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Is Indian Machinery Industry Better Integrated into Global Value Chains vis-à-vis Other Asian Economies?

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Abstract

The paper aims to assess the extent of integration of Indian machinery industry (HS 84-92) into global value chains (GVCs) particularly with respect to countries of South-East, East and South Asian regions. World Integrated Trade Solutions (WITS) software is used to obtain 'export shares of machinery parts and components' for 72 countries. Higher this share, better integrated the country into GVCs. India's import shares are higher than export shares and it lags far behind South-East and East Asian countries, but is better linked than other South Asian countries. Its trade in finished machinery goods is higher than intermediate goods in recent years, but latter is also gradually improving. Major products for India's exports are general machinery (HS 84), electric machinery (HS 85) and automotive (HS 87). The paper studies the integration level for each of these machinery segments. Further, India is using considerable amount of 'imported inputs in exports' of machinery goods, although domestic content is still very high. Using Grubel-Lloyd Index at both the aggregated and disaggregated product level (based on trade data), more than half of trade in this industry is found to be intra-industry trade (IIT) where majority of this is vertical IIT. India's input-output tables are also used to substantiate the results of IIT calculated through trade data. This paper show steadily rising but low integration level of Indian machinery industry in GVCs. Thus, India needs to invest more in R&D and encourage economies of scale in the production which will ultimately lower the costs as well as try to capture the areas which ever are vacated by South-East and East Asian countries. Potential segments must be identified to find out the feasibility of forming regional supply chains for machinery industry in South Asia.

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1. Introduction

The machinery industry serves as backbone of manufacturing sector and is reported to have immense presence in global value chains (GVCs). South-East and East Asian economies, particularly China since 1980s, have shown high growth due to the substantial trade in intermediate goods and rise in vertical intra-industry trade (IIT) in their machinery industry. Presence of several parts and components in machinery goods require diverse range of technologies and instigate the need for greater fragmentation of different production activities across varied locations (Kimura & Ando, 2005; Ando, 2006; Kimura, 2006; Haddad, 2007; Ando & Kimura, 2009; Athukorala & Menon, 2010). There is evidence of rising IIT and vertical specialization even in Indian manufacturing sector (see, Veeramani, 2002; Veeramani 2009; Sawyer, Sprinkle, & Tochkov, 2010). Even though existing literature shows less integration of India in global production networks especially when compared to China (Dimaranan, Ianchovichina, & Martin, 09; Tong, 2008), but its non-electrical and electrical machinery and automotive are found to be vital segments which have rising trade, mainly two-way trade (Francis, 2011). Also, the machinery industry has always been given the priority in the five year plans of India, and the role of foreign assemblers and component manufacturers is found to be increasing therein (Uchikawa, 2011). Accordingly, the paper aims to assess the extent of integration of India's machinery industry into GVCs and compare it with machinery industries of other prominent Asian countries of South-East Asia (SEA), East Asia (EA) and South Asia (SA) regions[4].

This paper defines machinery industry, as per the renowned work of Kimura and Ando (2005) as well as of Ando and Kimura (2009), on the basis of Harmonised System product classification (HS Chapters 84-92)[5], that is, general machinery (HS 84), electric machinery

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[4] In this paper, SEA includes Brunei, Cambodia, Indonesia, Lao PDR, Malaysia, Myanmar, Philippines, Singapore, Thailand, East Timor and Vietnam; EA includes China, Hong Kong, Macao (Macau), Japan, Mongolia and Korea; and other SA countries include Afghanistan, Bangladesh, Bhutan, Islamic Republic of Iran, Maldives, Nepal, Pakistan and Sri Lanka (based on latest classification of countries given on UNDESA website: http://esa.un.org/wpp/Excel-Data/country-classification.pdf).

[5] **Machinery industry** covers very wide range of products - HS 84: nuclear reactors, boilers, machinery, etc.; HS 85: electrical, electronic equipment; HS 86: railway, tramway locomotives, rolling stock, equipment; HS 87: vehicles other than railway, tramway; HS 88: aircraft, spacecraft, and parts thereof; HS 89: ships, boats and

(HS 85), transport equipment (HS 86–89), and precision machinery (HS 90–92). Similarly, machinery parts and components are defined according to the recent work of Kimura and Obashi (2010)[6]. The time-period taken for this study is 1988-2012[7] (the era of major changes in the world, especially in Asia).

Four periods/ years are selected to show the extent of integration of India's machinery industry into GVCs, namely, 1988-95[8], 1999, 2005 and 2012 as these hold special significance due to the various schemes introduced from 1990 till 2012 for promotion of exports, such as, introduction of Export Promotion Capital Goods (EPCG) Scheme during 1990-93 for import of capital goods at a concessional rate. Further, the switch to flexible exchange rate regime; introduction of Foreign Exchange Management Act (FEMA), 1999; announcement of Special Economic Zones (SEZs) Policy, 2000; etc. were few steps to facilitate external trade, liberalize and attract foreign investments in Indian industries (especially in capital goods), reduce multiplicity of controls and clearances, develop world-class infrastructure; etc. Accordingly, the second year considered is 1999. This captures the impact of liberalization process in India and joining of WTO; this also captures the world-

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other floating structures; HS 90: optical, photo, technical, medical, etc apparatus; HS 91: clocks and watches and parts thereof; and HS 92: musical instruments, parts and accessories.

[6] **Definition of Machinery Parts and Components** (Distinct Definition for different HS Classification)
As per HS 1988/1992 Classification
840140, 840290, 840390, 840490, 840590, 8406, 8407, 8408, 8409, 8410, 8411, 8412, 8413, 8414, 841590, 8416, 8417, 841891, 841899, 841990, 842091, 842099, 842123, 842129, 842131, 842191, 842199, 842290, 842390, 842490, 8431, 843290, 843390, 843490, 843590, 843691, 843699, 843790, 843890, 843991, 843999, 844090, 844190, 844240, 844250, 844390, 8448, 845090, 845190, 845240, 845290, 845390, 845490, 845590, 8466, 846791, 846792, 846799, 846890, 8473, 847490, 847590, 847690, 847790, 847890, 847990, 8480, 8481, 8482, 8483, 8484, 8485, 8503, 850490, 8505, 850690, 8507, 850890, 850990, 851090, 8511, 8512, 851390, 851490, 851590, 851690, 851790, 851840, 851850, 851890, 8522, 8529, 853090, 8531, 8532, 8533, 8534, 8535, 8536, 8537, 8538, 8539, 8540, 8541, 8542, 854390, 8544, 8545, 8546, 8547, 8548, 8607, 8706, 8707, 8708, 870990, 8714, 871690, 8803, 8805, 9001, 9002, 9003, 900590, 900691, 900699, 900791, 900792, 900890, 900990, 901090, 901190, 901290, 9013, 9014, 901590, 901790, 902490, 902590, 902690, 902790, 902890, 902990, 903090, 903190, 903290, 9033, 9104, 9110, 9111, 9112, 9113, 9114, 9209
As per HS 1996 Classification
840140, 840290, 840390, 840490, 840590, 8406, 8407, 8408, 8409, 8410, 8411, 8412, 8413, 8414, 841520, 841590, 8416, 8417, 841891, 841899, 841990, 842091, 842099, 842123, 842129, 842131, 842191, 842199, 842290, 842390, 842490, 8431, 843290, 843390, 843490, 843590, 843691, 843699, 843790, 843890, 843991, 843999, 844090, 844190, 844240, 844250, 844390, 8448, 845090, 845190, 845240, 845290, 845390, 845490, 845590, 8466, 846791, 846792, 846799, 846890, 8473, 847490, 847590, 847690, 847790, 847890, 847990, 8480, 8481, 8482, 8483, 8484, 8485, 8503, 850490, 8505, 850690, 8507, 850890, 850990, 851090, 8511, 8512, 851390, 851490, 851590, 851690, 851790, 851840, 851850, 851890, 8522, 8529, 853090, 8531, 8532, 8533, 8534, 8535, 8536, 8537, 8538, 8539, 8540, 8541, 8542, 854390, 8544, 8545, 8546, 8547, 8548, 8607, 8706, 8707, 8708, 870990, 8714, 871690, 8803, 8805, 9001, 9002, 9003, 900590, 900691, 900699, 900791, 900792, 900890, 900990, 901090, 901190, 901290, 9013, 9014, 901590, 901790, 902490, 902590, 902690, 902790, 902890, 902990, 903090, 903190, 903290, 9033, 9104, 9110, 9111, 9112, 9113, 9114, 9209
Source: Kimura and Obashi (2010)

[7] For the period before 1996, the data is collected on the basis of HS 1988/92 classification, while the data for later years is based on HS 1996 so as to maintain uniformity in the data. HS classification is very descriptive and covers wide range of products and that too at much disaggregated level.

[8] India's trade data is available for 1988, but some of other countries started providing the data in 1990, some in 1992, and so on; thus, period 1988-95 is selected as one time-period. 1995 has also been the major year in international trade when World Trade Organisation (WTO) was set up and hence, the period is restricted up to 1995 only.

wide effects of Asian economic crisis of 1996-97. However, since 2000, many changes have occurred, especially in India such as IT revolution, more focus on capital-intensive products, new initiatives under foreign trade policy of 2004-09, etc. Accordingly, the year 2005 has been selected. 2012 as the recent year is appropriately selected as the year after the economic recession of 2008-09 (it is also important to note that 2013 trade data is not yet available for few countries). Moreover, since 2008, the EPCG scheme allowed import of capital goods at 3% customs duty[9]. This also permitted import of second hand capital goods, without any restriction of age. In Foreign Trade Policy (FTP) 2009-2014, the 'Zero duty EPCG Scheme[10]' has been introduced for the exporters of engineering and electronic products. Electronic products, automobiles, and other engineering products have also been incorporated for incentives under Market Linked Focus Product Scheme[11]. It therefore becomes important to capture the impact of these policies/schemes.

The next two sections of this paper show India's role in the world for machinery industry as a whole and for each product category, respectively. Calculation of IIT is given in the fourth section. The last section concludes the paper.

2. Integration of Machinery Industry

The extent of integration of Indian machinery industry is assessed with respect to various countries of the world, particularly SEA, EA and SA countries. The trade shares of India are calculated. Trade data is collected from 'COMTRADE database' of World Integrated Trade Solution (WITS) software[12]. Secondly, import content of exports is also measured.

[9] This scheme allowed import of capital goods for pre-production, production and post-production (including CKD/SKD thereof as well as computer software systems) at 3% customs duty, subject to an export obligation equivalent to 8 times of duty saved on capital goods imported under EPCG scheme (50% of export obligation in case of import of spares), to be fulfilled in 8 years reckoned from Authorization issue-date.

[10] Zero duty EPCG Scheme allowed import of capital goods for pre-production, production and post-production (including CKD/SKD thereof as well as computer software systems) at zero customs duty, subject to an export obligation equivalent to 6 times of duty saved on capital goods imported under EPCG scheme, to be fulfilled in 6 years reckoned from Authorization issue-date. It was to be in operation till 31.3.2013 and available for exporters of electronics and engineering goods.

[11] In order to give significant boost to market penetration of specific product in specified markets, a variant under Focus Product Scheme (FPS) called 'Market Linked Focus Product Scheme' (MLFPS) has been introduced from April 2008. Products of high export intensity (which are not covered under present FPS List) but which have a low penetration in countries (which are also not covered under present Focus Market Scheme list) are incentivised and entitled to duty credit scrip equivalent to 2% of FOB value of exports, provided that the product/ sector are destined to specified linked markets for that particular product/ sector. The products covered include motor vehicles, auto-components, value added plastic and rubber goods, household articles of aluminium, machine tools, earth moving equipments, transmission towers, electrical and power equipments, steel tubes/pipes/galvanized sheets, compressors, iron and steel structures, three wheelers, etc. The countries covered include Algeria, Egypt, Kenya, Nigeria, South Africa, Tanzania, Brazil, Mexico, Ukraine, Australia, New Zealand, Cambodia, Vietnam, Japan and China.

[12] WITS software is used in many research works on international economics as this covers very large database on international trade, tariff and non-tariff measures, such as COMTRADE, TRAINS, etc. It is data extraction software with simulation capabilities. It has been developed by World Bank along with UNCTAD, ITC, UNSD and WTO. This database provides values of exports and imports in US$ thousand terms.

2.1 India and Other Countries

As trade in intermediate goods is rising faster than trade in finished goods, especially over the last few decades, data on "export shares of intermediate inputs" is used to estimate the extent of integration of industries into GVCs. Several studies pertaining to machinery industry have used this approach, such as, Kimura and Ando (2005), Ando and Kimura (2009), Kimura and Obashi (2010), etc. The underlying presumption is that when a country supplies intermediate inputs or parts to other countries, it develops links to their production chains as the intermediate goods are further processed in different countries for use in the production of goods meant for domestic consumption or for exports to the other countries.

Indian machinery industry's integration into GVCs is measured relative to other 71 countries in the world (selected on the basis of work of Ando &Kimura, 2009; Kimura & Obashi, 2010; etc.) and their exports and imports data are collected for total machinery goods and for machinery parts and components, and accordingly, their shares in world trade are calculated. Data in the form of calculated trade shares for selected countries is graphically plotted (as clustered-stacked column graph) beginning with the country which has highest export share of machinery parts and components. The more the country is located towards left side of graphs (i.e., high export shares), the more it will be integrated into the GVCs. The export share of each machinery part and component for each country is calculated as (export value of that machinery part or component in a particular country/ value of total exports in that country)*100. Summation of shares of each of these individual machinery parts for any country gives its total export share of machinery parts and components (that is, a country's share of machinery parts and components in its total exports to the world). The export share of finished machinery goods is equal to the export share of total machinery goods[13] minus the export share of machinery parts and components. Similarly, import shares are also calculated for all the selected time-periods.

Trade Shares of Intermediate and Finished Machinery: 1988-95

For the period 1988-95, trade data is available for 65 countries (Figure 1). The most integrated countries have very high global exports shares in machinery parts and components. Table 1 shows top ten integrated countries in GVCs in 1988-95. However, there was a greater degree of convergence in the shares of exports and imports for majority of these countries. The exports shares of machinery parts and components were greater than import shares in case of many of these countries, particularly for Malta, Japan, Austria, France and Germany. Majority of them also traded finished machinery goods.

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[13]The export share of each machinery good for each country is calculated as (export value of that machinery good in a particular country/ value of total exports in that country)*100. Summation of shares of each of these individual machinery goods, from HS 84 to HS 92, for any country gives its export share of total machinery goods.

