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*South Asia Economic Journal* 2012 13: 183  
DOI: 10.1177/1391561412457233

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# High Technology Merchandise Exports: Where does India Stand?

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South Asia Economic Journal  
13(2) 183–206  
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System for Developing Countries &  
Institute of Policy Studies of Sri Lanka  
SAGE Publications  
Los Angeles, London,  
New Delhi, Singapore,  
Washington DC  
DOI: 10.1177/1391561412457233  
<http://sae.sagepub.com>



## Abstract

By and large, India's performance on the high-technology manufacturing trade front is not too impressive. India is a small player in most of the product categories barring pharmacy sector. In the last 10 years' period of observation, India has not been able to increase her presence significantly in most of the segment. By contrast, China, starting from a similar base like India in some of the segments, has exhibited marked improvement. It should also be mentioned that unlike China, India has not been able to enter high-end segment of product in most of the categories. Of course, India's performance would have been better if India would have concentrated on products which have low NTBs. China has done the same in some cases.

**JEL: F1, F14**

## Keywords

India, high technology exports, product category

## Introduction

The process of major economic reforms undertaken in the Indian economy has now completed two decades. The economy is now more integrated with the world. One of the objectives of the launching of the economic reforms was that it would facilitate access to new technology. As a result, India would be able to move up the technology ladder in all spheres of activities. It has also been expected that

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Indian economy would become more innovative with economic reforms. Modern growth theory acknowledges that a country's economic prosperity depends in large part on its capacity for technological innovation (Carroll, Pol & Robertson, 2010). Empirical evidence, however, supports the view that not all sectors are equally innovative. Consequently, it seems desirable from a public policy perspective to identify and promote sectors displaying high innovativeness and in a highly globalized world, a high degree of international competitiveness. It is generally believed that high-technology manufacturing, and knowledge-intensive service sectors satisfy both these criteria (Carroll et al., 2010). Thus, it is important to analyze the trends in these segments of production capability in a country. Since cross-country comparative production data in disaggregated form over time is not usually available, researchers have used trade data to analyse a country's performance in the realm of high technology exports. The simple reasoning is that the growth of high-technology manufacturing industries and knowledge-intensive service industries would be manifested in exports of the same.

In recent past, there have been a few studies analyzing the performance of developing countries in general and India in particular in respect of high technology trade (see Lall, 1998, 1999, 2000; Lall et al., 2006; Mani, 2000, 2004, 2009, 2010; Pohit, 2009). The key question raised by the studies by Lall et al. and Mani is whether the increasing high-tech intensity observed in the case of a number of developing countries in Asia is merely a statistical artefact or whether it is real. This may happen if the developing countries merely assemble at home taking advantage of locally available cheap labour and then export them at a later date. Consequently, the domestic value addition would be low and the firms would lack technological capability to move up the technological ladder. The study by Mani (2004) concludes that the share of high-tech export is not merely a statistical artefact. However, the author argues that there is considerable variation in the technological capability among high technology exporting countries. Of course, quite a few of these studies have attempted to look at the methodological issues regarding definition of high technological product.

On the other hand, the paper by Pohit (2009) has focussed on India's performance in respect of high technology trade. The principal finding is that India's performance is not too impressive in the post-reform period and particularly if we compare it with that of China.

However, though the papers by Mani (2000, 2004, 2009, 2010) and Pohit (2009) have followed a product approach, the analyses have been carried out in 9 broad components of high technology exports. Typically, each broad component of high technology exports is composed of several products at SITC 3/5 digit level. Thus, aggregate study masks several points. For example, it does not tell whether India's strength in high technology exports is concentrated in a few commodities or not. Or, does India, China or Japan compete in same SITC 3/5 digit product items? Also, when one looks at more disaggregated product item, one realizes that assembling items using cheap labour for exports is not always possible (for example, in case of products like satellite, integrated circuits, etc.).

Another point that has not been analyzed by the studies by Mani (2000, 2004) and Pohit (2009) is the role of tariff and non-tariffs barriers (NTB) in affecting the trends of high technology exports. In other words, India's high technology exports is low because India exports to countries which follow restrictive trade policy or India specializes in products which are generally guided by high tariffs/NTBs.

To answer these questions and aspects of high technology exports, this article makes a fresh attempt to analyze India's position in respect of high technology merchandise exports vis-à-vis other countries after two decades of economic reforms.

The plan of the rest of the article is as follows. The next section defines what constitutes high technology products, while the following section analyzes India's trends in respect of high technology exports. The following section analyzes the role of tariffs and NTBs in influencing India's high technology exports. Finally, the findings are summarized in the concluding section.

## Defining High Technology Merchandise Trade

At the outset, one needs to specify what constitutes high technology segments of manufacturing products.

The approach that is commonly used to identify technology-intensive industries and products is the product approach. The product list is based on the calculations of R&D intensity by groups of products (R&D expenditure/total sales). Exports of these products comprise high technology trade. According to the European Union's definition of high technology trade, the following commodities comprise the same (see Hatzichronoglou, 1997): (a) aerospace items; (b) computers-office machines; (c) electronics-telecommunications items; (d) pharmacy products; (e) scientific instruments; (f) electrical machineries; (g) non-electrical machineries; (h) chemicals; and (i) armaments. However, researchers like Lall (2000) argue that some products like electronics have labour-intensive final assembly which makes it economical to place this stage in low-wage areas. However, with increasing sophistication, many of these products can now only be produced by specialized industrial robots (Pohit, 2012a). Thus, the argument by Lall (2000) only stands partially nowadays.

Of course, it must be mentioned that the classification using R&D intensities is not perfect. It makes an over simplification by ignoring inter-industry flows of embodied and disembodied technology flows and the knowledge spillovers thereof (Carroll et al., 2000). It also does not capture the degree of innovativeness and human capital formation exhibited by certain industries. Even within a segment of high technology product, firms differ in respect of innovation of R&D intensity. Moreover, this classification ignores the differences of the nature and societal effects of innovation as observed by Baldwin and Gellatly (1998).

Notwithstanding these shortcomings, researchers have used this classification to arrive at trends of high technology exports of different countries since detailed

comparative data on trade fronts are available. It should be noted that each broad component of high technology segment is further composed of several product at 3/5 digit SITC trade codes. While recent trade data are usually classified under HS trade codes, data of old time points are still only available according to SITC codes. Hence for comparative study, we have carried our analysis using SITC codes.

