in India, but they are predominantly involved in production for the domestic market. In most East Asian countries Special Economic Zones (SEZs) have proved to be an effective vehicle for integrating domestic manufacturing into production networks in these global industries. However, although SEZs have

mushroomed in India following the new SEZ Law came into force in 2005, electronics and electrical goods account for only tiny share of export from these zones (2.3%).

The view widely held in some policy circles that India has already 'missed the boat' for joining global production networks, as a result of the MNEs' long-standing attachment to the existing production bases and China's emergence as the premier assembly centre within global production networks, is not consistent with the East Asian experiences surveyed in this paper. In recent years, production networks have begun to spread in a big way into Vietnam, and also to Cambodia. There has been contraction in final assembly of consumer electronics and electrical goods exported from the other East Asian countries as an outcome of competitive pressure from China, but overall there has evolved a close complementarity between China and these countries within production networks, dispelling the 'crowding out' fear. The upshot of this analysis is that explanation for India's poor performance in network trade lies primarily on the supply side, in India's overall business and investment climate.

The findings of this study provide further support to the case made in a number of influential studies for completing the unfinished reform agenda, encompassing both trade and investment policy reforms and 'behind-the-border' reforms. Further reforms are even more important for linking India into global production networks than for the expansion of the standard labour intensive products and other conventional exports.

There is also a strong case, based on the experiences in East Asia and elsewhere, for combining further reforms with a proactive investment promotion campaign to attract multinational enterprises (MNEs) engaged in global production networks. Over time global production sharing has expanded well beyond the confines of intra-firm activities of MNEs, but there is compelling evidence that MNEs are still the leading vehicle for developing countries to enter global production networks. In global industries like electronics and electrical goods, initial success in attracting a big player/players to set up operations in a country 'breeds success' because in these industries there is something akin to 'herd mentality' in the site selection process of MNEs. Effective investment promotion should go beyond simply 'marketing the country' and also focus on facilitating and coordinating the perquisites for setting up operations and effective functioning when the MNEs decide to set up production plants. As part of designing investment proportion strategy, it is also vital to probe why Indian SEZs have so far not been successful in acting an

effective second-best option for providing investors with a suitable investment climate that is insulated from the remaining distortions in the rest of the economy.

APPENDIX: TRADE DATA COMPILATION

Following the seminal paper by Yeats (Yeats, 2001), it has become common practice to use data on parts and components to measure GPN trade. However, there has been a remarkable expansion of production sharing from parts and component to encompass final assembly in recent years. Moreover, the relative importance of these two tasks within production networks varies among countries and over time in a given country, making it problematic to use data on the parts and components trade as a general indicator of the trends and patterns of GPN trade over time and across countries. In this study we define GPN trade to incorporate both components and final (assembled) goods exchanged within the production networks.

The data used in this study for all countries except Taiwan are compiled from the *UN Comtrade* database. The data for Taiwan (a country which is not covered in the UN trade data reporting system) come from the database of the Council of Economic Planning and Development, Taipei. The data are compiled at the 5-digit level of the Standard International Trade Classification (SITC) based on SITC Revision 3.

Parts and components are delineated from the reported trade data using a list compiled by mapping parts and components in the intermediate products subcategory of the UN Broad Economic Classification (BEC) with the Standard International Trade Classification (SITC).[12] There is no hard and fast rule for delineating final goods assembled within global production networks from the standard trade data. The only practical way of doing this is to focus on the specific product categories in which GPN trade is heavily concentrated. Once these product categories are identified, trade in final assembly can be approximately estimated as the difference

[12] The list is available on request from the author.

between parts and components, which are directly identified based on our list, and the total trade of these product categories.

Guided by the available literature on production sharing, we identified the following product categories: office machines and automatic data processing machines (SITC 75), telecommunication and sound recording equipment (SITC 76), electrical machinery (SITC 77), road vehicles (SITC 78), other transport equipment (SITC 79), travel goods (SITC 83), clothing and clothing accessories (SITC 84), footwear (SITC 85), professional and scientific equipment (SITC 87) , photographic apparatus (SITC 88) and toys and sport goods (894). It is quite reasonable to assume that these product categories contain virtually no products produced from start to finish in a given country. Of these SITC 83, SITC 84, SITC 85, and SITC 894 are classified as products predominantly traded with buyer-driven production networks and the rest as belonging to producer-drive production networks. The difference between the value of total exports of these categories and the value of total parts and components falling under these categories was treated as the value of final assembly. Admittedly the estimates based on this list do not, however, provide full coverage of final assembly in world trade. For instance, outsourcing of final assembly does take place in various miscellaneous product categories such as furniture and leather products. It is not possible to meaningfully delineate parts and components and assembled goods in reported trade data in these product categories because they contain a significant (yet unknown) share of horizontal trade.

A number of recent studies have analyzed trade patterns using 'value added' trade data derived by combining the standard trade data with national input-output tables.[13] The underlying rationale is that, in a context of rapidly expanding cross-border trade in parts and components driven by global production sharing, the standard (gross) trade data (trade data based on Customs records) tend to give a distorted picture of bilateral trade imbalances of a given country and the geographic profile of its global trade linkages (Lamy, 2013). This approach is, however, not relevant for the present study, which aims to examine patterns and determinants of global production sharing. The pertinent approach is to analyze data on the reported (gross) exports, separated into parts and components and final assembly. Trade and industry policies have the

[13] For surveys of the related literature, see Johnson (2014) and Timmer et al. (2014).

potential to influence only a country's engagement in a given slice of the value chain; domestic value addition evolves over time as the country becomes integrated into the value chain over time.

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