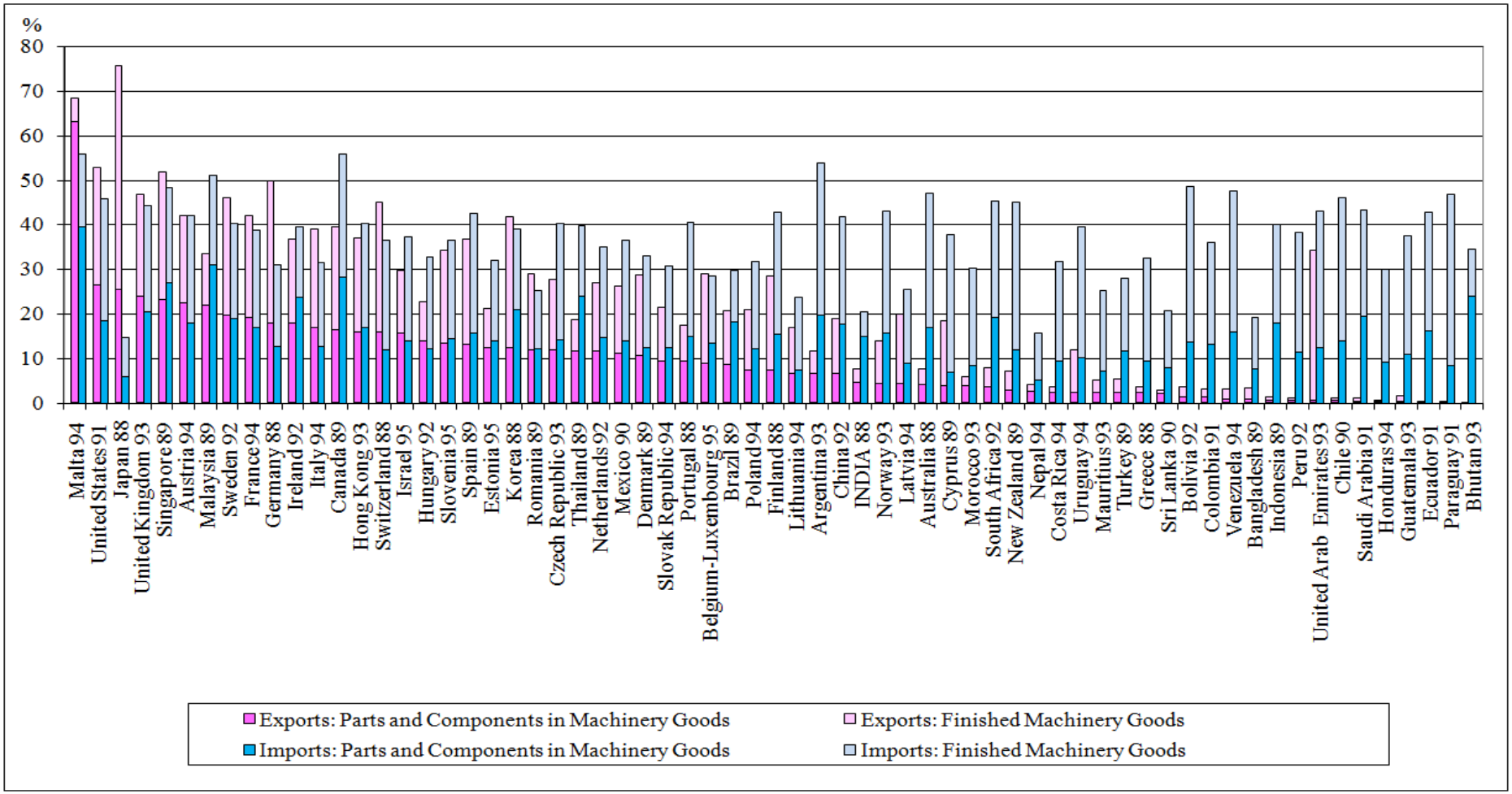
Table 1: Top Ten Integrated Countries in GVCs in 1988-95: Export and Import Shares of Intermediate and Finished Machinery (%)

Country	Exports: Parts & Components in Machinery Goods	Exports: Finished Machinery Goods	Imports: Parts & Components in Machinery Goods	Imports: Finished Machinery Goods
Malta 94	62.93	5.39	39.35	16.48
United States 91	26.48	26.25	18.29	27.33
Japan 88	25.47	50.19	5.80	8.89
United Kingdom 93	23.98	22.80	20.49	23.77
Singapore 89	23.24	28.61	26.98	21.37
Austria 94	22.30	19.73	17.76	24.09
Malaysia 89	21.78	11.76	30.93	19.97
Sweden 92	19.64	26.35	18.76	21.39
France 94	19.21	22.86	16.97	21.68
Germany 88	17.84	31.82	12.70	18.20

Source: Own calculations, WITS Software

These countries are followed by Ireland, Italy, Canada, Hong Kong, Switzerland, Israel, Hungary, Spain, Korea, Czech Republic, Thailand, etc. which also had relatively high export shares of machinery parts and components. Thus, in late 80s and early 90s, there seems to be a considerable presence of intra-regional trade and production sharing between the US and its neighbouring countries; between the European countries; as well as between some SEA countries.

Figure 1: Shares of Machinery Goods in Total Exports to and Total Imports from World in 1988-95



Source: Own Calculations, WITS Software

For the countries towards the right side of the Figure 1, the export shares are drastically low, while their imports increased especially for finished machinery products. Most of these countries are developing or LDCs and therefore, they justify their higher imports for promoting rapid industrialization process in their economies. Cyprus, Morocco, South Africa, Nepal, Costa Rica, Sri Lanka, etc. had slightly low export shares of machinery parts and components. Table 2 lists ten least integrated countries in 1988-95.

Table 2: Ten Least Integrated Countries in GVCs in 1988-95: Export and Import Shares of Intermediate and Finished Machinery (%)

Country	**Exports: Parts & Components in Machinery Goods**	**Exports: Finished Machinery Goods**	**Imports: Parts & Components in Machinery Goods**	**Imports: Finished Machinery Goods**
Indonesia 89	0.49	0.73	17.97	21.87
Peru 92	0.46	0.63	11.40	26.86
United Arab Emirates 93	0.44	33.69	12.39	30.47
Chile 90	0.42	0.73	13.82	32.25
Saudi Arabia 91	0.25	0.69	19.48	23.72
Honduras 94	0.20	0.32	9.19	20.68
Guatemala 93	0.17	1.42	10.91	26.54
Ecuador 91	0.10	0.23	16.15	26.49
Paraguay 91	0.03	0.21	8.38	38.41
Bhutan 93	0.00	0.01	23.97	10.42

Source: Own calculations, WITS Software

India is placed at the 37th position among the 65 countries with shares of 7.7% of total machinery exports and 20.5% of imports. The higher proportion of imports of machinery than exports in the pre-liberalization period was mainly to build sound industrial base. India's share of exports of machinery parts and components being 4.6% was only marginally higher (by 1.5 percentage points) than that of finished machinery. But, in case of imports of machinery parts and components, the share was much higher at 14.8%. However, high contribution of trade in intermediate goods to total trade of India can be taken as an indicator of industry's presence on world platform. The imports of finished machinery were low at 5.6%. On the whole, the exports shares of intermediate goods were much lower than their imports. This indicates low integration of Indian machinery industry into GVCs in 1988 as compared to other countries over the period 1988-95. In comparison to India, China is placed at the 36th position with much higher total exports' shares of 18.8%; but with only 6.5% of exports shares of machinery parts and components, it also had lower integration in GVCs.

To summarize, SEA and EA countries were largely integrated in this time-period and were placed at much higher positions as compared to India in terms of integration into GVCs;

while South Asia (SA) region was the least integrated. It was mainly the countries from America and Europe which displayed high linkages into GVCs.

Trade Shares of Intermediate and Finished Machinery: 1999

In 1999, where trade data is available for 72 countries (Appendix Figure 2), Philippines, Malta, Costa Rica, Singapore, Malaysia, Japan, United States (US), Hungary, Korea, Thailand and Mexico had very high shares of exports of machinery parts and components. These are followed by countries which had almost similar yet comparatively low shares, such as, Czech Republic, United Kingdom (UK), Sweden, Hong Kong, Austria, Germany, etc. There were improvements in shares of few countries, including SEA and EA countries (Table 3). In these countries, imports shares of finished goods declined; while export and import shares increased considerably for machinery components. Further, it has also been found that the relative positions declined for countries namely US, UK, Japan, Austria, etc. despite similar or improved trade shares.

Table 3: Export and Import Shares of Intermediate and Finished Machinery: Changes from 1988-95 to 1999 (including changes in positions) [in percentage point terms]

Country	**Exports: Parts & Components in Machinery Goods**	**Exports: Finished Machinery Goods**	**Imports: Parts & Components in Machinery Goods**	**Imports: Finished Machinery Goods**
Costa Rica (moved from 47th position among 65 countries in 1988-95 to 3rd in 1999 among 72 countries)	41.74	3.24	6.47	-5.22
Korea (21st to 9th)	15.10	0.58	7.16	-5.25
Thailand (24th to 10th)	15.25	9.98	7.22	-1.06
China (36th to 31st)	7.08	7.73	9.64	-6.11

Source: Own calculations, WITS Software

India moved to 49th position among 72 countries and had 7.9% and 16.7% of exports' and imports' shares, respectively. Shares of export of machinery parts and components and finished goods did not change much as compared to 1988 (fall by 0.1 percentage points and rise by 0.3 percentage points, respectively). The imports of total machinery and machinery parts and components declined by 3.8 percentage points and 6.3 percentage points, respectively; while that of finished machinery increased by 2.5 percentage points.

Trade Shares of Intermediate and Finished Machinery: 2005

In 2005, among the selected 72 countries, SEA and EA countries dominated with very high shares of exports and with greater integration into GVCs. Other countries, particularly American and European countries also enjoyed high shares of exports of intermediate machinery. However, some of the prominent countries which were located on the extreme left side in 1999 have shifted towards right side, for instance, Costa Rica, UK, Switzerland and Canada (see Appendix Figures 2 and 3). Over the years, China has become the assembly hub for machinery with larger imports of parts and components and exports of finished machinery. Vietnam, India, South Africa, Cyprus, Norway, Sri Lanka, etc. had very low proportion of exports (Appendix Figure 3). Further, least integrated countries in GVCs were still Colombia, Russia, other SA countries, Chile, Ecuador, Venezuela, Guatemala, Peru and Paraguay with extremely low export shares.

India at the 46th position indicates that it had low participation in GVCs and its position did not seem to improve much as compared to earlier periods under the study. Its export share of machinery parts and components was only marginally higher (by 0.4 percentage points) than that of finished machinery. But, import share of finished machinery was comparatively higher (by 4.5 percentage points) than that of intermediate products. However, share of imports of total machinery exceeded exports by 11 percentage points. Thus, the trend in 2005 has been that there were more imports of finished machinery; further, in case of machinery parts and components, import shares exceeded export shares by 3.1 percentage points.

Moreover, India's total exports' share increased in 2005 by about 3 percentage points from 1999 and 1988; while imports' shares have increased by 5.7 percentage points and 1.9 percentage points, respectively (Table 4). Further, in 1988, shares of imports of parts and components were much higher than that of finished machinery; thereafter, the shares of latter picked up rapidly. This implies that India may have gained efficiency in production of some parts and components.

Table 4: Comparison of Shares of Exports and Imports of Finished and Intermediate Machinery of India (in percentage point terms)

Years	Exports: Parts & Components in Machinery Goods	Exports: Finished Machinery Goods	Imports: Parts & Components in Machinery Goods	Imports: Finished Machinery Goods
Comparison of 2005 with 1999	1.38	2.05	0.40	5.33
Comparison of 2005 with 1988	1.25	2.42	-5.90	7.80

Source: Own calculations, WITS Software

Trade Shares of Intermediate and Finished Machinery: 2012

Table 5 shows the top ten most integrated as well as ten least integrated countries into GVCs in 2012, where SEA and EA countries occupy first five positions (see Appendix Figure 4).

Romania, Mexico, China, Germany, Austria, US, France, Italy, Poland, etc. are also highly integrated countries. However, in 2012, less integrated countries are South Africa, Norway, Australia, Sri Lanka, Mauritius, United Arab Emirates (UAE) and Russia. Countries such as Chile, Peru, Guatemala, and many SA countries continue to be hardly integrated in GVCs.

Table 5: Top Ten Integrated and Ten Least Integrated Countries in GVCs in 2012: Export and Import Shares of Intermediate and Finished Machinery (%)

Country	**Exports: Parts & Components in Machinery Goods**	**Exports: Finished Machinery**	**Imports: Parts & Components in Machinery Goods**	**Imports: Finished Machinery**
MOST INTEGRATED COUNTRIES				
Philippines	45.92	17.97	31.21	12.22
Hong Kong	41.71	19.80	38.28	20.39
Singapore	36.94	13.34	31.59	12.58
Japan	32.49	32.90	11.45	13.43
Korea	32.45	27.03	17.42	11.02
Hungary	27.46	27.78	28.65	14.61
Malta	26.84	4.99	14.77	12.03
Czech Republic	26.58	30.37	26.22	18.36
Malaysia	26.38	15.51	31.30	15.83
Costa Rica	25.96	13.62	20.17	18.69
LEAST INTEGRATED COUNTRIES				
Nepal 2011	0.76	0.64	4.96	14.81
Saudi Arabia	0.62	0.97	14.23	31.51
Guatemala	0.59	2.52	7.28	16.63
Iran 2011	0.54	0.58	12.34	17.71
Peru	0.48	0.54	10.52	27.98
Ecuador	0.40	2.65	10.48	23.35
Paraguay	0.29	0.79	6.73	32.43
Venezuela	0.08	0.44	15.18	28.05
Bolivia	0.07	0.13	9.74	26.97
Bhutan 2011	0.01	15.88	9.64	27.31

Source: Own calculations, WITS Software

However, export shares of machinery parts for most of the highly integrated countries have declined in 2012 from 2005 level; but they are still maintaining more or less similar positions due to their already much developed supply chains in machinery industry. These countries include Philippines, Singapore, Malta, Hungary and Malaysia. Their costs of production of machinery goods, particularly inputs, may be very low owing to extensive use of economies of scale. Moreover, this also shows growing participation of developing countries in GVCs. Secondly, from 1988-95 to 2012, there has been drastic fall in shares of prominent countries

like US, UK and Canada. However, in these countries, there has been fall in import shares of finished machinery, accompanied with rise in export shares for many countries (Table 6).

Table 6: Export and Import Shares of Intermediate and Finished Machinery: Changes from 1988-95 to 2012 (in percentage point terms)

Country	Exports: Parts & Components in Machinery Goods	Exports: Finished Machinery Goods	Imports: Parts & Components in Machinery Goods	Imports: Finished Machinery Goods
USA	-7.55	-5.51	-2.78	-1.73
UK	-8.37	-4.39	-7.78	-5.92
Canada	-6.03	-5.61	-9.36	-2.02
Hungary	13.49	19.08	16.55	-5.90
Korea	20.20	-2.43	-3.52	-6.95
Czech Republic	14.65	14.59	12.00	-7.58
Mexico	10.30	21.10	17.94	-4.56
China	14.65	17.84	10.60	-10.23
Costa Rica	23.60	12.44	10.91	-3.80
Indonesia	5.48	5.96	-1.80	-3.66

Source: Own calculations, WITS Software

In 2012, India's share of exports and imports of finished machinery exceeded that of intermediate products by 1.2 percentage points and 0.9 percentage points, respectively (this gap reduced more in case of imports as compared to 2005). Table 7 shows the changes in India's trade shares of intermediate and finished machinery from 1988 and 2005 to 2012.

Table 7: Comparison of Shares of Exports and Imports of Finished and Intermediate Machinery of India (in percentage point terms)

Country	Exports: Parts & Components in Machinery Goods	Exports: Finished Machinery Goods	Imports: Parts & Components in Machinery Goods	Imports: Finished Machinery Goods
Comparison of 2012 with 2005	0.82	2.39	-0.57	-4.11
Comparison of 2012 with 1988	2.07	4.81	-6.47	3.69

Source: Own calculations, WITS Software

There has been rise in India's exports shares, while decline in import shares. India may have achieved more self-sufficiency in production of intermediate as well as some finished machinery. However, this also reflects a shift in trend towards exports of finished machinery. It is to be noted that the trade in intermediate goods is also gradually rising and may soon catch up with trade in finished machinery goods. Also, in terms of relative positions, India

moved from 46th position in 2005 to 44thin 2012 (among 72 countries). Thus, all this indicates low but steadily rising integration level of Indian machinery industry in GVCs.

2.2 Trade Shares for Indian Machinery

The trade shares of each machinery product within HS 84-92 are calculated for 1988, 1999, 2005 and 2012 (Table 8). In all the years, the share of India's machinery industry in its total exports to the world has been lower than its share in total imports from the world. However, in 1988, the gap between the two was around 12 percentage points; but this declined to about 3 percentage points in 2012.

The export shares of Indian machinery industry in Indian export basket have increased rapidly after 1999 and became double in 2012 of that of 1988 level. HS 84 (general machinery), HS 85 (electric machinery) and HS 87 (automotive) had highest exports shares in 1988. This trend continued in later years with increased shares, except slight decline in the shares of HS 84 in 2012. Export shares have increased even for HS 89 and HS 90. This can be attributed to the rise of many component suppliers in the country in this industry and greater incentives of government to boost exports of Indian capital goods.