The source of our data is World Bank's WITS database. In what follows, we analyze the performance of India's exports in respect of the above commodity groups in recent years. To judge India's presence in the global market, a comparison is made with respect to selected countries. The selected countries are basically the so-called developed (OECD) countries, and some newly industrialized countries as well as the other members of the BRICs group of countries.<sup>1</sup>

## Aggregate Trade

Table 1 shows the trends of high technology exports in aggregate for selected countries between 1995 and 2010. As Table 1 shows, India's high technology exports have increased from US\$1,021 million in 1995 to US\$4,463 million in 2006. During the same period, the share of high technology exports of Brazil has increased by eight times, while that of China has risen by 25 times! The share of high technology exports in India's GNP stood at 0.49 per cent in 2006, which is the lowest among the group of selected countries. It increased marginally in subsequent years and stood at 0.59 per cent at the end of 2010, which compared poorly among the selected countries. The share of India in world's high technology exports is about 0.68 per cent in 2009, which has increased marginally since 2006. Even if we consider the share of high technology exports in manufactured exports, India's share hovers in the range of 6–8 per cent, while that of China is in the range of 26–28 per cent (author's estimate based on WITS database)!

We have seen that India's position in the global space of high technology export has improved marginally in recent years. A principal reason for the same is that in some of the product segment of high technology trade, in which India was virtually absent till 2006, its position has seen an upward trend. For this reason, we look at the growth of high technology export on the eight broad product groups. The excluded product category of analysis is armament exports, where India is a small player.

## Product Trade

In the category of aerospace instruments, India exported only US\$5 million in 2006, whereas a country like Israel exported US\$39 million, Korea US\$547 million,

**Table 1.** High Technology Exports (Thousand dollars and percentage)

Country	Values					Share in GNP (%)					Share in World's HT Exports (%)				
	1995	2006	2008	2010	2010	1995	2006	2008	2010	2010	1995	2006	2008	2009	
Austria	5,073,163	14,715,349	15,326,989	13,721,385	13,721,385	2.15	4.47	3.71	3.64	3.64	0.68	0.75	0.80	0.78	
Belgium		23,530,587	28,667,460	32,227,145	32,227,145		5.80	5.57	6.75	6.75		1.20	1.34	1.87	
Brazil	1,064,786	8,672,636	10,285,556	8,121,872.8	8,121,872.8	0.15	0.97	0.64	0.40	0.40	0.14	0.44	0.52	0.50	
Canada	18,120,670	33,183,716	26,911,378	23,966,156	23,966,156	3.23	2.77	1.81	1.55	1.55	2.42	1.69	1.54	1.47	
China	11,885,166	307,379,509	340,117,842	406,089,688	406,089,688	1.66	11.73	7.49	6.82	6.82	1.59	15.64	17.22	19.69	
Denmark	5,051,999	13,207,372	11,444,550	8,291,439.6	8,291,439.6	2.81	4.66	3.28	2.60	2.60	0.68	0.67	0.63	0.68	
France	43,532,092	85,555,176	91,980,274	99,735,769	99,735,769	2.77	3.71	3.19	3.83	3.83	5.82	4.35	4.46	5.25	
Germany	61,640,615	176,504,667	159,811,532	158,507,040	158,507,040	2.46	5.82	4.35	4.74	4.74	8.24	8.98	8.52	8.90	
India	1,021,961	4,463,637	7,738,414.1	10,086,626	10,086,626	0.29	0.49	0.64	0.59	0.59	0.14	0.23	0.29	0.68	
Israel	3,298,579	11,796,918	6,273,377	7,978,955	7,978,955	3.80	8.30	3.16	3.79	3.79	0.44	0.60	0.18	0.50	
Japan	120,595,526	155,180,995	119,914,966	122,047,238	122,047,238	2.30	3.14	2.38	2.18	2.18	16.12	7.90	6.52	6.05	
Korea	32,827,608	120,921,668	100,908,572			6.37	14.12	10.75			4.39	6.15	5.74	5.91	
The Netherlands	27,835,371	73,997,556	58,127,846	59,509,789	59,509,789	6.27	10.52	6.82	7.70	7.70	3.72	3.77	3.35	3.23	
Russia	1,125,504	4,505,480	5,071,296.7	5,193,355.1	5,193,355.1	0.29	0.55	0.31	0.36	0.36	0.15	0.23	0.23	0.29	
South Africa	722,424	1,949,254	1,974,037.7	1,420,049.2	1,420,049.2	0.49	0.76	0.74	0.40	0.40	0.10	0.10	0.10	0.09	
Sweden	14,265,223	25,936,063	15,424,454	16,132,911	16,132,911	5.83	6.56	3.07	3.46	3.46	1.91	1.32	0.99	0.81	
Switzerland	11,757,680	31,562,257	42,669,964	42,819,818	42,819,818	3.62	7.26	9.09	7.53	7.53	1.57	1.61	1.90	2.51	
UK	57,297,893	123,771,987	59,426,808	59,446,726	59,446,726	5.07	5.04	2.21	2.62	2.62	7.66	6.30	3.45	3.51	
USA	162,040,639	293,677,732	220,884,471	145,497,805	145,497,805	2.23	2.19	1.53	0.99	0.99	21.67	14.95	12.69	14.63	

**Source:** WITS online database (World Bank).

**Notes:** Armaments data of Russia and South Africa are incomplete.

Brazil US\$3,585 millions. In 2008, India's exports in aerospace instrument have increased almost 2000 per cent of that in 2006 (Table 2). The rate seems to be high partly due to the small value in the base year. On the other hand, countries like Brazil, Korea and Israel have improved their exposure in the global market in this segment. By contrast, China's performance in the last couple of years does not show any fixed trend. It captured 0.51 per cent of the global exports in 2006. This fell to 0.38 per cent in 2007, and then again rose to 0.65 per cent and 0.86 per cent in 2008 and 2009, respectively. The four countries—USA, UK, France and Germany—control about 80 per cent of the world exports in aerospace equipments. Coming to the different items of exports in the category of aerospace equipment, we find differences among them. The exports of developed countries are more in the technologically complex items like large planes, turbo-engines, etc.<sup>2</sup> Note that, China and Brazil (courtesy foreign investment) have made entry into the market of aircraft engines, while India is absent in the same. However, India has been able to make an entry into the sophisticated satellite market due to ISRO's effort, which is indeed a bright sign. Moreover, they have been able to export to the developed country which is a good sign.

