

**Process of Trade Liberalisation under the Information
Technology Agreement (ITA):
*The Indian Experience***



Working Paper

Murali Kallummal*

Associate Professor,
Centre for WTO Studies, IIFT

April, 2012

Centre for WTO Studies (CWS)

Indian Institute of Foreign Trade,
New Delhi

* The author would like to express his sincere gratitude to Prof. Abhijit Das (Head, Centre for WTO Studies) for the inspiration, comments and support extended. The responsibility for the contents in this paper rests solely with the author. The mail ID of the author is muralik@iift.ac.in.

Table of Contents

1. Introduction	1
<i>Methodology and Section Scheme of the Paper.....</i>	<i>3</i>
2. Information Technology Agreement Negotiations	4
3. Tracing the History of India’s Information Technology Sector	7
<i>Indian Software Industry and the Role of Government.....</i>	<i>8</i>
4. Performance of Hardware Sector in India and the ITA-1	13
<i>Tariff Elimination and Sequencing under the ITA-1.....</i>	<i>15</i>
<i>Technical Standards: TBT notifications under the WTO</i>	<i>17</i>
5. Trade Liberalisation of Information Technology Products	22
6. Scenario of Indian Hardware Sector - Dependence on Imports.....	35
<i>Estimation on the Growing Role of Imported Raw Materials in India</i>	<i>35</i>
7. Conclusion	39

List of Tables

Table 1: ITA member countries by economic status, 1996–2011	5
Table 2: Software Centres of India and their Ranking.....	11
Table 3: India’s Software Exports: A comparison Pre and Post ITA-1	12
Table 4: Tariff Reduction Schedules under the ITA-1.....	16
Table 5: TBT Measures: On Specific Four Digits Product Coverage (Top 31 Countries).....	18
Table 6: Top Thirty Suppliers of ITA products to India.....	28
Table 7: Top 50 Imported Product under the ITA-1 list by India.....	29
Table 8: Top Thirty Exports of ITA products to India.....	31
Table 9: Top 50 India’s Exported Values and Shares (164 Products of ITA-1).....	32

List of Figures

Figure 1: Map of ITA members of WTO	4
Figure 2: Evolution of India’s Information Technology (IT) Hardware Industry	7
Figure 3: Average MFN Tariffs of India on ITA Products and Count of HS 6 Digits Tariff Lines	15
Figure 4: TBT Measures: Cumulative and Product Coverage under the Yearly Notification	17
Figure 5: Usage of National Vs International TBT Measures under the ITA	19
Figure 6: TBT Standardised Objectives: by the Members of ITA Signatories.....	20
Figure 7: Developed and Developing Countries Usage of the Objective	21
Figure 8: Total Exports: Category-wise Share of ITA-1 Products	22
Figure 9: Total Imports: Category-wise Share of ITA-1 Products	23

Figure 10: Trends in India's Total Trade of ITA-1 Products.....	24
Figure 11: Shares Exports and Imports of Machinery and Transport Equipment (SITC-7) to India Total	25
Figure 12: Trend in India's Exports and Imports in terms of Values	26
Figure 13: Import Trends in Manufacturing Sector in India (percentage shares)	27
Figure 14: Export Trends in Manufacturing Sector in India (% shares).....	30
Figure 15: India's Tariff lines with IIT (GL index >0.5): total ITA-1 Products.....	33
Figure 16: World Tariff lines with IIT (GL index >0.5): total ITA-1 Products.....	33
Figure 17: Intra-Industry Trade: Comparison of GL Indices of World and India	34
Figure 18: Comparative Exports and Imports of China and India to World:.....	34
Figure 19: Indian Hardware Sector: Trends in Disclosure and Imported Contents	36
Figure 20: Unadjusted Trends in Imported Raw Material Content to Total Sales.....	37
Figure 21: Adjusted Trends in Imported Raw Material and Total Sales	38
Figure 22: STAN Input-Output Imports content of Exports (India)	39

List of Annexure

Annexure 1: Broad Measure: Category-wise TBT notifications	44
Annexure 2: Developing Countries with Broad Criteria for ITA Products (Notifications).....	44
Annexure 3: Total Membership TBT Measures – (yearly notifications & Avg. Cov. per Notif's).....	45
Annexure 4: Detailed Year-wise usage of National Vs International Standards in ITA-1 Products	45

Process of Trade Liberalisation under the Information Technology Agreement (ITA): *The Indian Experience*

Abstract

Information Technology Agreement (ITA) is a 'Plurilateral' agreement which has its roots to the Uruguay Round and was designed to achieve lowering/elimination of all entry barriers on information technology products. It was signed in 1996 and became operational in 1997 after the ITA achieved the critical mass of 90 percent of world trade. Presently, the trade coverage after including the 74th member Columbia is almost 97 percent of world trade. The special and differential treatment (S&D) principle was an integral part of ITA for addressing the tariff elimination in the listed products by the members. This mandated differential treatment of developed and developing countries and further the benefits of liberalisation were extended to all WTO members. The signatories were mandated to extend the liberalisation (zero tariffs) benefits to all the WTO members on MFN basis. The ITA-1 products belonged to broadly six product groups: computers; telecom equipment; semiconductors; semiconductor manufacturing and testing equipment; software and scientific instruments