Table 8: Shares of Indian Machinery Industry in Total Exports to and Total Imports from World (in percentage terms)

Year With Trade Flows	**1988**		**1999**		**2005**		**2012**	
Code	**Exp.**	**Imp.**	**Exp.**	**Imp.**	**Exp.**	**Imp.**	**Exp.**	**Imp.**
84	3.51	9.41	2.70	7.80	4.05	9.14	3.82	7.50
85	1.79	5.94	2.36	4.60	2.63	7.86	3.71	5.96
86	0.11	0.35	0.02	0.07	0.03	0.10	0.05	0.08
87	1.63	1.24	1.89	0.89	3.19	0.71	4.21	1.02
88	0.07	0.62	0.08	0.19	0.06	1.39	0.61	0.42
89	0.00	0.45	0.22	1.15	0.65	1.32	1.42	1.26
90	0.55	2.32	0.55	1.88	0.68	1.82	0.70	1.41
91	0.00	0.14	0.10	0.08	0.06	0.05	0.03	0.06
92	0.04	0.00	0.02	0.01	0.01	0.01	0.01	0.01
HS 84-92	**7.70**	**20.49**	**7.93**	**16.66**	**11.36**	**22.39**	**14.57**	**17.71**

Source: Own calculations [**Exp. – Export Shares; Imp. – Import Shares]**

On the other hand, the imports shares declined from 1988 to 2012 (although revived in 2005). These shares were comparatively higher than of exports shares for almost all the products except HS 87. In 1988 and 2012, products with highest imports shares have been HS 84 and HS 85. Other prominent products for imports by India are ships and boats, and optical, medical apparatus, and also auto products.

Secondly, trade shares of India are calculated for years 1988 and 2012 with respect to the selected countries of SEA, EA and SA regions, as gathered from previous section (Table 9).

It is found that shares of India's exports to the EA countries have been very low in comparison with SA and SEA countries[14]. In 1988 and 2012, Sri Lanka and selected SEA countries have been obtaining increased number of machinery goods from India. But as SEA countries have moved up to more hi-tech and sophisticated machines, so they might be importing parts or low-value machinery from India. Further, India's export share continues to be significant with Bangladesh even in 2012, but it increased tremendously with Bhutan. There are some rising shares with EA as well. In 2012, India's export shares are particularly higher in case of HS 84 and HS 87 with many countries, followed by HS 85.

On the other hand, India has very low import shares with SA countries. But with EA and SEA countries, India's import shares have been very high particularly in 2012. Over the period 1988-2012, these shares have increased tremendously for Philippines (by 75 percentage points), China (by 47 percentage points), Thailand (39 percentage points), and Malaysia (22 percentage points). In 2012, the main products for imports by India are mostly HS 84, HS 85 and even HS 87, and in some cases HS 89 and HS 90 as well.

[14] It is important to note that the India's bilateral total trade shares may be very high with many countries, but the high or significant shares might be present only for few commodities, for example, India's exports shares with Sri Lanka in 1988 was 36.5%, but the large share of 28% was in case of HS 87 only and 6% in case of HS 84; however, there were hardly any share present in case of other commodities (see Table 9).

Table 9: Trade Shares of Indian Machinery Industry with Selected Countries of SA, EA and SEA

Year	Product Codes	84	85	86	87	88	89	90	91	92	Total	84	85	86	87	88	89	90	91	92	Total
	Countries/ Trade Flows	Exp.	Exp.	Exp.	Exp.	Exp.	Exp.	Exp.	Exp.	Exp.	Exp.	Imp.	Imp.	Imp.	Imp.	Imp.	Imp.	Imp.	Imp.	Imp.	Imp.
1988	Bangladesh*	11.89	2.02	0.28	7.80			0.30	0.01		**22.29**										
	Bhutan*																				
	Pakistan	0.70	14.05		0.68			0.20			**15.62**										
	Sri Lanka	6.20	1.83	0.18	27.98		0.01	0.29	0.00	0.01	**36.51**	0.17	0.04		0.02						**0.24**
	China	3.83	0.40								**4.23**	1.14	0.62		0.01			0.44	0.15		**2.37**
	Hong Kong	0.58	1.10		0.14	0.00	0.00	0.04	0.01	0.00	**1.87**	11.00	22.25		0.05	0.10		2.62	4.82	0.00	**40.85**
	Japan	0.23	0.04	0.00	0.03	0.00		0.03		0.18	**0.52**	15.14	17.27	1.63	9.74	0.01	0.60	5.00	0.48	0.00	**49.88**
	Republic of Korea	0.52	0.61	0.04	0.11			0.15		0.31	**1.73**	3.59	21.12	1.07	0.04		0.40	1.46	0.14	0.13	**27.95**
	Malaysia	6.60	2.95	0.38	8.27	0.01		0.58		0.01	**18.79**	0.33	0.40		0.01			0.11	0.00		**0.85**
	Philippines	7.67	3.61		5.45			0.63		0.01	**17.37**	0.11	2.49								**2.60**
	Singapore	9.15	3.94	0.00	3.81	0.28	0.01	0.20	0.00	0.09	**17.47**	21.22	32.28	0.01	0.40	0.68	2.06	1.77	0.04	0.01	**58.45**
	Thailand	7.89	1.17		1.97			0.11	0.00		**11.14**	0.39	0.46		0.02	0.05		0.09	0.02		**1.02**
2012	Bangladesh*	5.54	2.38	0.01	8.36	0.00	0.04	0.56	0.02	0.00	**16.91**	0.95	0.84		0.06	0.00		0.09	0.00		**1.95**
	Bhutan*	8.45	8.08	0.07	11.70	0.00		0.41	0.00		**28.72**	0.00	0.03								**0.03**
	Pakistan	1.46	0.34		0.01	0.01		0.17	0.02		**2.00**	1.58	0.88	0.00	0.17	0.00		1.40	0.01	0.00	**4.03**
	Sri Lanka	4.35	2.76	1.05	16.75	0.02	6.71	0.44	0.03	0.01	**32.10**	5.42	5.85	0.01	0.88	0.17	18.38	0.36	0.04		**31.10**
	China	2.73	1.70	0.01	0.60	0.07	0.08	0.93	0.00	0.00	**6.12**	19.60	23.51	0.13	1.91	0.11	1.28	2.02	0.11	0.04	**48.72**
	Hong Kong	0.31	1.89	0.00	0.02	0.35	0.28	0.15	0.09	0.00	**3.10**	2.18	6.73	0.00	0.17	0.10	0.61	0.97	0.81	0.00	**11.57**
	Japan	2.26	1.68	0.01	1.69	1.17	0.00	0.69	0.00	0.02	**7.52**	29.10	10.80	0.19	4.75	0.23	5.07	4.90	0.06	0.01	**55.12**
	Republic of Korea	2.46	1.53	0.01	0.66	0.01	0.00	0.33	0.00	0.08	**5.08**	15.34	10.46	0.23	5.51	0.07	8.82	1.99	0.02	0.01	**42.43**
	Malaysia	4.80	3.62	0.05	2.29	0.26	5.49	2.45	0.00	0.00	**18.97**	8.79	11.69	0.01	0.19	0.04	1.53	0.77	0.01	0.00	**23.04**
	Philippines	5.08	4.98	0.00	14.07	0.39		0.69	0.10	0.01	**25.32**	20.41	41.33	0.04	12.29	0.22	0.05	3.12	0.39		**77.84**
	Singapore	2.73	1.63	0.06	2.70	0.99	10.46	1.88	0.06	0.00	**20.52**	12.68	14.38	0.01	0.20	0.53	11.89	4.54	0.04	0.00	**44.26**
	Thailand	10.21	2.12	0.00	8.21	0.36	0.09	0.75	0.01	0.00	**21.76**	23.92	9.57	0.02	5.01	0.22	0.60	1.51	0.02	0.01	**40.88**

Source: Own calculations [**Exp. – Export Shares; Imp. – Import Shares; in percentage terms**] (**Note**: * refers to LDCs)

2.3 Vertical Specialization Index

In previous sections, the focus has been on the shares of machinery parts and components/intermediate goods that are imported into and exported by India. But, within in global production chains, several of these imported parts are used for manufacturing finished goods for exporting to other countries. As a result, a country is able to develop links with various other value chains spread worldwide. Accordingly, this paper uses 'Vertical Specialisation Index', as put forward by Hummels et al. (2001) (as cited in De Backer and Yamano, 2012), to measure import content (capturing direct and indirect imported inputs) that is embodied in India's exports of machinery goods. Index for a country *i* is calculated as:

$$VS1_i = u * Am_i * [I-Ad_i]^{(-1)} * X_i/\sum X_i$$

Am_i and Ad_i are the input-output coefficients of country *i* for imported and domestic transactions respectively; u is 1 x n vector whose each component is unity; matrix X_i is nx1 vector of exports of country *i* and $\sum X_i$ is country *i*'s total exports (De Backer and Yamano, 2012) and here, *i* would not only refer to India as a country, but also to Industry. India's Input-Output Tables (IOT) of 1993-94, 1998-99, 2003-04 and 2007-08 (as obtained from Ministry of Statistics and Programme Implementation, Government of India) are used for calculation of VSI_{India} (VSI for India) and $VSI_{Indiamach}$ (VSI for Indian Machinery Industry). The earlier tables of 1993-94 and 1998-99 contain 115 sectors (IOT sector-wise classification for machinery industry is 78-97[15]), while latest tables contain 130 sectors (machinery industry covers IOT No. 83-102 and 104[16]).

[15] Sector No.98 which is 'Miscellaneous Manufacturing' also has some components of machinery industry, but as they include products from many other industries, that is why this No. is excluded from machinery industry's classification. Description of each IOT sector No.: 78 – Tractors and Other Agricultural Implements; 79 – Industrial Machinery for food and textile industries; 80 – Industrial Machinery (others); 81 – Machine Tools; 82 – Office Computing Machines; 83 – Other Non-Electrical Machinery; 84 – Electrical Industrial Machinery; 85 – Electrical Wires & Cables; 86 – Batteries; 87 – Electrical Appliances; 88 – Communication Equipments; 89 – Other Electrical Machinery; 90 – Electronic Equipment including TV; 91 – Ships and Boats; 92 – Rail Equipments; 93 – Motor Vehicles; 94 – Motor Cycles and Scooters; 95 – Bicycles, Cycle-rickshaw; 96 – Other Transport Equipment; and 97 – Watches and Clocks (for details, see the link: http://mospi.nic.in/Mospi_New/upload/nad_iott_1998_99/appendix%203.pdf). *HS 84 corresponds to IOT Sector No.78-83; HS 85 corresponds to IOT sectors No.84-90; HS 86-89 corresponds to sector No.91-96; HS 87 links to No.93-95; and HS 90-92 corresponds to IOT sector No. 97.*

[16] Sector No.105 which is 'Miscellaneous Manufacturing' is excluded from machinery industry's classification. Description of each IOT sector No.: 83 – Tractors and Other Agricultural Implements; 84 – Industrial Machinery for food and textile industries; 85 – Industrial Machinery (except food and textile); 86 – Machine Tools; 87 – Other Non-Electrical Machinery; 88 – Electrical Industrial Machinery; 89 – Electrical Cables, Wires; 90 – Batteries; 91 – Electrical Appliances; 92 – Communication Equipment; 93 – Other Electrical Machinery; 94 – Electronic Equipment including TV; 95 – Ships and Boats; 96 – Rail Equipments; 97 – Motor Vehicles; 98 – Motor Cycles and Scooters; 99 – Bicycles, Cycle-rickshaw; 100 – Other Transport Equipment; 101 – Watches and Clocks; 102 – Medical, Precision, Optical Instruments; 104 – Aircrafts and Spacecrafts (for details on 2007-08, see the link: http://mospi.nic.in/Mospi_New/upload/iott_2007-08/Appendix%203.pdf). *HS 84 corresponds to IOT Sector No.83-87; HS 85 corresponds to sectors No.88-94; HS 86-89 matches IOT sectors No.95-100 and 104; HS 87 links to No.97-99; and HS 90-92 corresponds to IOT sector No. 101-102.*

VSI_{India} is less at about 21% in 2007-08, but it was much lower in earlier years (11% in 1993-94 and 16% in 2003-04). That is, there has been low usage of imported content in Indian exports. $VSI_{Indiamach}$ was quite low in 1993-94 at 16% and it increased slightly in 2003-04. The usage of domestic content in exports was high around 80% (Table 10). But, in 2007-08, this index increased to 38%.

Table 10: Calculation of $VSI_{Indiamach}$ from India's Input-Output Tables

Years	VSI (Import Content of Exports)	1-VSI (Domestic Content of Exports)
1993-94	16%	84%
1998-99	18%	82%
2003-04	20%	80%
2007-08	38%	62%

Source: Own Calculations

However, usage of domestic value addition of about 62% is still significant, which indicates that several machinery parts and components are being domestically produced and sourced for producing the exportables. At the same time, Indian machinery industry imports considerable vertical trade and its links in production chains are connected with other countries as well. VSI is also calculated for various types of machinery (Table 11). In 1993-94, it was just 9-11% for transport and precision machinery. General and electric machinery had used reasonable import content in their exports. In 2003-04, the index has shown good improvements in these products. Domestic value addition was high at 80% and above.

Table 11: Calculation of $VSI_{Indiamach}$ for Types of Machinery

Types of Machinery	1993-94		1998-99		2003-04		2007-08	
	VSI	1-VSI	VSI	1-VSI	VSI	1-VSI	VSI	1-VSI
General Machinery	18%	82%	17%	83%	20%	80%	31%	69%
Electric Machinery	18%	82%	20%	80%	24%	76%	34%	66%
Transport Machinery	11%	89%	15%	85%	17%	83%	50%	50%
Automotives	11%	89%	15%	85%	16%	84%	28%	72%
Precision Machinery	9%	91%	17%	83%	15%	85%	24%	76%

Source: Own Calculations

In 2007-08, the exports of Indian machinery goods had the highest import content for transportation machinery, whose VSI increased by 39 percentage points from 1993-94. There has been major contribution from automotives as well. Significant and higher VSI is found in case of general and electric machinery. It can be concluded that India has rising vertical trade in machinery goods, particularly since mid-2000s.

3. Integration Level in HS 84, HS 85 and HS 87

As per trade shares and VSI, the major products of India are HS 84, HS 85 and HS 87, and their integration is separately assessed with respect to other countries.

General Machinery (HS 84)

The export shares of general machinery parts and components have increased rapidly from 1988-95 to 2012 for many countries among 72 countries (Table 12 shows top ten countries).

Table 12: Top Ten Countries as per Highest Rise in Export Share of Intermediate General Machinery (1988-95 to 2012) [in % terms]

Country	**1988-95**	**1999**	**2005**	**2012**	*Changes in Export Shares (1988-95 to 2012): in percentage points*
Hungary	3.78	17.94	15.76	12.34	8.56
Poland	2.95	4.54	8.24	7.17	4.22
Hong Kong	4.62	6.21	10.69	8.79	4.17
Czech Republic	5.74	8.54	10.37	9.76	4.01
China	2.17	4.03	6.50	5.84	3.67
Korea	2.14	4.52	5.98	5.35	3.21
Slovak Republic	4.33	5.26	6.70	7.34	3.02
Finland	4.25	4.70	6.01	6.92	2.67
Turkey	1.06	2.42	3.32	3.63	2.57
Malaysia	1.92	13.82	7.83	4.46	2.54

Source: Own Calculations, WITS Software

However, in 1988-95, the most integrated countries in GVCs for HS 84 (see Appendix Figures 5-8) were mainly European like Austria, Ireland, UK, Italy, Sweden, Germany and Switzerland; US; Japan; and Singapore. Japan who triggered the development of GVCs had very high export shares of total general machinery goods of 29.9% (with 8.9% as export shares in parts and components), while its import share was very low (4.9%). But in later years, its export shares of intermediate machinery have risen only by 2.4 percentage points. Further in 1999, Costa Rica and Hungary occupied the top most position from lower levels in earlier time-period. In 2012, Hungary, Japan, Italy, Austria, UK, Czech Republic, Germany Singapore, Hong Kong, Sweden, etc. are the most integrated countries. Further, China, Thailand, Korea and Malaysia were placed towards middle of the graph in 1988-95 period (see Appendix Figure 5), but their shares have increased rapidly over the years.