On the other hand, India exhibits a better presence in the global market of trade in computer office equipments, even though the share in global exports was negligible in 2008 (Table 3). India exported US\$305 million of computer office equipment in 2008. Except China, India compares favourably with respect to other BRIC countries. There are not many differences with regard to disaggregated items of exports of India, China or developed countries. Like developed countries, India is exporting digital computers, albeit small, to developed countries like USA, Netherlands, etc.<sup>3</sup>

Table 4 shows stylized facts of trade in electronic telecommunication equipments. Between the periods 1995 and 2006, India's exports in value terms more than doubled to US\$814 million. However, between 2006 and 2008, India's exports have risen only by about US\$400 million. Its export share in global market place is insignificant—only 0.19 per cent, while the same of Korea is 8.17 per cent, Israel is 0.27 per cent, and Brazil is 0.37 per cent in 2008. The striking point is that China has been able to increase its market share in this product category from 2.6 per cent in 1995 to 33 per cent in 2009. In fact, it is the major exporter in the global market followed (way behind) by USA (10 per cent) and Japan (10 per cent).

If one looks at the disaggregated items of exports within this category, we find a disquieting trend in India's product categories (Table 5). The electronic integrated circuit, a complex product, is typically a main item of exports of developed country. China and Brazil have both made a mark in this category. This is not a main item of exports of India (Table 5). One crucial factor in India's lack of capabilities in production of commodities like integrated circuit is the production methodology. Typically, these types of products are produced

**Table 2.** Exports of Aerospace Equipment: Stylized Facts (Thousand dollars and percentage)

Country	Exports in Value					Share in Global Exports (%)				
	1995	2006	2007	2008	2009	1995	2006	2007	2008	2009
Austria	118,087	702,915	596,737	362,452	192,178	0.19	0.41	0.33	0.19	0.17
Belgium		406,585	538,231	701,462	1,039,275		0.24	0.29	0.36	0.91
Brazil	315,924	3,585,899	4,940,246	5,665,994	4,206,174	0.50	2.09	2.70	2.92	3.68
Canada	3,401,773	9,937,340	10,629,250	10,717,606	10,172,210	5.37	5.80	5.81	5.52	8.89
China	103,251	867,270	702,145	1,266,057	980,073	0.16	0.51	0.38	0.65	0.86
Denmark	45,271	433,147	225,389	207,903	186,582	0.07	0.25	0.12	0.11	0.16
France	13,984,291	30,030,314	33,468,810	40,697,675	37,859,479	22.07	17.54	18.30	20.96	33.08
Germany	6,750,900	28,607,937	24,426,798	27,321,319	29,739,539	10.65	16.71	13.36	14.07	25.98
India	268	5,170	11,106	126,811		0.00	0.00	0.01	0.07	0.00
Israel	203,608	39,925	27,920	153,050	215,734	0.32	0.02	0.02	0.08	0.19
Japan	384,066	1,649,882	1,828,728	1,907,897		0.61	0.96	1.00	0.98	0.00
Korea	716,202	547,191	389,535	323,964		1.13	0.32	0.21	0.17	0.00
The Netherlands	2,497,735	1,961,717	1,759,715	2,338,011		3.94	1.15	0.96	1.20	0.00
Russia	585,814	1,997,510	1,070,557	1,059,236	101,6480	0.92	1.17	0.59	0.55	0.89
South Africa	104,861	546,180	481,214	448,600	142,369	0.17	0.32	0.26	0.23	0.12
Sweden	1,646,256	1,336,151	759,943	785,680	607,992	2.60	0.78	0.42	0.40	0.53
Switzerland	983,231	2,925,297	1,682,805	2,281,547	1,782,811	1.55	1.71	0.92	1.18	1.56
UK	7,396,581	16,234,944	12,995,478	12,181,099	12,702,545	11.67	9.48	7.11	6.27	11.10
USA	24,578,320	70,884,592	72,221,308	69,326,417	4,445,223	38.78	41.40	39.49	35.70	3.88
World	63,371,566	171,226,232	182,901,909	194,165,574	114,451,601					

Source: WITS online database (World Bank).



**Table 3.** Trade in Computer Office Machines: Stylized Facts (Thousand dollars and percentage)

Country	Exports in Value						Share in Global Exports (%)					
	1995	2006	2007	2008	2009	2009	1995	2006	2007	2008	2009	
Austria	684,362	1,297,284	1,323,424	1,178,772	934,655	934,655	0.32	0.28	0.35	0.31	0.37	
Belgium		4,468,038	2,123,911	2,444,801	1,877,700	1,877,700		0.95	0.57	0.65	0.73	
Brazil	177,396	344,431	219,155	182,378	218,243	218,243	0.08	0.07	0.06	0.05	0.09	
Canada	5,338,519	3,049,406	2,169,653	2,198,573	1,488,325	1,488,325	2.46	0.65	0.58	0.59	0.58	
China	-116,228	102,492,625	139,858,079	149,435,214	134,447,052	134,447,052	-0.05	21.78	37.51	39.81	52.52	
Denmark	753,822	1,168,237	985,676	898,796	867,072	867,072	0.35	0.25	0.26	0.24	0.34	
France	7,512,337	6,835,280	4,451,433	4,790,332	3,404,966	3,404,966	3.46	1.45	1.19	1.28	1.33	
Germany	11,311,722	27,469,541	20,569,418	18,125,976	13,608,933	13,608,933	5.21	5.84	5.52	4.83	5.32	
India	183,641	275,831	276,595	305,290		305,290	0.08	0.06	0.07	0.08	0.00	
Israel	115,132	362,957	418,383	467,579	420,788	420,788	0.05	0.08	0.11	0.12	0.16	
Japan	31,581,613	21,881,486	7,790,638	6,964,782		6,964,782	14.56	4.65	2.09	1.86	0.00	
Korea	4,683,879	17,277,196	17,955,574	12,893,493		12,893,493	2.16	3.67	4.82	3.44	0.00	
The Netherlands	11,486,925	33,048,791	25,196,896	22,479,398		22,479,398	5.30	7.02	6.76	5.99	0.00	
Russia		90,998	104,018	167,336	162,968	162,968		0.02	0.03	0.04	0.06	
South Africa	70,621	221,003	158,388	157,224	134,782	134,782	0.03	0.05	0.04	0.04	0.05	
Sweden	706,655	1,533,016	4,094,672	4,150,076	3,149,520	3,149,520	0.33	0.33	1.10	1.11	1.23	
Switzerland	765,633	471,268	441,539	465,482	414,594	414,594	0.35	0.10	0.12	0.12	0.16	
UK	16,331,587	17,165,196	9,911,311	8,418,887	6,493,708	6,493,708	7.53	3.65	2.66	2.24	2.54	
USA	36,718,777	40,369,569	21,622,088	21,185,552	15,953,646	15,953,646	16.93	8.58	5.80	5.64	6.23	
World	216,907,512	470,641,085	372,846,990	375,352,483	255,989,945	255,989,945						

**Source:** WITS online database (World Bank).

**Table 4.** Trade in Electronic Telecommunications Equipment: Stylized Facts (Thousand dollars and percentage)

Country	Exports in Value					Share in Global Exports (%)				
	1995	2006	2007	2008	2009	1995	2006	2007	2008	2009
Austria	2,114,484	6,318,649	5,115,394	5,221,212	3,437,778	0.69	0.82	0.76	0.78	0.90
Belgium		1,707,343	4,707,634	4,926,536	3,574,698		0.22	0.70	0.73	0.93
Brazil	116,844	3,217,064	2,278,378	2,495,438	1,727,041	0.04	0.42	0.34	0.37	0.45
Canada	6,620,538	8,231,028	4,585,431	5,627,315	5,129,044	2.17	1.07	0.68	0.84	1.34
China	7,833,558	112,982,938	114,567,706	132,268,163	125,342,318	2.57	14.70	16.95	19.67	32.68
Denmark	1,606,763	3,189,197	2,114,146	1,707,343	1,280,715	0.53	0.41	0.31	0.25	0.33
France	12,250,885	21,461,424	13,821,649	12,973,599	10,781,778	4.02	2.79	2.04	1.93	2.81
Germany	21,055,935	51,265,066	42,534,409	39,322,554	28,481,353	6.91	6.67	6.29	5.85	7.43
India	327,597	813,675	1,023,245	1,268,365		0.11	0.11	0.15	0.19	
Israel	1,877,282	2,639,937	345,736	1,841,052	4,261,287	0.62	0.34	0.05	0.27	1.11
Japan	66,694,895	63,767,406	65,583,053	66,360,664		21.87	8.30	9.70	9.87	
Korea	25,704,561	50,102,179	55,315,321	54,903,969		8.43	6.52	8.18	8.17	
The Netherlands	7,527,159	18,992,392	20,297,347	14,644,338		2.47	2.47	3.00	2.18	
Russia		882,112	681,384	69,1947	717,435		0.11	0.10	0.10	0.19
South Africa	126,849	882,112	388,870	456,012	364,983	0.04	0.11	0.06	0.07	0.10
Sweden	9,306,396	9,628,641	5,468,635	5,589,204	4,331,261	3.05	1.25	0.81	0.83	1.13
Switzerland	1,960,229	2,817,018	2,401,459	2,845,540	2,283,514	0.64	0.37	0.36	0.42	0.60
UK	18,872,895	61,288,483	11,858,557	11,317,540	9,938,477	6.19	7.97	1.75	1.68	2.59
USA	62,753,701	61,696,820	50,903,952	48,802,628	38,804,939	20.58	8.03	7.53	7.26	10.12
World	304,901,063	768,554,534	675,917,952	672,307,324	383,529,562					

**Source:** WITS online database (World Bank).

**Table 5.** Decomposition of Electronic Telecommunications Equipment Trade (2008)

Trade in Electronic Telecommunications Equipments (Top Three Items)			
Country	Exported Items	Destination of Exports	Share of Top Three Exports in Total (%)
USA	Electron integrated circuits		76.5
	Diodes/transistors/etc.		
	Radio/TV transmit equip.		
Germany	Electron integrated circuits		70.5
	Diodes/transistors/etc.		
	Switchboards, etc. < 1,000 V		
Japan	Video recorders/players		76.9
	Electron integrated circuits		
	Diodes/transistors/etc.		
China	Radio/TV transmit equip.	USA	64.5
	Video recorders/players	USA	
	Electron integrated circuits	Korea	
India	Diodes/transistors/etc.	Germany	70.2
	Radio/TV transmit equip.	Israel	
	Switchboards, etc. < 1,000 V	USA	
Brazil	Radio/TV transmit equip.	USA	94.6
	Electron integrated circuits	USA	
	Switchboards, etc. < 1,000 V	USA	

**Source:** Authors' estimates based on WITS online database (World Bank).

by industrial robots. China has made a big progress in adopting industrial robots in the manufacturing process. India has been extremely slow in this respect. Thus, it has failed to make any inroads in production of these types of commodities (Pohit, 2012a).

Among the high technology product category, pharmacy is the one where India has a marked presence among the developing countries (Table 6). As this table shows, India's share of exports at about 5 per cent in 2006 is the highest among the developing countries (except China) and is higher than some of the OECD countries like Japan, Canada. In fact, the divide between India and China is not too wide only in this product category. However, though India's export has risen between 2006 and 2008, its overall share in the global exports has fallen to 1.8 per cent. Initially, India's pharmaceutical industry was concentrated fully on developing drugs through reverse engineering and production of generic products. However, with change in India's IPR regulation, Indian firms

**Table 6.** Trade in Pharmacy: Stylized Facts (Thousand dollars and percentage)

Country	Exports in Value					Share in Global Exports (%)				
	1995	2006	2007	2008	2009	1995	2006	2007	2008	2009
Austria	964,398	3,030,902	3,660,812	4,221,324	4,274,004	3.54	10.45	3.29	3.30	3.36
Belgium	6,976,603	6,976,603	9,761,065	11,029,584	14,827,654		24.04	8.78	8.63	11.65
Brazil	86,053	145,468	196,837	292,839	411,295	0.32	0.50	0.18	0.23	0.32
Canada	249,995	1,009,696	1,244,725	1,311,825	1,595,104	0.92	3.48	1.12	1.03	1.25
China	774,317	2,410,132	3,168,312	3,790,405	4,433,429	2.66	8.31	2.85	2.97	3.48
Denmark	1,501,824	4,411,529	4,765,289	5,182,185	5,313,369	5.51	15.20	4.29	4.06	4.18
France	2,032,257	6,272,540	7,345,412	9,222,612	1,040,076	7.46	21.62	6.61	7.22	0.82
Germany	2,527,459	10,628,944	13,633,108	17,006,879	18,956,387	9.27	36.63	12.26	13.31	14.90
India	290,246	1,298,566	1,879,945	2,384,334		1.06	4.48	1.69	1.87	
Israel	70,140	127,474	157,315	242,661	294,075	0.26	0.44	0.14	0.19	0.23
Japan	982,244	1,207,959	1,235,941	1,477,145		3.60	4.16	1.11	1.16	
Korea	187,144	324,647	420,469	566,112		0.69	1.12	0.38	0.44	
The Netherlands	1,139,988	4,136,998	5,238,099	2,271,485		4.18	14.26	4.71	1.78	
Russia	68,738	85,719	118,595	105,487	104,343	0.25	0.30	0.11	0.08	0.08
South Africa	15,171	19,542	27,735	31,012	29,615	0.06	0.07	0.02	0.02	0.02
Sweden	399,748	2,078,393	1,928,331	2,051,532	1,814,689	1.47	7.16	1.73	1.61	1.43
Switzerland	2,378,040	13,311,231	16,206,752	20,535,428	20,903,440	8.72	45.87	14.58	16.08	16.43
UK	2,329,465	7,402,244	8,427,068	9,012,973	9,450,284	8.55	25.51	7.58	7.06	7.43
USA	3,994,150	12,957,246	15,594,394	18,268,890	20,509,974	14.65	44.65	14.03	14.30	16.12
World	27,256,229	29,017,107	111,188,422	127,733,823	127,246,759					