On the other hand, the least integrated countries for general machinery in GVCs have been SA countries like Bangladesh, Nepal, Bhutan; Saudi Arabia, Venezuela, Peru, Ecuador, Honduras, Guatemala, etc. However, those countries are listed in Table 13 where export share of machinery parts and components in the category of HS 84 declined over the years.

Table 13: Countries as per Declining Export Share of Intermediate General Machinery (1988-95 to 2012) [in % terms]

Country	**1988-95**	**1999**	**2005**	**2012**	*Changes in Export Shares (1988-95 to 2012)*
Philippines*		7.51	9.69	6.20	-1.31
Argentina	2.84	2.17	1.70	1.47	-1.38
Brazil	4.94	5.22	4.94	3.33	-1.61
Austria	12.13	11.13	9.92	10.06	-2.06
Nepal	2.15	0.00		0.09	-2.07
Vietnam*		3.62	2.11	1.41	-2.20
Switzerland	8.51	8.54	7.41	5.89	-2.62
Malta	3.77	2.06	3.18	1.07	-2.70
United States	10.97	11.81	11.55	8.20	-2.78
Estonia	6.42	2.04	2.71	2.67	-3.75
Ireland	11.73	10.34	5.78	3.00	-8.73

Source: Own Calculations, WITS (***Note:*** * indicates that the changes are from 1999)

In 1988, India was placed at the 40th position among 65 countries (as compared to 37th position in case of HS 84-92) with 3.5%, 1.8%, 9.4% and 6.6% shares of exports of total general machinery goods, of intermediate goods, shares of imports of total goods and of intermediate goods, respectively. However, in terms of export share of intermediate machinery, its position declined to 50th among 72 countries in 1999, but this had improved a lot in 2005 with position of 41st; thereafter again declined to 42nd in 2012. Over these years, India's export shares of intermediate general machinery increased only by 0.75 percentage points. Thus, India's participation in GVCs for HS 84 remained low. However, India's export shares of general machinery parts and components accounted for about 40% of India's export shares of entire machinery parts and components in both 1988 and 2012.

Electric Machinery (HS 85)

Malta's high integration in GVCs has been mainly due to the large export shares in total electric machinery goods as well as its parts and components, i.e., of 58.1% and 55.8%, respectively, in 1988-95 period. Very high integration of Philippines is also due to very high shares in electric machinery (see Appendix Figures 9-12).

In 1988-95, other highly integrated countries for HS 85 were Singapore, Japan, Hong Kong, Israel, US, Hungary, Austria, UK, Thailand, etc. China only had 3.3% export share of

intermediate goods. SA countries had extremely low shares, along with Chile, Peru, Honduras, etc. In 1999, export shares of electric machinery for many countries have increased with Malta, Philippines, Singapore, Malaysia, Korea, Japan, Hong Kong, and Thailand as the most integrated countries. China's total export shares had also increased by almost 7 percentage points and its position improved. Similarly, in 2005 and 2012, SEA and EA regions are more integrated into GVCs. Table 14 lists out top ten countries whose shares in intermediate electric machinery have increased rapidly from 1988-95 to 2012.

Table 14: Top Ten Countries as per Highest Rise in Export Share of Intermediate Electric Machinery (1988-95 to 2012) [in % terms]

Country	**1988**	**1999**	**2005**	**2012**	*Changes in Shares from 1988-95 to 2012*
Costa Rica	2.09	4.06	17.76	24.18	22.09
Hong Kong	8.97	13.89	24.92	30.43	21.46
Honduras	0.11	0.60	0.92	11.00	10.89
Singapore	13.56	27.36	29.84	24.07	10.51
Morocco	2.78	9.91	14.02	12.90	10.12
Romania	1.34	0.43	7.80	11.40	10.07
China	3.30	7.65	9.90	11.30	8.01
Korea	9.15	19.35	17.19	16.70	7.55
Mexico	1.65	14.43	11.73	8.97	7.32
Bulgaria*		1.89	3.64	5.19	3.30

Source: Own Calculations, WITS Software (***Note:*** * indicates that the changes are from 1999)

For India, in 1988-95, the shares of exports of total electric machinery goods and of intermediate goods were 1.7% and 1.3%, respectively. These were lower than their respective imports shares of 5.9% and 5.1%, and India held 39th position among 65 countries. Its position worsened from 47th position in 1999 to 49th position in 2005, but this improved in 2012 to 47th position (among 72 countries). There is only a slight rise in India's export shares of electric machinery parts and components from 1988-95 to 2012 by 0.38 percentage points. At the same time, their proportion in exports of total machinery parts and components has also declined from 29% in 1988 to 26% in 2005 and 2012.

Thus, India's electric machinery industry is less integrated into GVCs as compared to general machinery, whose export shares of parts and components are just more by 1 percentage points than latter in 2012. In case of HS 84, the trend has been that export shares of intermediate goods are slightly higher than that of finished machinery goods in all the years; but this was true till 2005 in case of HS 85. Initially, the import shares of general and electric intermediate inputs were much higher than that of their finished machinery, but by 2012, they were almost on similar level.

Automotive (HS 87)

In 1988-95, Canada, Spain, France, Romania, Japan, Sweden, US, Hungary, Germany, etc. were most integrated in GVCs of auto machinery (Appendix Figures 13-16). India was also located more towards left side of Appendix Figure 13, but with lesser shares. In fact, most of the countries had very low shares in HS 87 as compared to their shares in HS 84 and HS 85. Hong Kong, Singapore, Korea, China, Thailand, etc. had very low exports of auto parts and components. Indonesia and SA countries were least integrated with insignificant export shares; however, their imports were also low as compared to HS 84 and HS 85. In 1999 also, Latin American and many European countries dominated, along with Japan. Rest all other SEA and EA countries, namely Philippines, Korea, Indonesia, Thailand, Singapore, Indonesia, Malaysia, India, etc. had lower export shares of intermediate machinery. The situation remained somewhat similar in 2005 and 2012. On the whole, Asian countries have much lower integration in GVCs in terms of HS 87; although some good trade shares exist for Japan, Korea, Philippines, Thailand, India and China. Table 15 highlights the top countries with maximum rise in export shares of auto components from1988-95 to 2012.

Table 15: Top Ten Countries as per Highest Rise in Export Share of Auto Components (1988-95 to 2012) [in % terms]

Country	**1988-95**	**1999**	**2005**	**2012**	*Changes in Shares from 1988-95 to 2012*
Czech Republic	1.60	5.75	7.24	6.86	5.25
Poland	0.48	2.21	4.44	5.01	4.53
Slovak Republic	2.14	4.49	5.94	6.48	4.34
Korea	0.39	1.24	2.77	4.16	3.77
Mexico	1.60	3.80	4.61	5.19	3.59
Thailand	0.20	0.93	2.34	2.85	2.65
Portugal	1.43	2.39	4.24	4.07	2.64
Romania	4.01	0.16	3.33	6.48	2.47
Philippines*		1.34	3.41	3.55	2.21
Turkey	0.47	1.51	2.09	2.37	1.90

Source: Own Calculations, WITS Software (***Note:*** * indicates that changes are from 1999)

India with export shares of 1.6% and 1.1% of total automotive goods and of auto parts and components in 1988 was at 24th position among 65 countries and it has remained more or less in a similar position even in 1999 (27th position among 72 countries). In 2005, India's position declined to 29th among 72 countries, but exports shares of total automobile goods have increased considerably to 3.2%, where shares of parts and components were 1.3%, while that of finished goods had increased to 1.8%. All these shares increased further as 4.2%, 1.4% and 2.7%, respectively, and India's position improved to 28th in 2012. However, exports shares have been higher than that of imports, mainly due to greater rise in exports

shares of finished auto goods. In contrast, the auto parts and components have been imported more as compared to finished automotive. Moreover, in all the years, India has been ahead of China, even after substantial improvement in China's position from 41st position in 1992 to 29th position in 2012. Secondly, export shares of intermediate machinery in 2012 and rise in these shares from 1988-95 to 2012 have been higher in case of general and electric machinery as compared to automobile machinery (rise of only 0.30 percentage points) (Table 16).

Table 16: Comparison of India's Export Shares of Intermediate Machinery over the period 1988-2012: HS 87, HS 84 and HS 85 (%)

Product Codes	1988	1999	2005	2012
HS 87	1.13	1.15	1.36	1.44
HS 84	1.87	1.88	2.77	2.63
HS 85	1.36	1.28	1.51	1.74

Source: Own Calculations, WITS Software

To summarize, India's exports shares have been rising for general, electric and auto machineries, especially the shares of machinery parts and components which have exceeded finished goods in all the years in case of HS 84. Thus, it can be concluded that despite some improvements in all the product categories, there has not been any major change in the export shares and the linkages of Indian machinery industry into GVCs, which is still not very high.

4. India's Intra-Industry Trade (IIT)

Another way to assess integration of machinery industry into GVCs is through measurement of intra-industry trade (IIT) using the standard tool of 'Grubel-Lloyd Index (GLI)'. The index measure IIT as that percentage of country's total trade which is balanced, that is, exports equal imports. The value of index lies between 0 (no IIT – trade is one-way) and 100 (complete IIT). According to the original version of GLI, for an individual product group or industry *i*, GL Index is calculated as: $\mathbf{GLI_i = [(X_i + M_i) - |X_i - M_i|].100/ (X_i + M_i),}$ where X_i= exports of industry *i*; and M_i= imports of industry *i* (here *i* is taken for different products of India's machinery industry). Formula $\mathbf{GLI_j = \{[(\sum(X_i + M_i) - \sum|Xi - M_i|)].100 / \sum(X_i + M_i)\}}$ refers to the average level of IIT for a country *j*, where i is the *i*th of n industries ($\mathbf{GLI_{India}}$).

IIT is measured by using trade data from WITS (both at aggregate and disaggregate level) and then by using data from India's Input-Output tables.

4.1 IIT for 2-digit Level Products

In 1988, GLI for India's machinery industry was quite significant at 42%. It rose to 50% in 2000 and further to 54% in 2012 (rise by 12 percentage points from 1988 to 2012). Thus, more than half of the trade in this industry is intra-industry trade (Table 17).

Table 17: Values of GLI_i for HS 84-92

↓Product Code/ Years→	1988	1996	2000	2005	2012
84	42	39	45	48	46
85	35	70	60	39	54
86	36	23	32	32	52
87	97	78	63	47	58
88	14	3	60	6	93
89	0	27	16	52	80
90	29	31	42	42	46
91	5	98	89	91	43
92	23	60	58	97	79
GLI_{India}	**42**	**49**	**50**	**43**	**54**

Source: Own Calculations

IIT has increased in almost all the products, except HS 87 where it declined by 39 percentage points from 1988 to 2012. The precision machinery and the transportation machinery have substantial and rising IIT, more particularly in case of HS 88 (aircrafts and parts), HS 89 (ships and floating structures) and HS 92 (musical instruments). IIT in general and electric machinery have also increased. On the whole, there exists considerable IIT in India's machinery industry, but it is still lower than other developing Asian countries (for instance, in 2009, Thailand had 84% of IIT, China had 79% and Malaysia had 86% with large trade surplus; as estimated by Gupta, 2012).

Estimations for 2012 in previous sections show India's export shares of machinery parts and components as 6.7%, where 5.8% is contributed by 4-digit level inputs (as per the list of classification of machinery parts and components); while only 0.8% by 6-digit level components[17]. Hence, there is larger contribution of 4-digit level parts and components into the total exports shares of machinery parts and components. Moreover, at 6-digit level, there are no intermediate inputs identified from HS 86, HS 88, HS 91 and HS 92. All these are included in the classification of 4-digit level parts and components. Accordingly, disaggregated product level of 4-digit inputs is used for further analysis of IIT.

4.2 IIT for 4-digit Level Machinery Parts

The table 18 lists the top five Indian machinery parts and components at 4-digit level based on highest GLI values in each of the selected year during 1988-2012.

[17]It is to be noted that many 4-digit level parts and components do not include some of the 6-digit level parts (see parts and components classification given in Footnote 4); so there is no overlap between them. Both of these levels give different sum. Further, in 2012, individual product category-wise, at 6-digit level, the shares are 0.4% for HS 84, 0.3% for HS 85, 0.01% for HS 86-89, 0.08% for HS 90-92 and 0.01% for HS 87.While at 4-digit level, their respective shares are 2.2%, 1.4%, 2.1%, 0.2% and 1.4%.

Table 18: Top Five 4-digit Machinery Parts for years 1988, 1996, 2000, 2005 and 2012

1988		1996	
HS Code	**Description**	**HS Code**	**Description**
8535	Electrical apparatus for switching electrical circuits (exceeding 1000 volts)	8407	Spark-ignition internal combustion piston engines
8714	Parts/ accessories of vehicles of 87.11-87.13 [motorcycles, bicycles, carriages for disabled]	8507	Electric accumulators, including separators
8409	Parts suitable for use with piston engines	8505	Electro-magnets
8546	Electrical insulators of any material	9003	Frames for spectacles, goggles and parts thereof
9001	Optical fibres and optical fibre bundles/ cables	8408	Compression-ignition internal combustion piston engines
Range of GLI in 1988 and 1996: 90-96			

2000		2005		2012	
HS Code	**Description**	**HS Code**	**Description**	**HS Code**	**Description**
8512	Electrical signalling equipment used for vehicle	8481	Taps, valves for pipes, boiler shells, etc	8511	Electrical ignition or starting equipment used for internal combustion engines
9112	Clock cases and parts	8505	Electro-magnets; permanent magnets	8708	Parts of motor vehicles 87.01-87.05
8708	Parts of motor vehicles 87.01-87.05 (tractors, motor vehicles for transport of persons and goods, special purpose vehicles)	8512	Electrical signalling equipment for vehicle	8484	Gaskets and similar joints of metal sheeting
8466	Parts and accessories for use with machine-tools	8708	Parts of motor vehicles 87.01-87.05	8535	Electrical apparatus for switching electrical circuits
8803	Parts of balloons, gliders, aircrafts, spacecrafts	8466	Parts for use with machine-tools	9114	Other clock or watch parts
GLI Range in 2000 and 2005: 85-94				***GLI Range: 93-99***	

Source: Own Calculations, WITS software

Indian machinery parts and components with highest IIT with the world mainly belong to the categories of electric machinery and automotive. These are followed by parts from general machinery and watches and clocks as well.

However, for selected machinery products in 2012, India's IIT is much better than that of other prominent Asian countries like Japan, Malaysia and Philippines (Table 19). Except electrical parts, China has almost similar IIT as India. SA countries like Sri Lanka and Nepal have almost negligible IIT in five products.

Table 19: India's IIT and IIT of other Asian countries for Top Machinery Parts in 2012 (%)

Product Code	India	China	Japan	Sri Lanka	Malaysia	Philippines	Nepal
HS 8511	99	68	18	4	53	29	
HS 8708	99	98	30	20	58	48	1
HS 8484	99	99	37	1	55	43	
HS 8535	98	78	44	13	30	89	
HS 9114	93	99	83		97	24	

Source: Own Calculations, WITS software

Secondly, over the entire period 1988 to 2012, IIT has increased for majority of the machinery parts and components. Table 20 mentions top ten such parts. That is, IIT has risen tremendously over the years for the parts and components belonging to the general machinery and mainly the precision machinery (i.e., HS 91 and HS 92).

Table 20: Top Ten 4-digit Machinery Components with Highest Percentage Rise in GLI (1988-2012) [%]

HS Code	Description	GLI 1988	GLI 2012
9114	Other clock or watch parts	1	93
9033	Parts and accessories for machines, appliances, apparatus of Chapter 90, nec	2	80
8411	Turbo-jets, turbo-propellers and other gas turbines	1	30
8482	Ball or roller bearings	2	55
9014	Direction finding compasses; other navigational instruments	2	37
8431	Parts suitable for use with construction equipment machinery	4	62
9111	Watch cases and parts	1	13
8416	Furnace burners for liquid fuel, for pulverised solid fuel or for gas; and mechanical stokers	2	23
8483	Transmission shafts and cranks; gears	6	68
9112	Clock cases and and parts	6	67

Source: Own Calculations, WITS software

Out of these, two inputs are very prominent as their IIT has not only increased in the 1988-2012 period, but also in the decade of 2000, that is from 2000 to 2012 (as highlighted in the

Table 21). This table also mentions other top eight machinery parts where IIT has risen tremendously during 2000-2012 (parts are mainly from transport machinery).

Table 21: Top Ten 4-digit Machinery Components with Highest Percentage Rise in GLI (2000-2012) [%]

HS Code	Description	GLI 2000	GLI 2012
8805	Aircraft launching gear; ground flying trainers; and parts	1	92
8410	Hydraulic turbines, water wheels, and regulators	10	64
8538	Parts for use with electric apparatus of heading Nos. 85.35-85.37	14	84
8714	Parts and accessories of vehicles of 87.11-87.13 [motorcycles, bicycles, carriages for disabled]	17	84
8706	Chassis fitted with engines for motor vehicles	3	14
8406	Steam turbines and other vapour turbines	5	22
9033	Parts and accessories for machines of Chapter 90	23	80
8537	Boards, panels, desks, cabinets, etc., equipped with electric apparatuses, for electric control	27	86
8431	Parts for use with machinery of headings Nos. 84.25 to 84.30	21	62
9209	Parts (mechanisms for musical boxes) and accessories (discs and rolls for mechanical instruments) of musical instruments	26	75

Source: Own Calculations, WITS software

However, there are some machinery parts and components of India whose IIT has declined rapidly from 1988 to 2012. Table 22 lists out such top 10 inputs. These largely include parts from HS 90 and HS 85 (also few parts of HS 84).

Table 22: 4-digit Machinery Components with Highest Percentage Fall in GLI (1988-2012)

HS Code	Description	GLI 1988	GLI 2012
9003	Frames and mountings for spectacles, goggles, and parts	85	11
8540	Thermionic, cold cathode or photo-cathode valves and tubes	40	7
8408	Compression-ignition internal combustion piston engines	78	52
8548	Waste and scrap of primary cells, primary batteries	18	12
8707	Bodies for motor vehicles of heading 87.01- 87.05	61	41
8507	Electric accumulators	63	45
8546	Electrical insulators of any material	90	67
9110	Complete/incomplete watch/ clock movements	13	10
8466	Parts and accessories for use with machine-tools	56	46
9001	Optical fibres and optical fibre bundles	90	75

Source: Own Calculations, WITS software

Some of these parts are also listed among 10 inputs where GLI declined from 2000 to 2012 such as HS 9003, HS 8540, HS 9110, HS 8507, and HS 8466. The remaining five machinery parts with highest percentage fall in GLI in 2000s are given in Table 23 (mainly includes electric machinery).

Table 23: Machinery Components with Highest Percentage Fall in GLI (2000-2012)

HS Code	Description	GLI 2000	GLI 2012
8541	Diodes, transistors and similar semiconductor devices	65	21
9111	Watch cases and parts	37	13
8505	Electro-magnets; permanent magnets	80	37
9013	Liquid crystal devices; lasers	10	5
8522	Parts/accessories for use with sound recording apparatus	5	3

Source: Own Calculations, WITS software

To summarize, IIT for parts and components belonging to HS 84 and HS 91 has increased rapidly from 1988 to 2012; however, IIT for many parts belonging to transport machinery also increased from 2000 to 2012. But, in both these time period, IIT has declined for several machinery parts belonging to electric machinery and optical and medical apparatus as well parts used with machine tools.

4.4 IIT through Input-Output Table

As per methodology of IO tables, the IIT is found to be comparatively lower for Indian machinery industry with 31% in 1993-94 and 38% in 2007-08 (see Table 24). However, it rose to 54% in 2003-04, almost close to the IIT calculated through trade data (about 50%).

Table 24: Values of GLI for Indian Machinery Industry from India's Input-Output Tables

IOT Sec No.(1993-94, 1998-99)	*IOT Sec No.(2003-04, 2007-08)*	*Product label*	*1993-94*	*1998-99*	*2003-04*	*2007-08*
78	83	Tractors and agri. Implements	20	53	32	40
79	84	Industrial machinery [Food& Textiles (F&T)]	33	41	51	22
80	85	Industrial machinery (other than F&T)	21	31	52	24
81	86	Machine tools	38	35	57	27
82		Office Computing Machines	59	65		
83	87	Other non-electrical	29	23	81	46

		machinery				
84	88	Electrical industrial Machinery	27	36	69	81
85	89	Electrical wires & cables	50	74	60	57
86	90	Batteries	65	98	79	26
87	91	Electrical appliances	45	85	83	46
88	92	Communication equipments	49	59	47	16
89	93	Other electrical Machinery	31	29	76	66
90	94	Electronic equipments(including TV)	78	11	32	14
91	95	Ships and boats	3	44	15	62
92	96	Rail equipments	98	22	23	64
93	97	Motor vehicles	23	76	62	94
94	98	Motor cycles and scooters	0	31	10	72
95	99	Bicycles, cycle-rickshaw	8	14	3	49
96	100	Other transport equipments	77	18	84	85
97	101	Watches and clocks	86	82	88	39
	102	Medical, precision & optical instruments			52	32
	104	Aircraft & spacecraft			12	10
GLI Values for Machinery			**31**	**38**	**54**	**38**
General Machinery			**28**	**27**	**72**	**38**
Electric Machinery			**45**	**46**	**51**	**34**
Transport Machinery			**23**	**57**	**31**	**44**
Automotives			**22**	**65**	**53**	**92**
Precision Machinery			**86**	**82**	**57**	**33**

Source: Own Calculations

From 1993-94 to 2007-08, IIT has declined for industrial machinery, machine tools, batteries, communication equipments, electronic equipments, rail equipment, and watches; while it increased for the remaining products. The rise in GLI has been more prominent in case of ships and boats, motor vehicles, motor cycles, bicycles as well as electrical industrial machinery. From 1998-99 to 2007-08 as well as from 2003-04 to 2007-08, IIT has increased in all the categories of transport goods and electric industrial machines.

It is to be noted that on the basis of IO tables, GLI in ships and boats increased by 12 percentage points from 1993-94 to 2003-04; but in terms of trade data, it increased by 25 percentage points from 1996 to 2005 (i.e. from 27% to 52%). Further, GLI for rail equipment declined drastically by 75 percentage points from 1993-94 to 2003-04, but it increased in terms of trade data (i.e. from 23% in 1996 to 32% in 2005). Table 25 highlights the differences in GLI results based on IO tables and trade data for transport and electric machinery.

Table 25: Comparison of GLI for Indian Machinery Industry from India's Input-Output Tables and Trade Data from WITS (%)

Types of Machinery	Based on IO Table			Based on Trade Data		
	1993-94	1998-99	2003-04	1996	2000	2005
Transport Machinery	23	57	31	53	49	39
Electric Machinery	45	46	51	70	60	39
Automotive	22	65	53	78	63	47

Source: Own Calculations

IIT of transport machinery has been much lower initially in terms of IO tables, unlike IIT based on trade data (over 50%). It increased by 8 percentage points in case of former, but decreased by 14 percentage points in case of latter. GLI has mainly increased for automotive by 31 percentage points from 1993-94 to 2003-04 and by 70 percentage points from 1993-94 to 2007-08. But, GLI based on trade data declined rapidly for automotive from 1996 to 2005. Index of electric machinery is also declining, but increased by 6 percentage points from 1993-94 to 2003-04 based on the measurement of IO tables. However, initially, in 1993-94 and 1998-99, precision machinery had highest IIT of above 80% as measured by IO tables, which declined thereafter. In contrast, it was 37% and 45% in 1996 and 2000 (measured as per trade data) and increased to 44% and 46% in 2005 and 2012, respectively. Thus, results from IO tables differ slightly from trade data, but indicate partial integration of the industry.

4.5 Vertical IIT in Indian Machinery Industry

The 'Decomposition-type Threshold Method' is used [as per the method of Ando (2006) [18]] for calculation of vertical IIT for selected HS six-digit level parts and components (Table 26).

[18] Vertical IIT is intra-industry trade in vertically differentiated products (products differentiated by quality) as well as back-and-forth transactions with value-added embodied in vertically fragmented production processes (international fragmentation within same product category). The method involves the followings steps and formulas to calculate the types of IIT (refer to Ando, 2006):

1. To find out whether trade in commodity *q* is one-way or IIT, the degree of trade overlap is: $\mathbf{Min\ (X_{kq}, M_{kq})/ Max\ (X_{kq}, M_{kq}) \leq 0.1}$. If this equation holds, trade is one-way; otherwise IIT [X_{kq} is country *k*'s exports of *q* to the world; M_{kq} is country *k*'s imports of *q* from the world] (export values on an f.o.b. basis are multiplied by 1.05, a proxy, to adjust import values on a c.i.f. basis). Here, *k* is India and *q* is machinery good.
2. To identify whether IIT of commodity *q is* horizontal or vertical by using certain range of relative unit prices of exported and imported goods: $\mathbf{1/1.25 \leq P^x_{kq}/ P^m_{kq} \leq 1.25}$ [P^x_{kq} – unit value of *q* exported to the world by *k*; and P^m_{kq} – unit value of *q* imported from the world by *k*; threshold percentage of distinguishing types of IIT taken as 25%]. If equation holds, then trade is horizontal IIT. Vertical IIT if $P^x_{kq}/ P^m_{kq} < 1/1.25$ or $1.25 < P^x_{kq}/ P^m_{kq}$. Unit values are calculated as dividing the trade values by the corresponding quantities.
3. To calculate the share of the *n*-type trade pattern, that is, the threshold-based index (S^n_z), for the aggregated commodity category *z* as: $\mathbf{S^n_z = \sum_q (X^n_{kq} + M^n_{kq})/ \sum_q (X_{kq} + M_{kq})}$, where n= a (one-way), b (horizontal IIT) and c (vertical IIT).

Table 26: Vertical IIT of Indian Machinery

Machinery (HS 84-92)	Type of Trade			
	One-Way Trade	Intra-Industry Trade (IIT)		
Years		*Horizontal IIT (HIIT)*	*Vertical IIT (VIIT)*	*Not Classified*
1988	65%	2%	33%	0%
1996	50%	1%	49%	0%
2000	38%	5%	57%	0%
2005	37%	6%	57%	0%
2010	51%	10%	25%	14%
2012	11%	1%	89%	0%

Source: Own Calculations (***Note****: In 2010, some of the commodities have no information on quantities; that is why there is high 'Not-classified IIT')*

In 1988, majority of the trade in India's machinery industry was one-way trade/inter-industry trade at 65%, but this had declined in 2005. However, it has increased to 51% in 2010. This imply that IIT for this industry was close to 50% in 2010 (this result is almost similar to the GLI results at 2-digit level machinery products). But, the drastic change came in 2012 when there is just 11% of one-way trade. That is, IIT at about 90% is extremely high for Indian machinery industry. It was very low in 1988, but increased tremendously after 2010. VIIT is comparatively much higher than HIIT which indicates rising trade in products which have differences in quality and are at different processing levels as well as increasing fragmentation in production activities. It was 25% in 2010 (though greater than HIIT by 15 percentage points), but it became outstandingly high in 2012. To conclude, majority of the trade of Indian machinery industry is vertical IIT. However, the trend is such that the imports have been much higher than that of exports in most of the machinery parts and components.

5. Conclusion

The Indian machinery industry has much higher import shares as compared to the shares of exports; however, exports have increased rapidly over the years. The prominent products are general machinery, electric machinery and automobiles, followed by ships and boats, as well as optical and medical apparatus. Shares of India's exports to the East Asian (EA) countries have been very low in comparison with South Asian (SA) and South-East Asian (SEA) countries.

In the late 1980s and early 1990s, the machinery industry of India witnessed higher trade in 'machinery parts and components', but thereafter, trade shares for 'finished machinery' have been higher. However, exports of intermediate machinery are also gradually improving. In spite of moving up its line of suppliers of components, the Indian machinery industry is yet to become a full-fledged part of GVCs. India still needs more finished machinery goods from other countries to speed up the growth of its industrial sector and to fulfil domestic as well as exports demands. Imports of intermediate capital goods are also largely undertaken particularly those which cannot be effectively produced within India.

Further, SEA countries, namely, Philippines, Singapore, Malaysia and even Thailand, and EA countries, such as, Japan, Hong Kong, Korea and China have become very prominent in decade of 2000s. These countries have huge presence in GVCs, along with many European countries (such as Hungary, Czech Republic, Germany, etc.), but India is far behind them. However, Indian machinery industry is much better linked than other SA countries, which are scarcely integrated for any of the machinery products. SEA and EA countries are more integrated in terms of HS 84 and HS 85 in comparison to HS 87. India has rising export shares as well as capabilities for strong development in all these product categories, but high and significant integration level in GVCs is not found for any of them. At the same time, India uses remarkable amount of imported inputs in the exports of machinery goods, but still the domestic content in exports is much higher.

More than half of the trade of Indian machinery Industry is IIT. High GLI values (based on trade data) are for transport and precision machinery. But at 4-digit level parts and components, IIT has increased rapidly in case of general machinery and clocks and watches. IIT calculated through input-output tables is slightly lower. Moreover, most of the IIT in Indian machinery industry is found to be vertical IIT.

To summarize, despite significant policy measures undertaken by Indian Government, this industry has not been able to integrate much into GVCs. This may be due to the reasons like more protection of segments of transport (especially automotive) and general machinery, dominance of services sector, etc. Therefore, India must enhance its trade relation with EA and SEA by not only importing several machinery parts and components, but also by supplying to them the products which can be potentially supplied by India at comparatively lower costs and with better quality. For this, India needs to invest more in R&D and encourage economies of scale in the production which will ultimately lower the costs as well as try to capture the areas which ever are vacated by SEA and EA countries.

In order to become strong part of GVCs, the policy focus should be directed more towards raising the growth of manufacturing sector in India and increasing the employment opportunities therein. Various hubs in India for different product segments of this ndustry should be identified and promoted in all zones of India, such as, for engineering goods, automobiles, ICT products, etc. Indian machinery firms must be surveyed in a detailed manner for understanding the reasons for their low participation in value chains, constraints being faced by them, and their expectations from Central and State Governments. Moreover, SA is importing several products from India but in return not supplying much. Accordingly, potential segments must be identified so as to see whether it is feasible to form regional supply chains for machinery Industry in SA as well as to assess whether the experiences of intra-regional trade of EA ad SEA can be of any help in this matter. It is necessary to check whether it is possible to initiate more projects like Mekong-India Economic Corridor (MIEC). To conclude, there exists enormous opportunities in the Indian machinery industry which needs to be tapped and worked upon.