Source: WITS online database (World Bank).

**Table 7.** Decomposition of Pharmacy Trade (2008)

Country	Pharmacy Trade (Top Three items)		Share of Top Three Exports in Total (%)
	Exported Items	Destination of Exports	
USA	Insulin medicaments bulk		86.4
	Hormones/steroids/derivs		
	Glycosides/glands/vaccine		
Germany	Hormones		97.0
	Glycosides/glands/vaccine		
	Insulin medicaments bulk		
Japan	Antibiotics, non-medical		85.9
	Hormones		
	Glycosides/glands/vaccine		
China	Antibiotics, non-medical	India	91.0
	Glycosides/glands/vaccine	USA	
	Hormones/steroids/derivs	India	
India	Hormones	USA	93.1
	Insulin medicaments bulk	Austria	
	Antibiotics, non-medical	China	
Brazil	Hormones	Germany	79.6
	Glycosides/glands/vaccine	Netherlands	
	Insulin medicaments bulk	USA	

**Source:** Authors' estimates based on WITS online database (World Bank).

had to modify their production approach. While the industry has faced some hardship in this regard, it should be noted that the industry has been able to face this challenge.

Table 7 shows the components of pharmacy exports in detail. It seems that India has been able to penetrate markets of USA, Austria and also of China.

The low level of exports in scientific instruments by India is a cause for concern. This probably portrays the state of scientific research in India. India exported only US\$690 millions of instrument in 2008, whereas a country like Israel exported nearly US\$2 billion in 2008 (Table 8). Another thing to note is that India, unlike China, has not been to penetrate the export market in a major way in respect of optical appliances (Table 9). Also, developing countries like China, India, etc., do not seem to make an entry into the market of physical/chemical analysis equipment. Most of them are manufactured and supplied by USA, Germany, etc.

**Table 8.** Trade in Scientific Instruments: Stylized Facts (Thousand dollars and percentage)

Country	Exports in Value						Share in Global Exports (%)					
	1995	2006	2007	2008	2009		1995	2006	2007	2008	2009	
Austria	766,080	1,899,630	1,935,102	2,013,095	1,654,566		1.12	0.88	0.81	0.77	0.99	
Belgium		1,988,513	2,156,793	2,658,880	2,868,818			0.92	0.91	1.02	1.72	
Brazil	96,980	335,343	348,828	362,592	295,367		0.14	0.16	0.15	0.14	0.18	
Canada	1,286,323	4,051,816	2,928,965	3,178,275	2,596,217		1.87	1.88	1.23	1.22	1.56	
China	1,320,713	20,508,092	28,617,332	33,286,716	29,402,244		1.92	9.52	12.02	12.81	17.68	
Denmark	989,500	2,182,269	2,357,166	2,668,393	2,332,439		1.44	1.01	0.99	1.03	1.40	
France	4,269,057	10,499,341	9,772,399	10,860,589	9,437,654		6.22	4.87	4.10	4.18	5.67	
Germany	12,861,005	33,159,994	30,823,510	32,704,114	28,021,813		18.74	15.39	12.94	12.58	16.85	
India	47,619	563,407	564,948	690,770			0.07	0.26	0.24	0.27		
Israel	492,679	1,707,195	1,328,148	1,844,529	1,477,402		0.72	0.79	0.56	0.71	0.89	
Japan	12,480,609	25,475,418	23,205,578	24,039,381			18.18	11.82	9.74	9.25		
Korea	948,096	17,112,604	22,446,334	26,569,845			1.38	7.94	9.43	10.22		
The Netherlands	3,037,103	7,784,830	838,723	9,229,748			4.42	3.61	3.54	3.55		
Russia		667,380	574,873	760,287	591,611			0.31	0.24	0.29	0.36	
South Africa	72,266	197,697	170,874	221,660	238,362		0.11	0.09	0.07	0.09	0.14	
Sweden	1,562,673	2,472,957	2,600,306	2,740,410	2,634,221		2.28	1.15	1.09	1.05	1.58	
Switzerland	3,157,445	7,581,627	7,357,321	8,579,728	8,012,086		4.60	3.52	3.09	3.30	4.82	
UK	6,010,485	10,932,673	10,330,904	10,552,479	9,184,755		8.76	5.07	4.34	4.06	5.52	
USA	19,188,169	42,879,818	34,608,741	36,057,145	32,893,520		27.95	19.90	14.53	13.87	19.77	
World	68,642,358	215,463,469	238,144,446	259,916,147	166,347,003							

**Source:** WITS online database (World Bank).

**Table 9.** Decomposition of Scientific Instruments Trade (2008)

Country	Trade in Scientific Instruments (Top Three items)		Share of Top Three Exports in Total (%)
	Exported Items	Destination of Exports	
USA	Elect./radiation meters		51.4
	Physic./chem. analysis equip.		
	Medical etc. EL diag. equip.		
Germany	Medical etc. EL diag. equip.		57.9
	Physic./chem. analysis equip.		
	Automatic control instr.		
Japan	Optical appliances nes.		54.6
	Automatic control instr.		
	Optical fibres/plates		
China	Optical appliances nes.	USA	81.0
	Optical fibres/plates	Japan	
	Automatic control instr.	USA	
India	Automatic control instr.	UK	59.5
	Fluid gauges/instruments	Germany	
	Medical etc. EL diag. equip.	USA	
Brazil	Automatic control instr.	France	9.6
	Fluid gauges/instruments	USA	
	Orthopaedic/fracture app.	USA	

**Source:** Authors' estimates based on WITS online database (World Bank).

India's performance is dismal in the product category electrical machinery. As Table 10 indicates, India exported US\$45 million in 2008, a value relatively stagnant since 2006. Among the BRIC countries, India's position is the lowest in this category. Note that India exports low end of items in this category (Table 11). She is absent in the export of special use electrical equipment nes, ceram-diel capacitor multiuse, etc. Note that China has made inroad in these two products, which are the main items of exports of developed countries like USA, Germany and Japan.

The similar trend is also observed in the product category non-electrical machinery (Table 12). In 2006, India exported US\$194 million. There has not been any significant change in the shares of export in the global trade over the 12 years' period 1995–2008. Looking at disaggregated items of exports within this category, we find that there are not many differences between items of export of developing countries (India, China) or developed countries like USA, Germany (Table 13). India has made inroads into the market of gas turbines. However, India is naturally absent in the trade of nuclear fuel element due to exclusiveness of the nuclear club.

**Table 10.** Trade in Electrical Machinery: Stylized Facts (Thousand dollars and percentage)

Country	Exports in Value					Share in Global Exports (%)				
	1995	2006	2007	2008	2009	1995	2006	2007	2008	2009
Austria	183,101	422,831	435,768	471,542	396,399	0.85	0.66	0.77	0.80	1.12
Belgium		751,196	771,943	784,926	507,913		1.17	1.36	1.34	1.44
Brazil	16,950	85,619	74,876	78,462	68,279	0.08	0.13	0.13	0.13	0.19
Canada	304,114	882,836	826,831	735,855	678,257	1.41	1.37	1.46	1.25	1.92
China	689,919	5,145,733	6,681,509	8,513,644	8,081,233	3.19	7.99	11.80	14.48	22.87
Denmark	99,564	171,249	177,798	183,384	193,109	0.46	0.27	0.31	0.31	0.55
France	626,776	648,633	763,357	771,733	747,673	2.90	1.01	1.35	1.31	2.12
Germany	2,001,326	5,754,904	4,854,171	533,5250	4,149,234	9.26	8.93	8.58	9.08	11.74
India	5,950	45,669	46,831	45,900		0.03	0.07	0.08	0.08	
Israel	413,606	5,979,009	435,175	644,706	464,212	1.91	9.28	0.77	1.10	1.31
Japan	5,396,108	8,267,644	8,522,262	7,949,993		24.98	12.84	15.06	13.52	
Korea	413,606	5,979,009	1,597,561	1,962,224		1.91	9.28	2.82	3.34	
The Netherlands	623,465	918,789	1,352,711	1,693,445		2.89	1.43	2.39	2.88	
Russia		152,622	96,140	225,113	102,850		0.24	0.17	0.38	0.29
South Africa	31,421	57,958	52,694	50,900	30,846	0.15	0.09	0.09	0.09	0.09
Sweden	109,021	279,468	295,869	368,124	319,618	0.50	0.43	0.52	0.63	0.90
Switzerland	291,828	477,006	465,808	521,606	415,541	1.35	0.74	0.82	0.89	1.18
UK	1,844,941	2,271,081	2,011,513	2,013,924	1,781,965	8.54	3.53	3.55	3.43	5.04
USA	2,759,945	7,311,178	4,891,577	4,515,198	3,545,841	12.77	11.35	8.64	7.68	10.03
World	21,606,024	64,410,826	56,605,310	58,786,893	35,339,397					

**Source:** WITS online database (World Bank).



**Table II.** Decomposition of Trade in Electrical Machinery (2008)

Country	Trade in Electrical Machinery (Top Three Items)		Share of Top Three Exports in Total (%)
	Exported Items	Destination of Exports	
USA	Ceram-diel capacitor multi.		42.2
	Special use EL equip. nes		
	Electric alarms, etc.		
Germany	Ceram-diel capacitor multi.		72.9
	Special use EL equip. nes		
	Electric alarms, etc.		
Japan	Alum electrolyte capacitor		17.3
	Ceram-diel capacitor multi.		
	Special use EL equip. nes		
China	Special use EL equip. nes	USA	85.7
	Electric alarms, etc.	USA	
	Ceram-diel capacitor multi.	Japan	
India	Alum electrolyte capacitor	China	23.1
	Electric alarms, etc.	UK	
	Special use EL equip. nes	USA	
Brazil	Electric alarms, etc.	USA	27.7
	Alum electrolyte capacitor	Germany	
	Special use EL equip. nes	USA	

**Source:** Authors' estimates based on WITS online database (World Bank).

With regard to high technology exports in chemicals product category, India's position is relatively better and has significantly improved between the years 1995 and 2008, peaking in 2006 at 2.41 per cent (Table 14). India has a share of 2.22 per cent in global high technology exports (2008) in this category, which is higher than many of the selected countries. India exported about US\$1,431 million in 2008. There has been a significant increase in export between the years under observations. In recent years, the stricter environmental regulations in the developed countries have led to a shift in the production base of the chemical industries to a developing country like India. To some extent, this has contributed to this trend. If we disaggregate this category, we find that silicon, important for solar energy, is a bulk item of exports of developed countries like USA and Japan (Table 15). China has entered this export market. India is absent. The household/garden chemical figures in the list of top three items of exports of India, which is surely not a high-end chemical product. India needs to shift to exports of high-end items like silicon. This is essential since India intends to increase her share of solar power in the coming decade.