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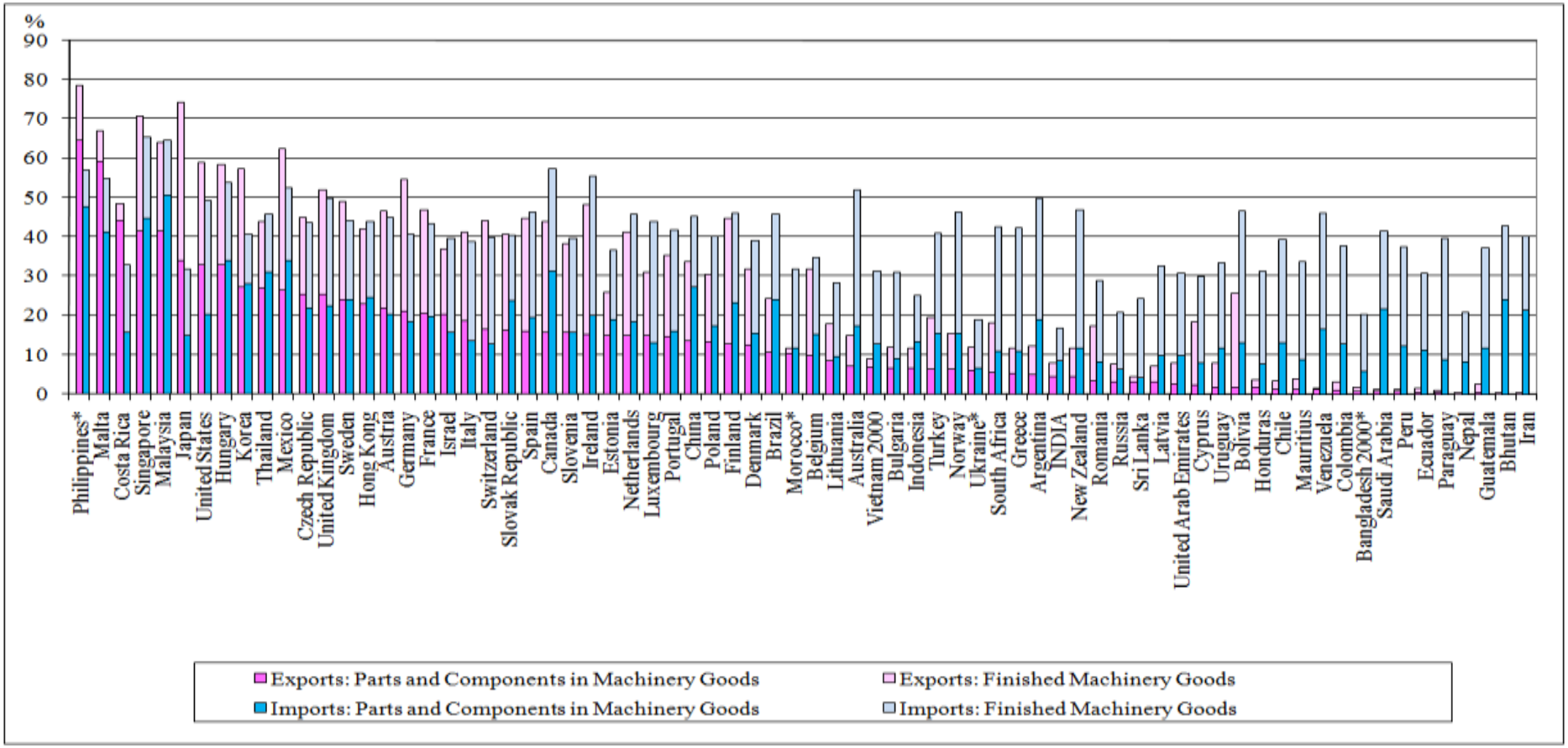
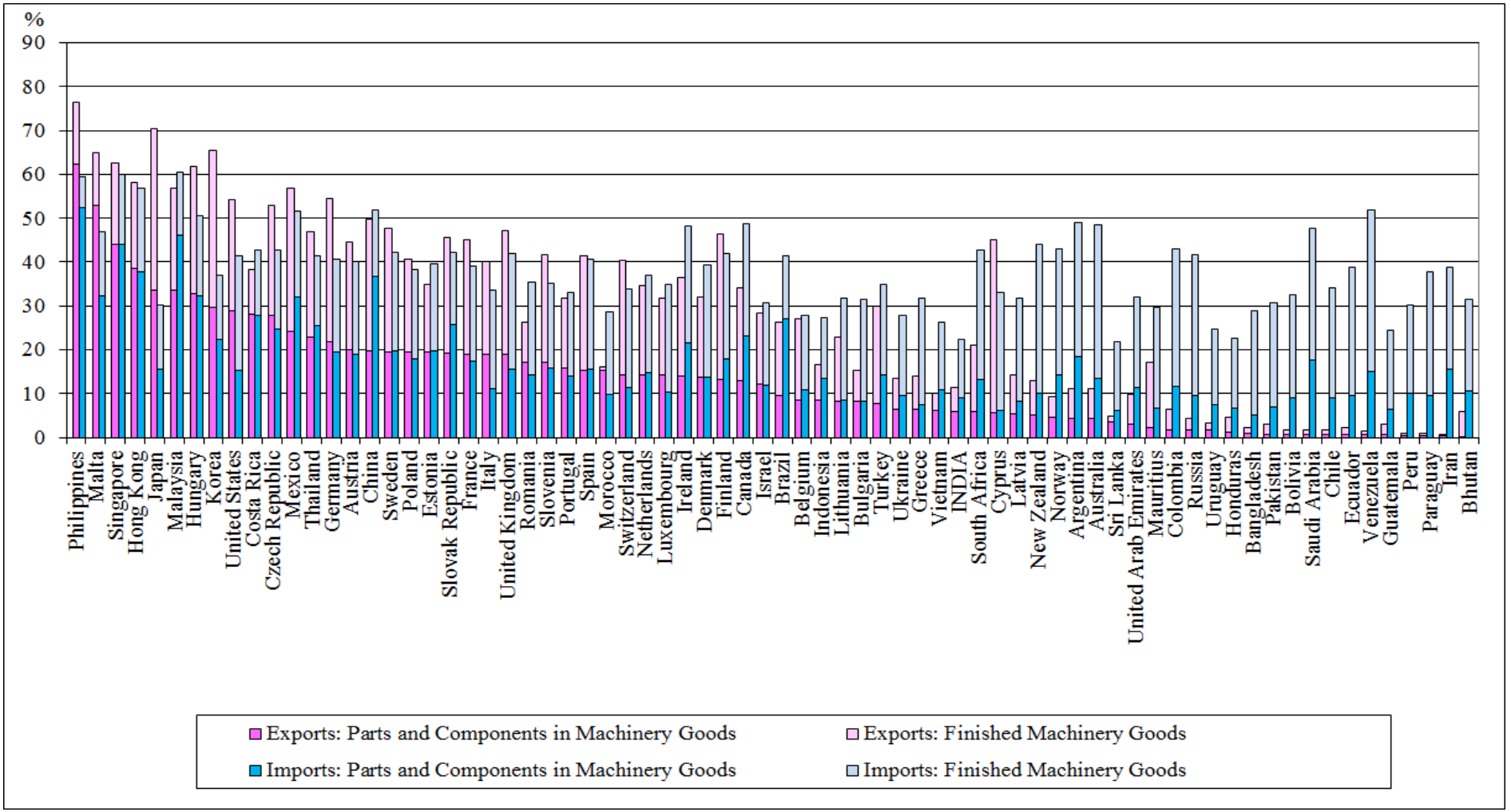
APPENDICES

Appendix Figure 2: Shares of Machinery Goods in Total Exports to and Total Imports from World in 1999 (Bangladesh and Vietnam have data for 2000 and * indicates that data is collected as per HS 1988/92 as no information available as per HS 1996)



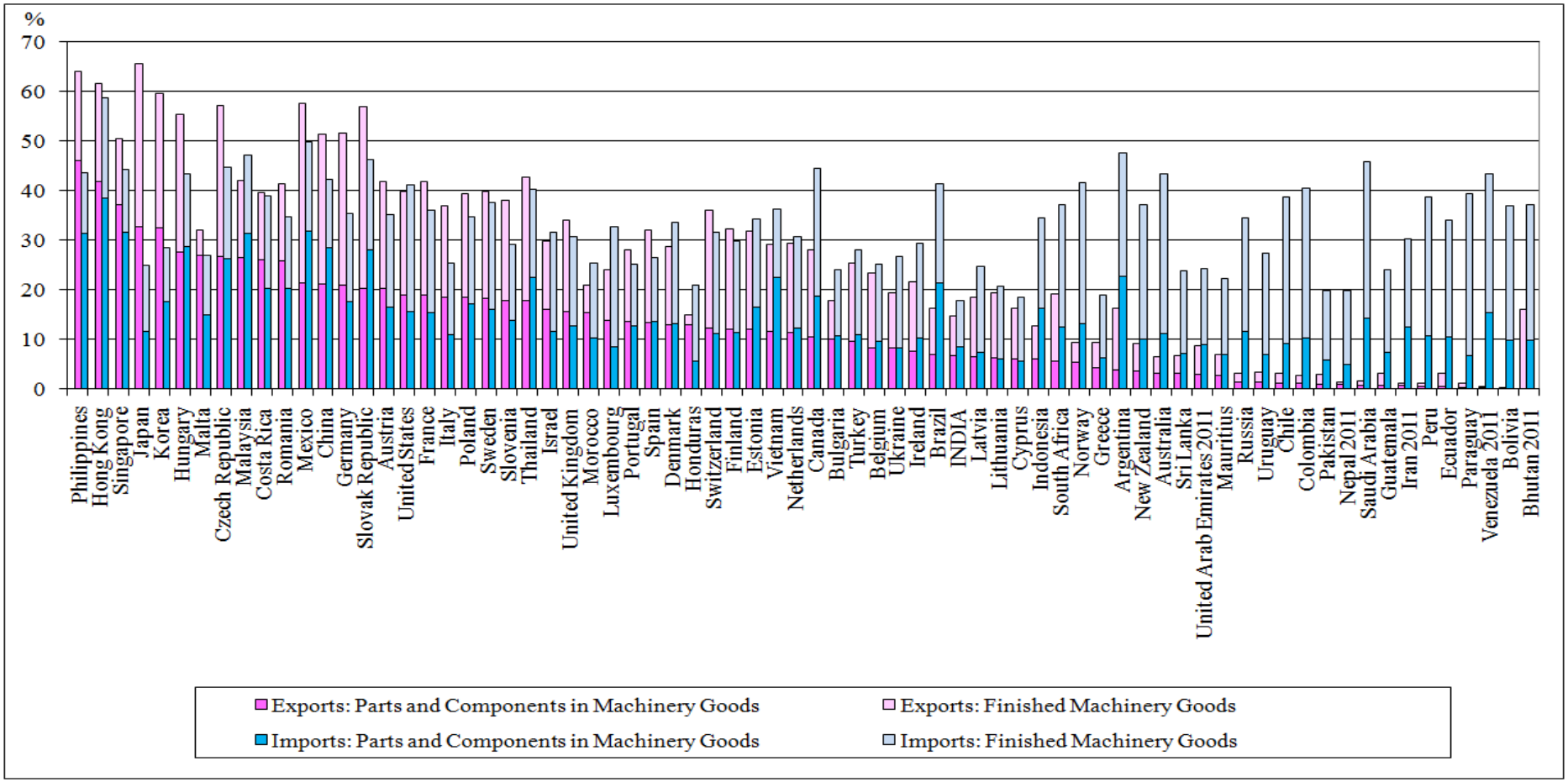
Source: Own Calculations, WITS Software

Appendix Figure 3: Shares of Machinery Goods in Total Exports to and Total Imports from World in 2005



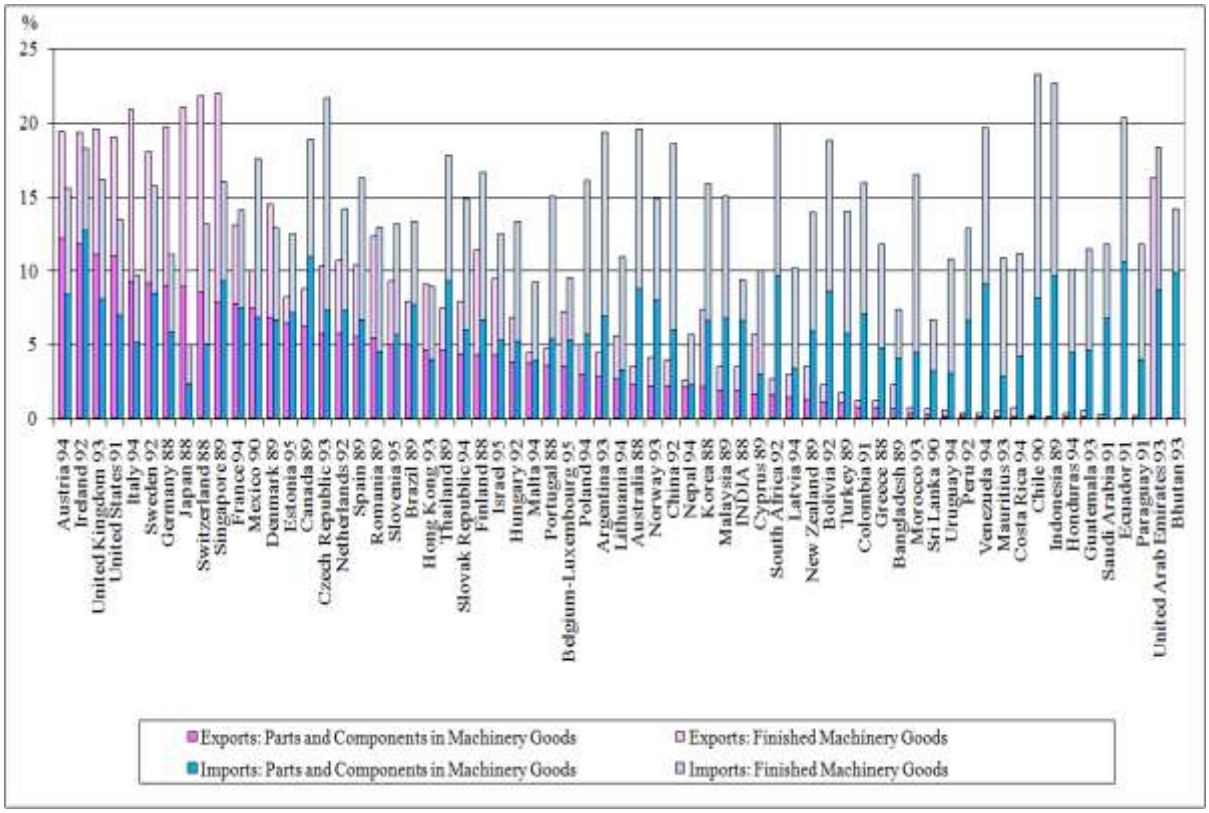
Source: Own Calculations, WITS Software

Appendix Figure 4: Shares of Machinery Goods in Total Exports to and Total Imports from World in 2012 (some countries have data for 2011)

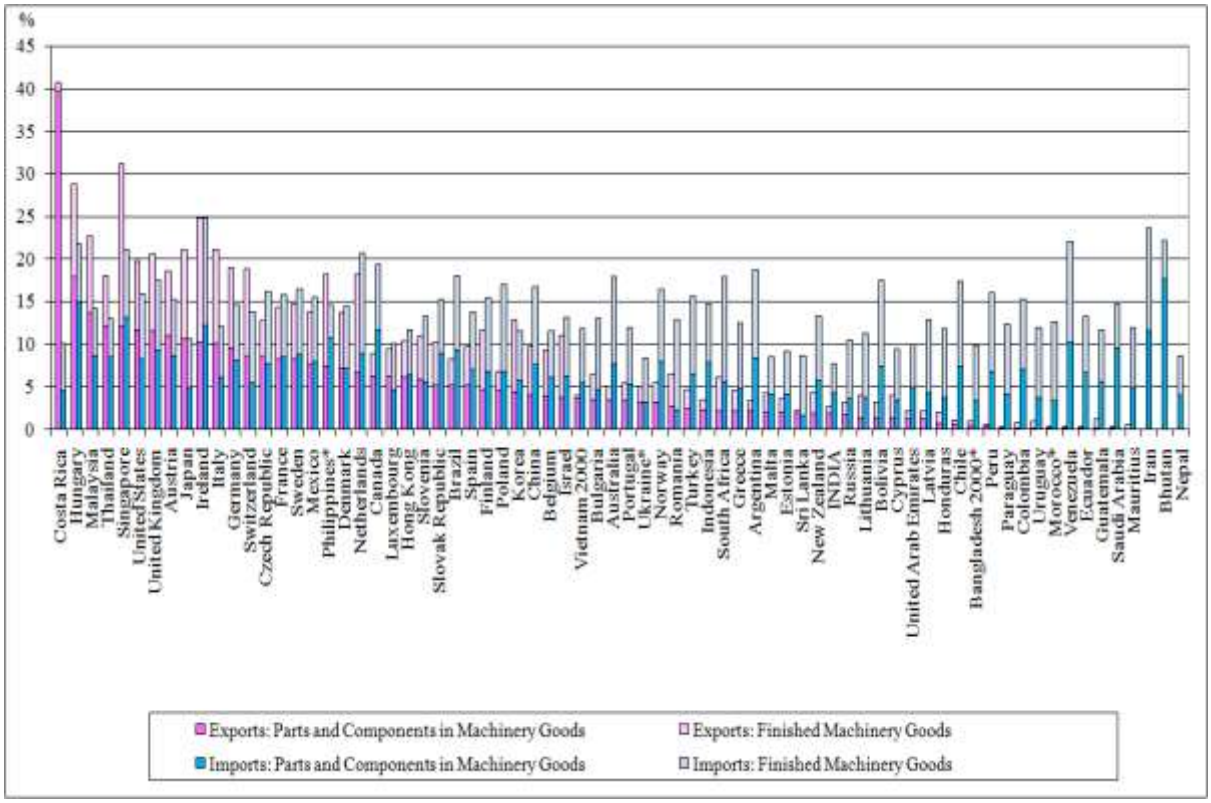


Source: Own Calculations, WITS Software

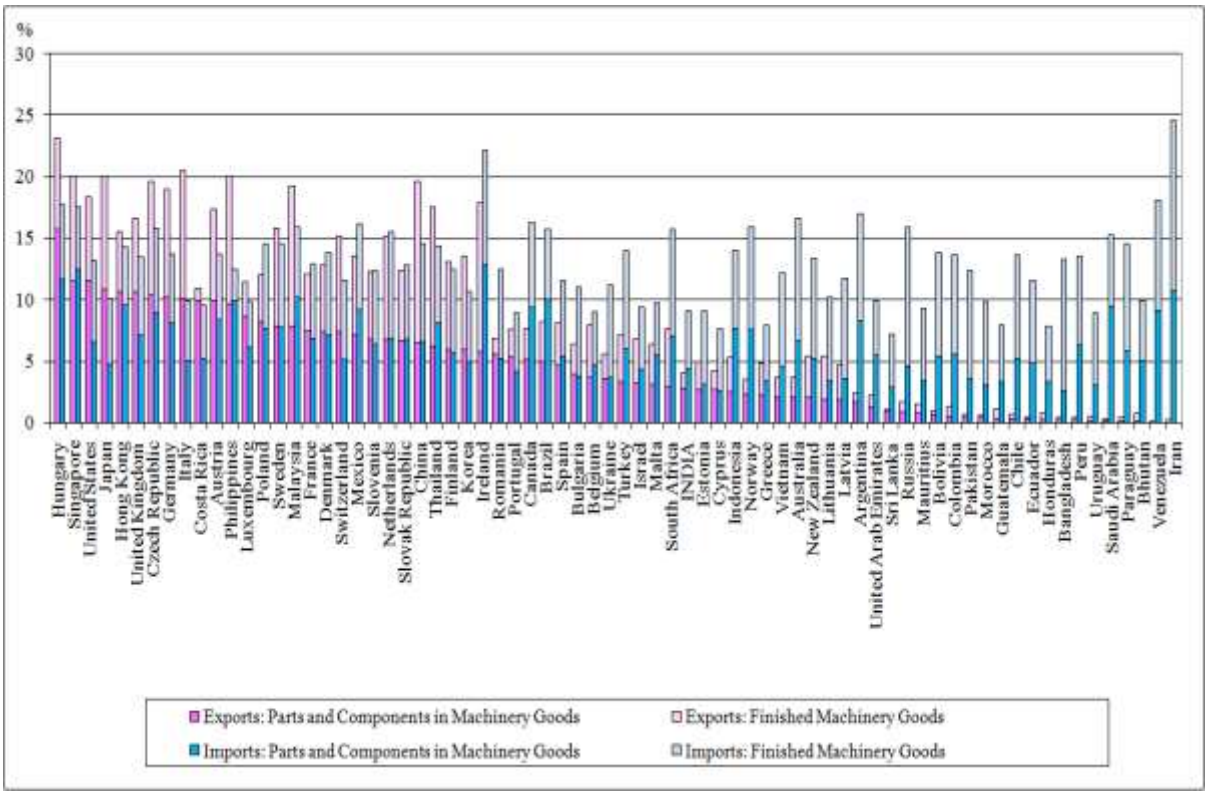
Appendix Figure 5: Shares of General Machinery in Total Exports & Imports (1988-95)



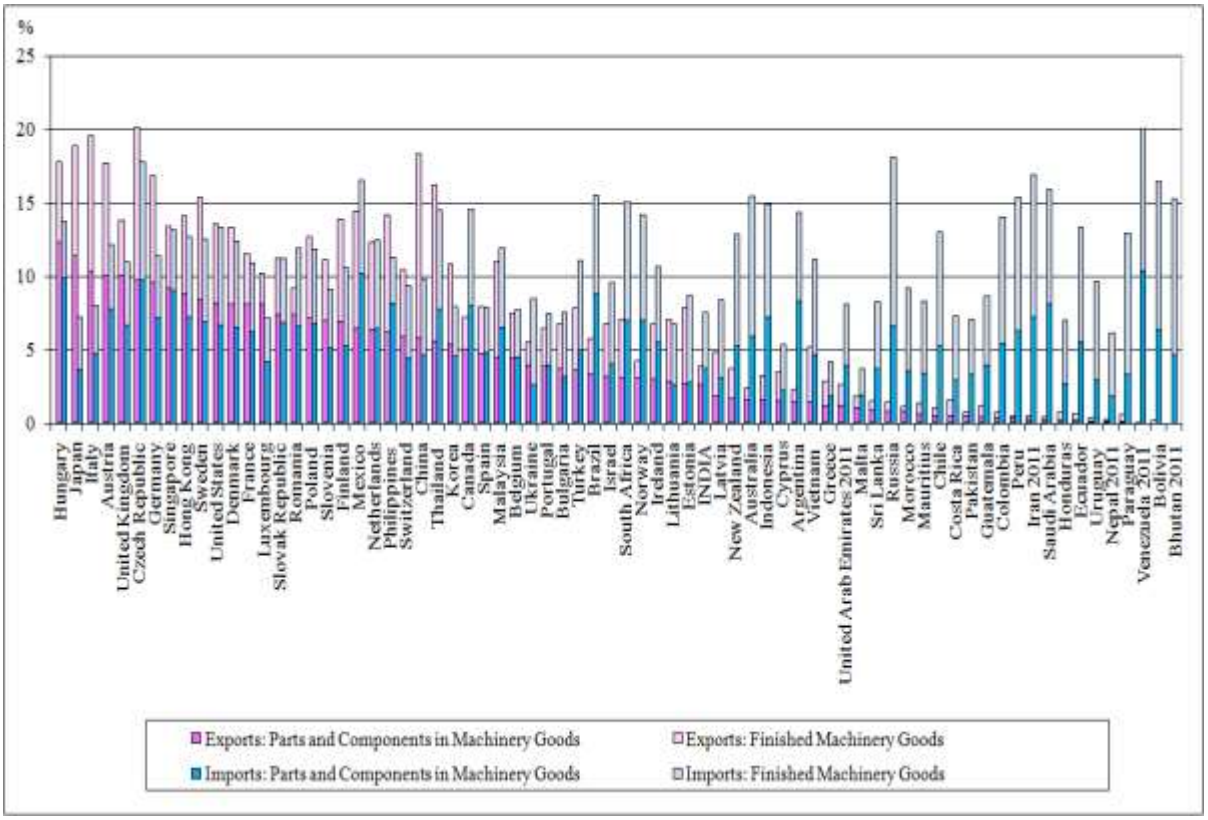
Appendix Figure 6: Shares of General Machinery in Total Exports & Imports (1999)



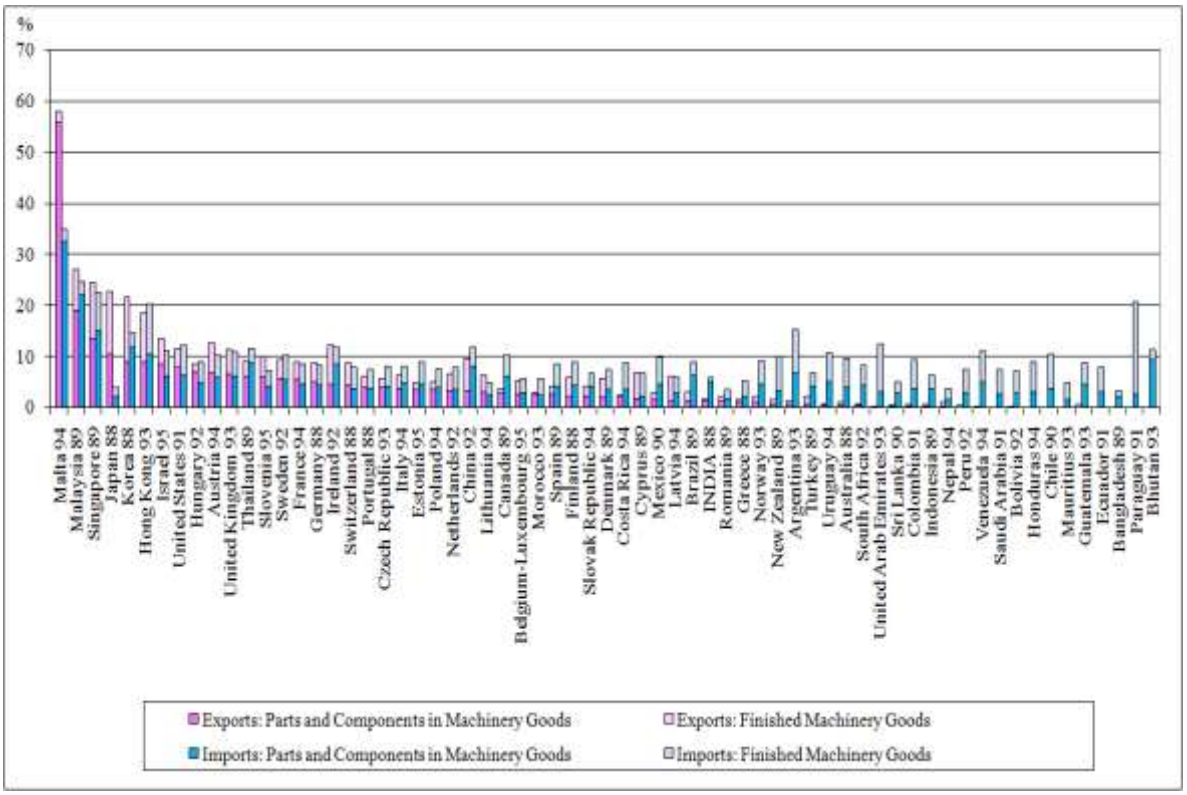
Appendix Figure7: Shares of General Machinery in Total Exports & Imports (2005)



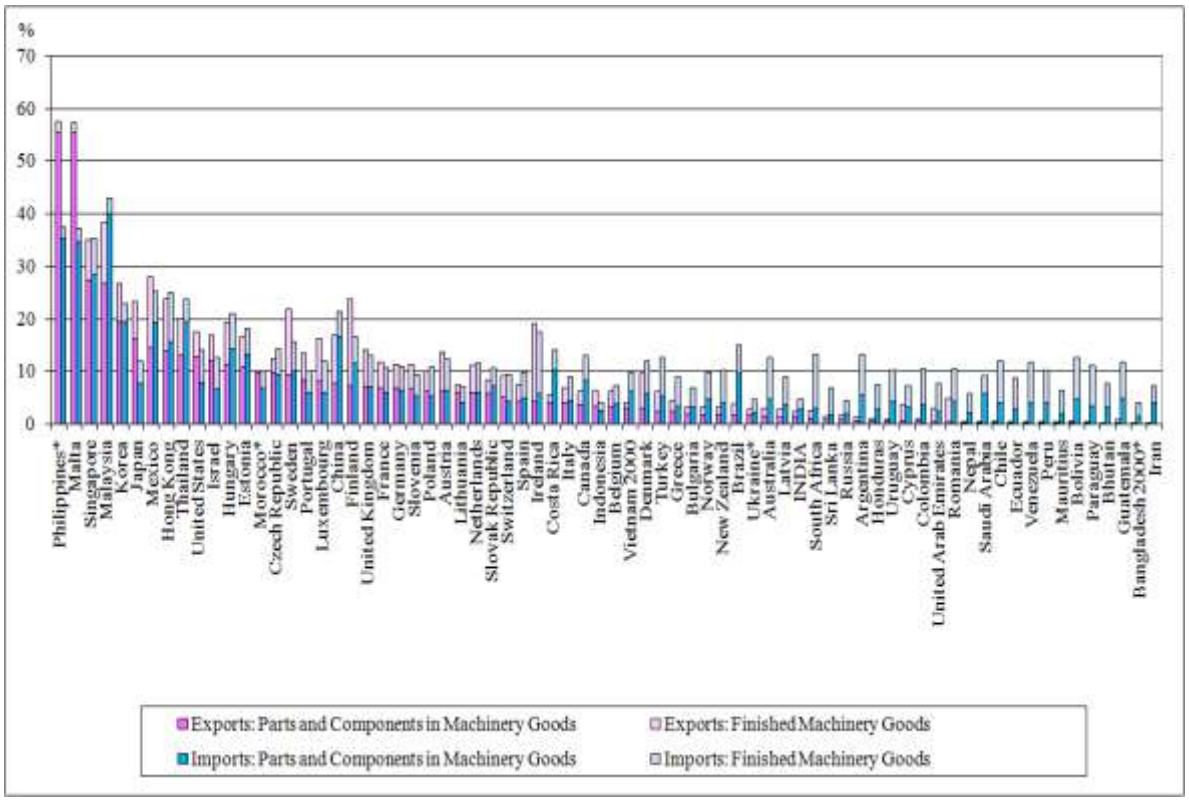
Appendix Figure 8: Shares of General Machinery in Total Exports & Imports (2012)



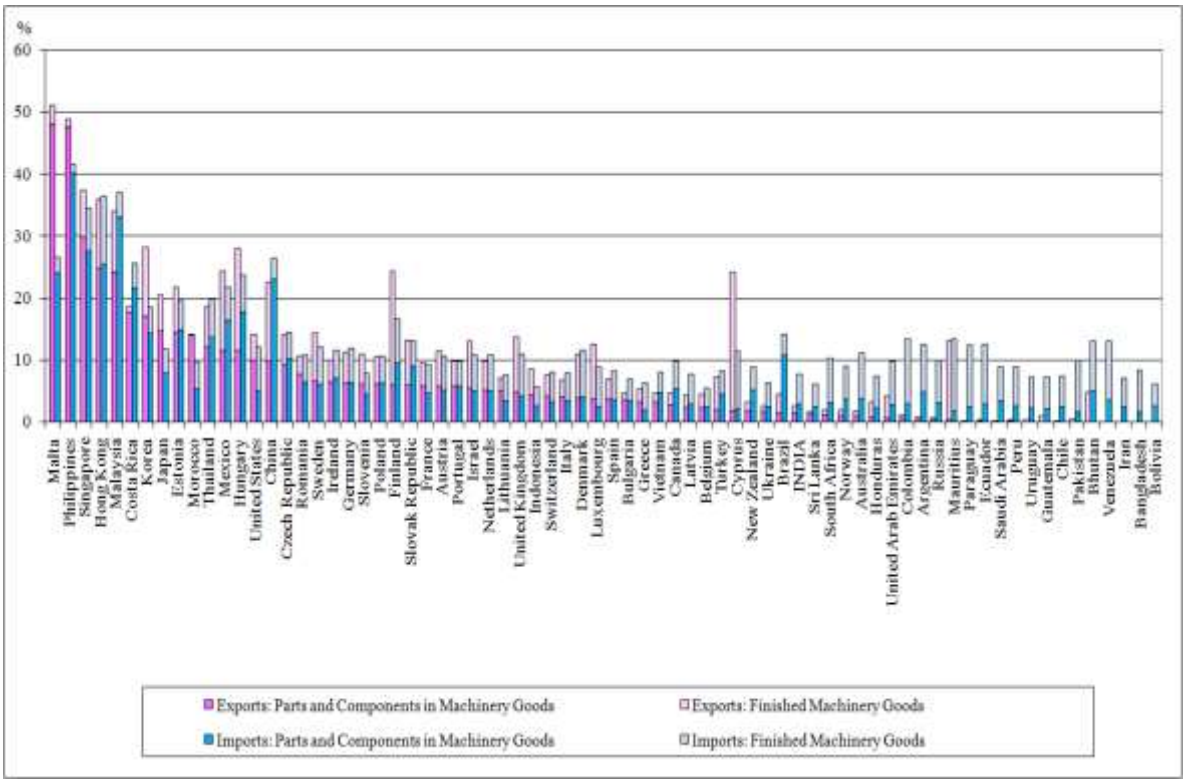
Appendix Figure 9: Shares of Electric Machinery in Exports & Imports (1988-95)