**Table 12.** Trade in Non-electrical Machinery: Stylized Facts (Thousand dollars and percentage)

Country	Exports in Value					Share in Global Exports (%)				
	1995	2006	2007	2008	2009	1995	2006	2007	2008	2009
Austria	177,514	402,682	606,342	749,441	432,848	1.06	0.95	1.39	1.47	1.20
Belgium		1,253,077	1,110,111	1,475,965	1,051,891		2.96	2.55	2.90	2.92
Brazil	10,753	10,696	19,887	27,614	17,668	0.06	0.03	0.05	0.05	0.05
Canada	220,510	453,979	493,792	685,064	792,196	1.32	1.07	1.13	1.35	2.20
China	21,408	473,767	542,059	878,320	766,924	0.13	1.12	1.24	1.73	2.13
Denmark	21,408	473,767	62,265	70,623	29,861	0.13	1.12	0.14	0.14	0.08
France	1,351,711	1,664,504	2,085,007	2,995,576	2,316,497	8.08	3.93	4.78	5.88	6.43
Germany	2,361,217	5,508,866	6,254,833	6,981,740	6,400,550	14.11	13.02	14.35	13.72	17.78
India	6,089	3,1057	159,901	194,874		0.04	0.07	0.37	0.38	
Israel	13,351	257,404	32,0750	246,179	149,769	0.08	0.61	0.74	0.48	0.42
Japan	2,188,918	4,523,179	3,574,180	4,267,477		13.08	10.69	8.20	8.38	
Korea	74	95,908	352,145	421,603		0.00	0.23	0.81	0.83	
The Netherlands	349,822	755,496	942,681	1,101,535		2.09	1.79	2.16	2.16	
Russia	610	3,160	1,030,212	1,445,762	1,327,720	0.00	0.01	2.36	2.84	3.69
South Africa	4,887	4,991	11,824	10,770	13,657	0.03	0.01	0.03	0.02	0.04
Sweden	445,566	1,272,060	1,756,814	1,394,080	1,297,496	2.66	3.01	4.03	2.74	3.60
Switzerland	1,412,849	2,661,675	3,324,325	3,750,558	2,971,675	8.44	6.29	7.62	7.37	8.25
UK	1,333,042	2,898,751	2,859,719	3,085,070	3,041,912	7.96	6.85	6.56	6.06	8.45
USA	4,526,901	11,097,480	9,392,958	10,134,112	8,512,725	27.05	26.23	21.54	19.91	23.64
World	16,737,317	42,303,608	43,601,172	50,902,649	36,004,215					

**Source:** WITS online database (World Bank).

**Table 13.** Decomposition of Trade in Non-electrical Machinery (2008)

Country	Trade in Non-electrical Machinery (Top Three Items)		Share of Top Three Exports in Total (%)
	Exported Items	Destination of Exports	
USA	Parts nes gas turbines		93.4
	Other gas turbines nes		
	Laser/etc. machine tools		
Germany	Nuclear fuel elements		52.2
	Parts nes gas turbines		
	Laser/etc. machine tools		
Japan	Other gas turbines nes		62.7
	Parts nes gas turbines		
	Laser/etc. machine tools		
China	Bending, etc., machines	India	76.0
	Laser/etc. machine tools	Japan	
	Parts nes gas turbines	USA	
India	Parts nes gas turbines	USA	95.6
	Other gas turbines nes	Canada	
	Laser/etc. machine tools	USA	
Brazil	Milling machine	USA	64.9
	Metallurgical resist-weld equip. automatic	Japan	
	Metal arc welders automatic	China	

**Source:** Authors' estimates based on WITS online database (World Bank).

## Barriers and High Technology Exports

Of course, like any other commodity, high technology exports are influenced by duties and non-tariff barriers (NTBs). If duties and barriers are high, exports would be low. For this reason, we have also looked at duty rates of the same. Our analysis is however focused on leading product of exports of India. Also, we have not excluded aerospace and armaments exports out of the purview of analysis due to unavailability of data. The obvious country for comparative analysis is China. The data is summarized in Table 16.

The data in Table 16 indicate that India's exports of digital computer face same barriers as that of China in USA markets. Moreover, India has more liberal import regime with respect to computer office machines than China. The non-tariff barriers (NTBs) of total line is 124 in India in contrast to 244 that of China. The liberal regime is probably due to absence of too many domestic players in the production stage in India. India's leading product in the telecommunication sector in American market is switch board, which is not governed by too many NTBs,

**Table 14.** Trade in Chemicals: Stylized Facts (Thousand dollars and percentage)

Country	Exports in Value					Share in Global Exports (%)				
	1995	2006	2007	2008	2009	1995	2006	2007	2008	2009
Austria	32,608	174,872	264,933	302,552	272,092	0.16	0.41	0.51	0.47	0.65
Belgium		1,667,673	2,121,514	2,832,510	2,373,045		3.89	4.05	4.39	5.63
Brazil	167,466	506,171	834,085	1,002,453	824,899	0.81	1.18	1.59	1.55	1.96
Canada	326,500	582,260	3,309,612	2,423,915	1,603,936	1.57	1.36	6.32	3.75	3.81
China	1,281,946	4,364,805	5,905,633	7,389,694	3,850,218	6.18	10.18	11.27	11.45	9.14
Denmark	24,693	151,187	247,160	387,067	343,695	0.12	0.35	0.47	0.60	0.82
France	1,356,769	4,229,369	5,582,871	7,758,544	6,070,587	6.54	9.87	10.66	12.02	14.41
Germany	2,498,919	4,387,025	4,976,205	7,202,341	6,503,304	12.05	10.23	9.50	11.16	15.44
India	160,225	1,032,173	1,066,698	1,431,210		0.77	2.41	2.04	2.22	
Israel	110,429	505,904	8,626	818,944	575,736	0.53	1.18	0.02	1.27	1.37
Japan			1,895,068	2,404,369				3.62	3.72	
Korea	125,546	1,183,552	1,400,506	2,100,697		0.61	2.76	2.67	3.25	
The Netherlands	996,574	2,431,826	2,803,639	2,881,093		4.80	5.67	5.35	4.46	
Russia	470,342	309,712	358,379	506,820	419,250	2.27	0.72	0.68	0.79	1.00
South Africa	291,524	459,821	522,271	580,126	397,439	1.41	1.07	1.00	0.90	0.94
Sweden	63,624	82,419	192,219	182,993	66,519	0.31	0.19	0.37	0.28	0.16
Switzerland	740,750	780,384	990,949	1,169,184	875,979	3.57	1.82	1.89	1.81	2.08
UK	1,996,915	1,422,291	1,630,102	1,763,081	1,617,715	9.63	3.32	3.11	2.73	3.84
USA	3,212,498	6,294,093	7,845,255	8,195,815	7,515,598	15.49	14.68	14.97	12.69	17.84
World	20,743,063	42,863,482	52,393,776	64,560,336	42,127,342					

**Source:** WITS online database (World Bank).

**Table 15.** Decomposition of Trade in Chemicals (2008)

Country	Trade in Chemicals (Top Three Items)		Share of Top Three Exports in Total (%)
	Exported Items	Destination of Exports	
USA	Silicon		82.2
	Radioactive, etc., material		
	Household/garden chemical		
Germany	Radioactive, etc., material		83.3
	Non-metals Se/Te/P/As/Bo		
	Household/garden chemical		
Japan	Oth oxides, bases etc. nes		86.8
	Household/garden chemical		
	Silicon		
China	Polyethylene terephthalate	Russia	70.3
	Silicon	Japan	
	Household/garden chemical	USA	
India	Household/garden chemical	USA	99.0
	Polyethylene terephthalate	USA	
	Non-metals Se/Te/P/As/Bo	China	
Brazil	Oth oxides, bases etc. nes	USA	98.1
	Household/garden chemical	Belgium	
	Silicon	USA	