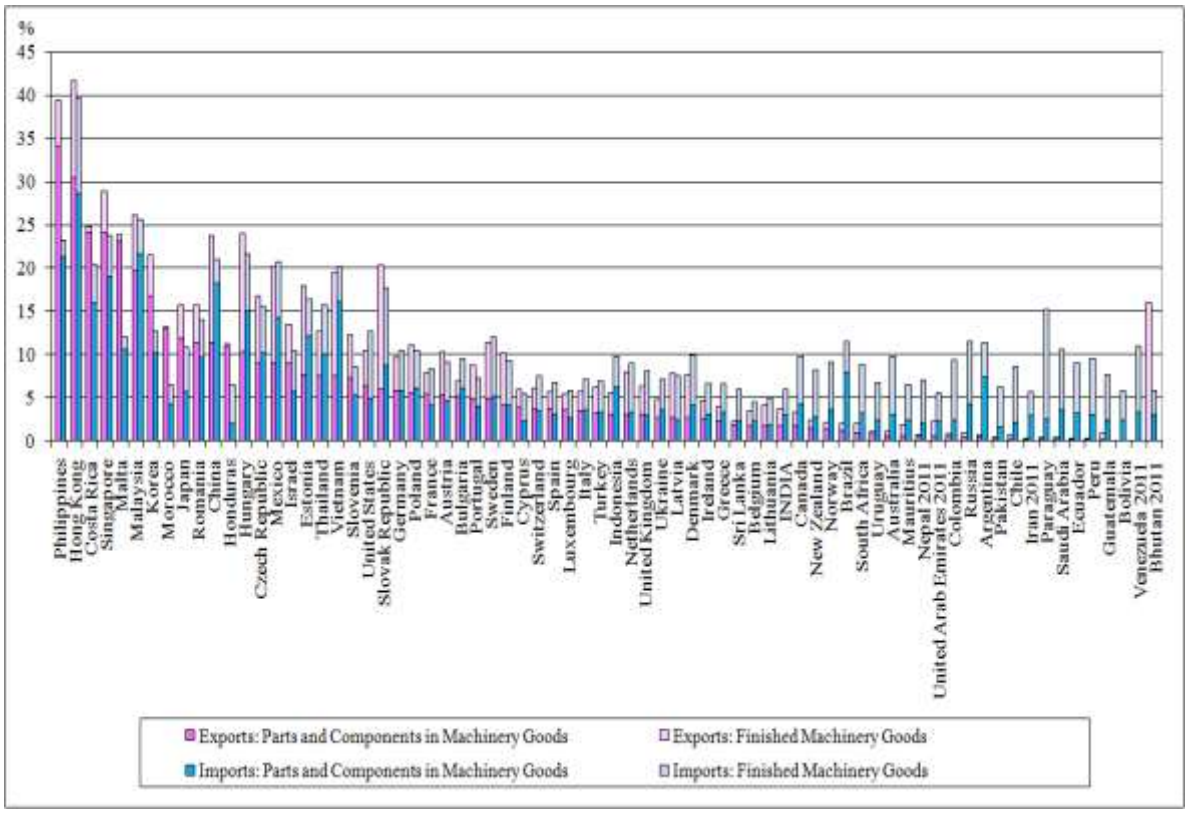
Appendix Figure 10: Shares of Electric Machinery in Total Exports & Imports (1999)



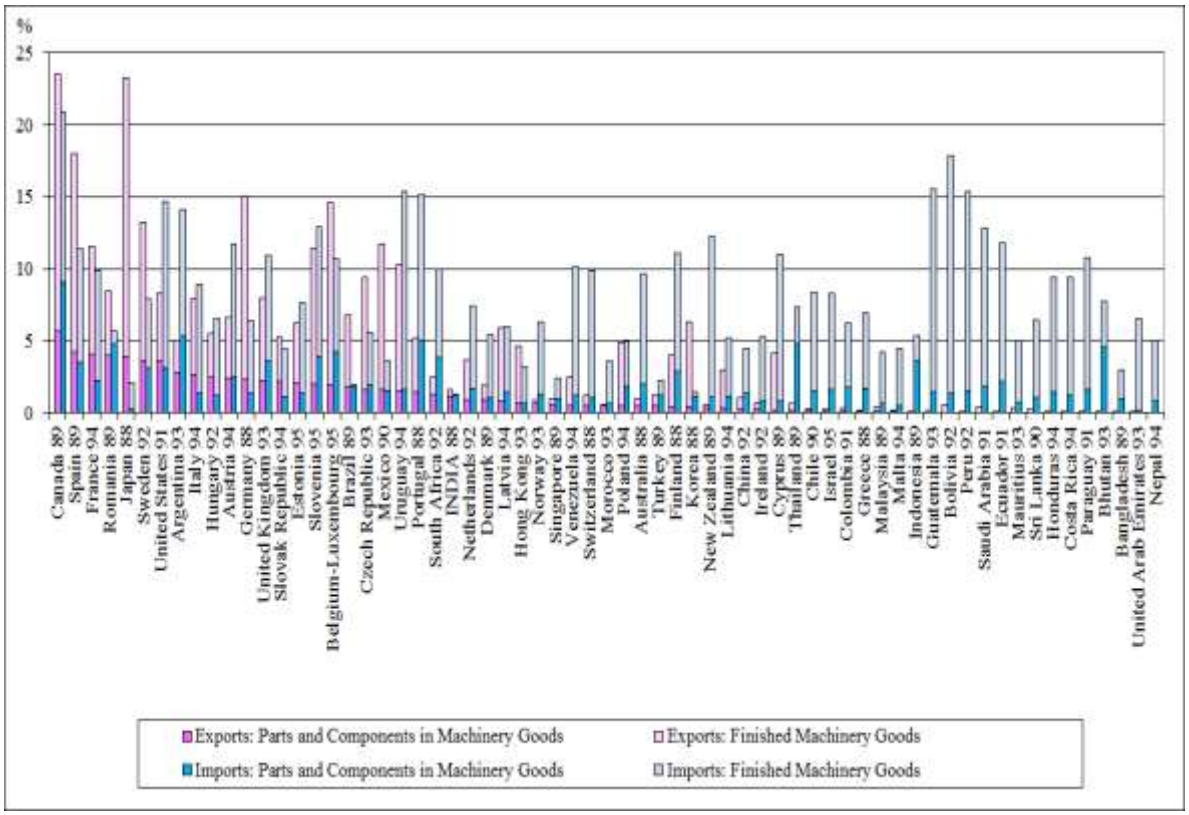
Appendix Figure 11: Shares of Electric Machinery in Total Exports & Imports (2005)



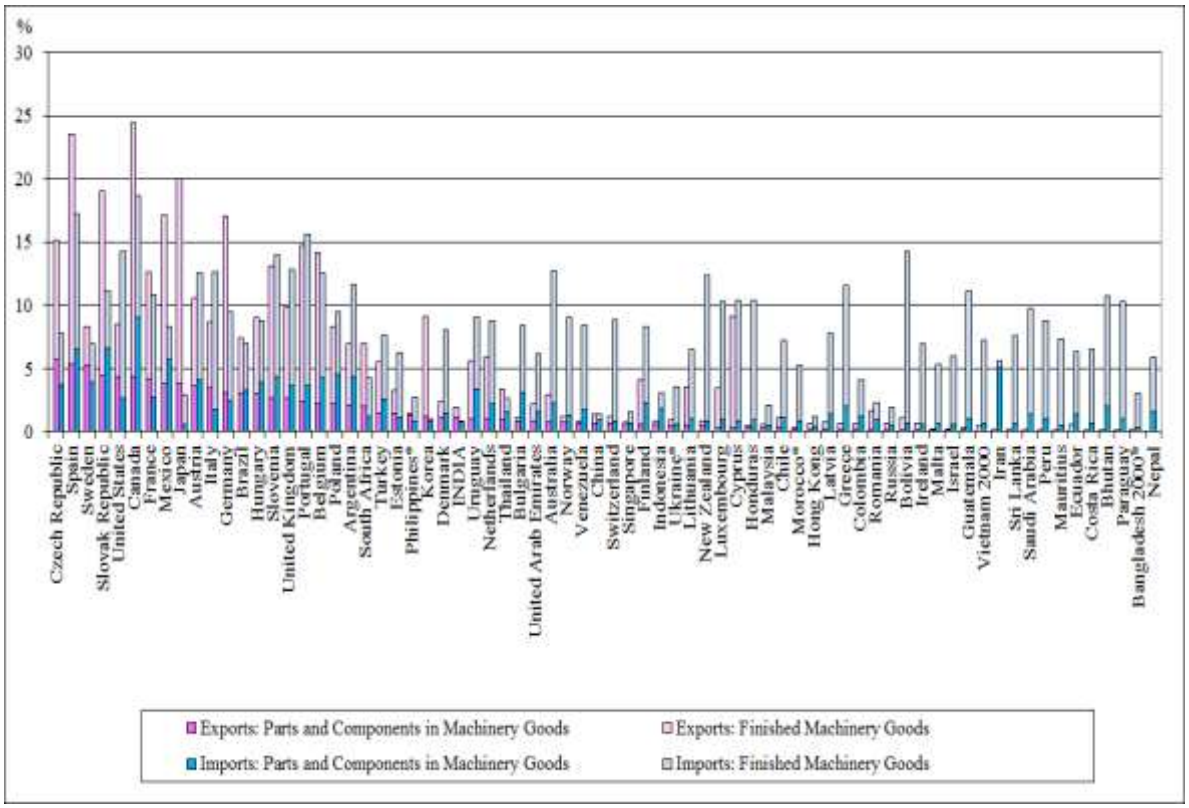
Appendix Figure 12: Shares of Electric Machinery in Total Exports & Imports (2012)



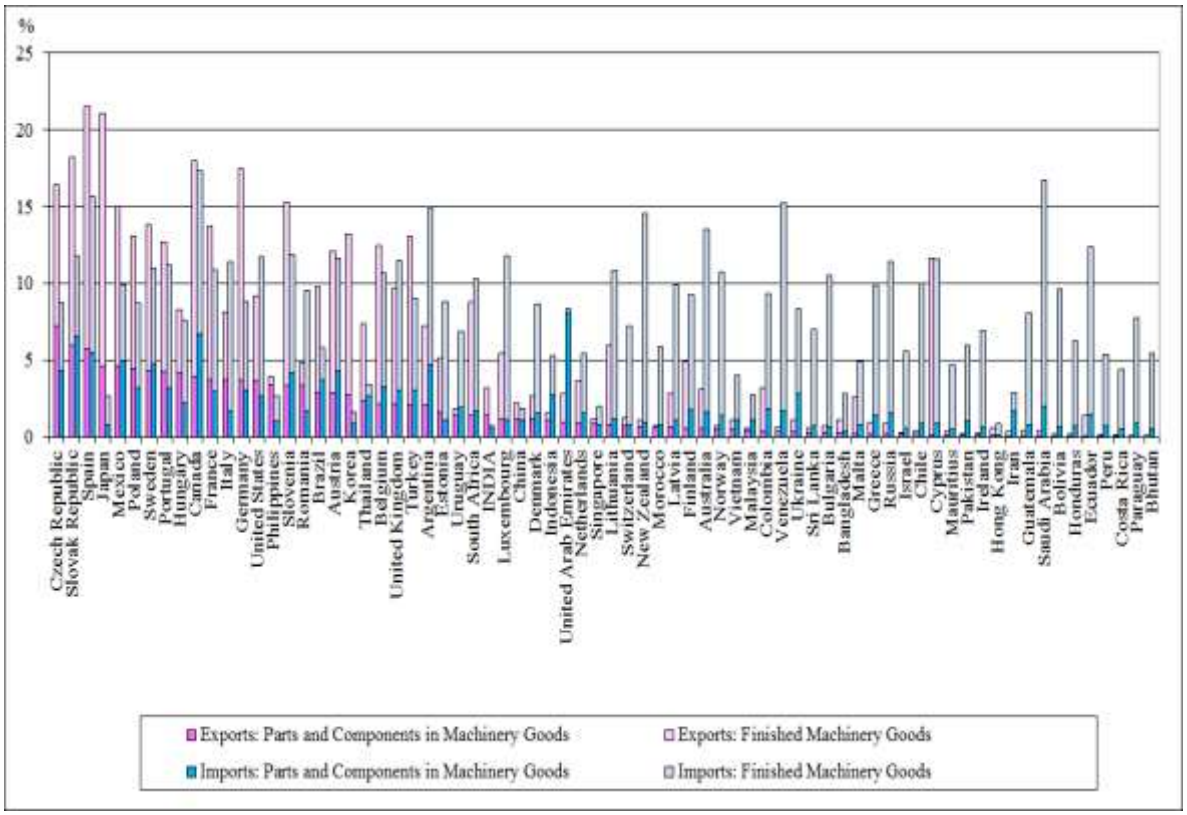
Appendix Figure 13: Shares of Automotive in Total Exports & Imports (1988-95)



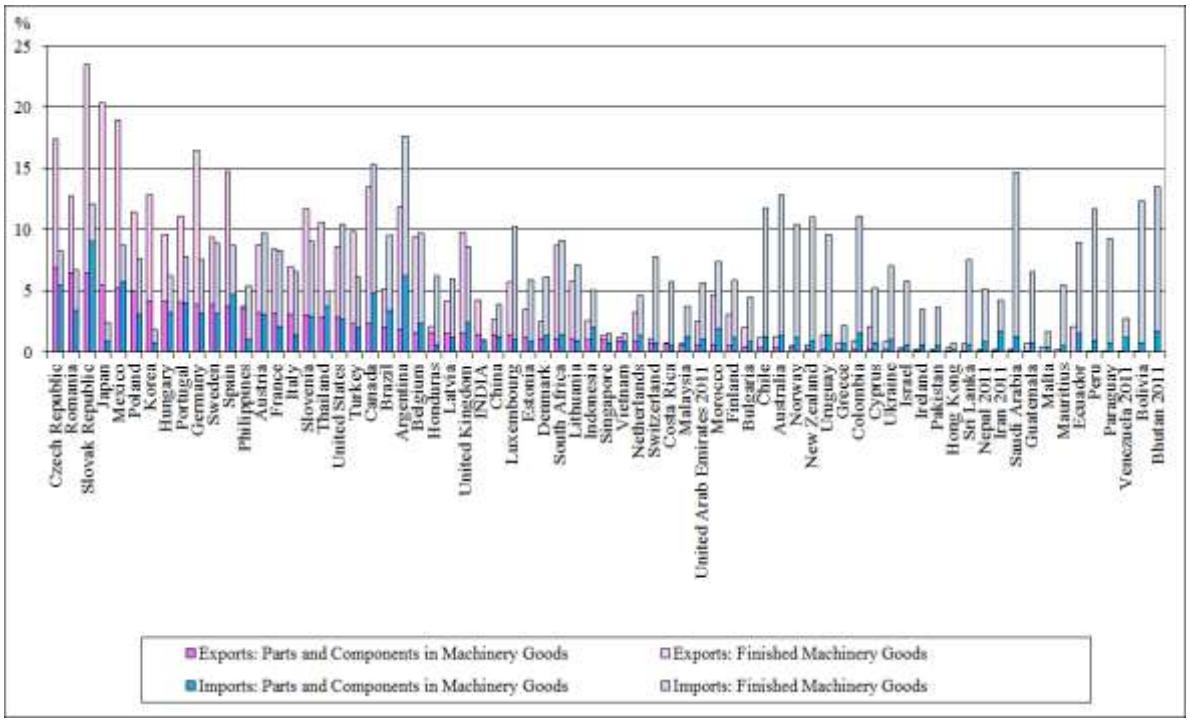
Appendix Figure 14: Shares of Automotive in Total Exports & Imports (1999)



Appendix Figure 15: Shares of Automotive in Total Exports & Imports (2005)



Appendix Figure 16: Shares of Automotive in Total Exports & Imports (2012)



Source: Own Calculations, WITS Software