**Source:** Authors' estimates based on WITS online database (World Bank).

**Table 16.** Barriers to High Technology Trade (2008)

Leading Product (Broad Product Group)	Exporting Country	Importing Country	Weighted Average Tariff	NTBs of Total Lines
Digital computers (computer office machines)	China	USA	0	12
Digital computers (computer office machines)	India	USA	0	12
Digital processing units (computer office machines)	OECD countries	China		244
Digital computers (computer office machines)	OECD countries	India	0	124
Video recorders/players (telecommunications)	China	USA	0	15
Switchboards etc. < 1,000 V (telecommunications)	India	USA	5.4	9
Diodes/transistors/etc. (telecommunications)	OECD countries	China	NA	178

(Table 16 continued)

(Table 16 continued)

Leading Product (Broad Product Group)	Exporting Country	Importing Country	Weighted Average Tariff	NTBs of Total Lines
Telephone equipment (telecommunications)	OECD countries	India	NA	27
Hormones/steroids/derivs (pharmacy)	China	India	55	36
Hormones (pharmacy)	India	USA	0	19
Glycosides/glands/vaccines (pharmacy)	OECD countries	China	3.4	200
Glycosides/glands/vaccines (pharmacy)	OECD countries	India	60.0	543
Optical appliances nes (scientific instruments)	China	USA	13.6	33
Medical etc. EL diag. equip. (scientific instruments)	India	USA	0.6	60
Physic./chem. analysis equip. (scientific instruments)	OECD countries	China	6.7	310
Automatic control instr. (scientific instruments)	OECD countries	India	55	184
Special use EL equip. nes (electrical machinery)	China	USA	6.4	32
Special use EL equip. nes (electrical machinery)	India	USA	2.7	29
Special use EL equip. nes (electrical machinery)	OECD countries	China	4.0	259
Special use EL equip. nes (electrical machinery)	OECD countries	India	24.3	247
Parts nes gas turbines (non-electrical machinery)	China	USA	3.2	7
Parts nes gas turbines (non-electrical machinery)	India	USA	2	7
Laser/etc. machine tools (non-electrical machinery)	OECD countries	China	8.5	93
Laser/etc. machine tools (non-electrical machinery)	OECD countries	India	32.8	85
Household/garden chemical (chemicals)	China	USA	NA	NA
Household/garden chemical (chemicals)	India	USA	NA	NA
Polyethylene terephthalate (chemicals)	OECD countries	China	19.5	60
Polyethylene terephthalate (chemicals)	OECD countries	India	55	34

**Source:** Estimated from WITS database.

**Note:** NA = Not available.

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even though there is marginal tariff (5 per cent) on it. We find that India's import regime is more liberal than China in respect of NTBs of the telecommunication equipments. With respect to pharmacy items, the leading exported product of India, namely, hormones, attracts zero tariffs in USA, and there are 15 NTBs of total lines on the same. By contrast, Chinese leading product, hormones/steroids/derivs (pharmacy), faces higher tariffs as well as NTBs in American market. On the import side, it is surprising to note that India's duties as well as NTBs are significantly higher than that of China in the case of leading imported items. India's principal product of scientific instruments exported to US market is governed by large NTBs. By contrast, Chinese export is concentrated on product which has low NTBs. Thus, the choice of exported product matters. As Table 3 indicates, trade barrier is not an issue in case of leading items of India's exports of non-electrical and (to some extent) electrical items to US market. Chinese items face stricter barriers in the US market. Import barriers on leading items of non-electrical machinery, namely, laser/etc. machine tools, is high in India compared to China, which may have impinged export's growth, if these are used for producing high technology exported items. This may be a factor responsible for slow usage of industrial robots in India's production process, essential for producing certain electronics and computer-related items.

In sum, barrier to trade is not a major issue that has prevented high technology exports. However, growth would have been higher if India would have concentrated on products which have low NTBs. China has done the same in some cases.

## Concluding Remarks

By and large, India's performance on the high technology manufacturing export front is not too impressive. India is a small player in most of the product categories, barring pharmacy sector. In the last 10 years' period of observation, India has not been able to increase her presence significantly in most of the segment. By contrast, China, starting from the similar base like India in some of the segments, has exhibited marked improvement. Since pharmacy is one sector where India is doing well, it would make sense to nurture this sector. However, the data in 2007 and 2008 indicate that the share of the same in global exports has declined in post-2006 period. It is also surprising that India, with a large scientific base, occupies such a small share in respect of trade in scientific instruments. The high technology exports of non-electrical machinery seem to have risen in the years succeeding 2006. This is a positive development.

It is evident from disaggregated analysis that India, unlike China, has not been able to make significant inroads in the high-end segment of goods. However, compared to past, we can see some evidence in this direction. Furthermore, India needs to introduce industrial robots in a big way in the production process if she

wants to increase her production capability in electronic commodities. China has basically followed the same path.

To some extent, undervaluation of Chinese currency, yuan, has helped Chinese export in general and high technology exports in particular. However, by its nature, high-tech products imply that there are limited suppliers of such products. So, exchange rate would not probably be a major factor in boosting Chinese exports.

To some extent, high technology exports depend on innovativeness of the economy which in turn is dependent on government's support towards innovation support mechanism in the economy (Pohit, 2012b). This has been a fact in case of China (Peters, 2005). However, the innovation support mechanism through government's initiation has been weak in case of India. This needs to be strengthened. In many countries, public procurement has been used as a tool to support new ideas/innovation, which has subsequently given to spin-off in exports (Pohit, 2012b). Indian government has not been too forthcoming in this regard.

The barriers to trade are not a factor for India's high-technology exports. However, it is also true that growth would have been higher if India would have concentrated on products which have low NTBs. China has done the same in some cases.

### Acknowledgements

The authors would like to acknowledge the comments of anonymous referees of the journal and Dr Parthasarathi Banerjee, Director, NISTADS (CSIR), which have helped towards the improvement of the article. The earlier draft of the article was presented in the Workshop on SUPRA, held at NISTADS (CSIR), 2012. The views expressed in the article are those of the authors and not of the organization to which they belong. Usual disclaimers apply.

### Notes

1. BRIC: Brazil, Russia, India and China.
2. Author's estimate based on disaggregated data. Since this product category occupies marginal share in world's basket, the estimated table is not produced here for space limitation. Interested reader may secure the table from author.
3. Author's estimate based on disaggregated data.

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