One of the challenges for the WTO till date has been to address the issue of the growing gap between the tariffs liberalisation and non-tariff measures. In general, while the average MFN tariffs have on the decline over the years correspondingly there has been a surge in non-tariff measures - like the TBT measures. The IT Agreement too suffered the consequences of the existence of this growing imbalance which took away the potential market access away. All the initiatives of liberalisation were nullified due to this growing number of NTMs. The TBT measures were initiated primarily as a measure intended to protect human safety and environmental protection but some of them were politically and economically motivated. Hence, the process of WTO negotiations from 1996 to up until 2012, only provided market access to few developed countries and the countries which were already the part of global production network. A detailed examination of these measures has been conducted in this paper using the Centre for WTO Studies TBT database. In India's case, there was a clear increase in dependence on imports. The trends were one of high concentration in terms of the number of suppliers of these products to India. It also indicates a tacit denial of "market access" by many developed and other emerging developing countries.

The myth that India's software export successes were a direct outcome of the liberalisation under the IT Agreement of 1996. This has been proved completely misplaced and has no basis. This has been clearly established in this paper. Two major objectives of the ITA were to increase trade and competition through trade liberalization for information technology (IT) products and secondly the global diffusion of information technology. Both these have only been partially achieved as there has been concentration of trade into few players after the formation of the Agreement. Another, critical aspect which emerges from this study is the impact on overall employment in the context of a decrease seen in indigenous content, in a growing export market of IT products, this only substantiates that there has been a reduction in local value addition; subsequently leading to an adverse impact on employment generation capacity by this sector.

Process of Trade Liberalisation under the Information Technology Agreement (ITA): *The Indian Experience*

Murali Kallummal

1. Introduction

Information Technology Agreement (ITA), 'Plurilateral' agreement emerged from the Uruguay Round and was designed to achieve lowering of all taxes and tariffs on the identified information technology products by signatories to zero - this was applicable on MFN basis. During the Singapore Ministerial Conference of the WTO, a proposal for the expansion of world trade in information technology products was adopted vide the "Ministerial Declaration on Trade in Information Technology Products" dated 13th December 1996. The declaration was adopted by 14 parties including the QUAD Countries (USA, Canada, Japan and EU), Singapore and Hong Kong, representing about 80% of the world trade in these products. The agreement became effective once the number of countries joining the agreement represented 90% of the trade in information technology products.

The two major objectives of the ITA was to increase trade and competition through trade liberalization for information technology (IT) products and secondly the global diffusion of information technology. Therefore, a critical and substantial mass of 90 percent was identified as the benchmark for its implementation in 1997. The ITA-1 came into effect in 1997 with only 29 WTO members and increased to 72 signatories by 2008. The trade coverage by 2008 was approximately \$4 trillion and with a global share of 95 percentages. Colombia became the most recent signatory of ITA and it was the 74th member of the ITA. The trade coverage after including Columbia almost touched 97 percent of the total world trade. ITA completely eliminates duties on IT products of participants and these benefits are extended to all WTO members.

The mandate of ITA-1 was to establish tariff-free trade in six product groups namely: computers, telecom equipment, semiconductors, semiconductor manufacturing and testing equipment, software and scientific instruments. The participating countries agreed to bind and eliminate all customs and other duties and charges on information technology products by the year 2000. However, the important issue of Non-tariff measures (NTMs) was left to be investigated by the parties as part of the on-going ITA process.

The NTB work programme¹ in the Doha Round was preceded by some work that the WTO members had done on this issue with regard to the IT sector. In this sector, steps have been taken towards the identification and subsequent development of a harmonized structure on NTBs under the WTO work programme. The NTB work programme, which began at the end

¹ The terminology of Non Tariff Barriers (NTBs) and Non Tariff Measures are inter-changeably used in this paper and they both mean the same.

of 2000, had three phases. In November 2000, a “Non-Tariff Measures Work Programme” was launched by the Committee of Participants on the Expansion of Trade in Information Technology Products (ITA Committee) to identify NTMs and assess their impact on IT trade. However in 2003², the ITA committee had suggested steps to be followed like: identifying next steps, examining ways to harmonize the conformity assessment³ for ITA products on EMC/EMI, and examining other means to facilitate the market access of ITA products. The pilot project could ultimately contribute to how countries can choose to facilitate market access of ITA-1 products. The successful completion of EMC/EMI Pilot Project by 2005 raised substantial hope in terms of market access gains in ITA products.

While the tariff elimination was carried-out on an MFN basis and began from July 1st, 1997 the NTMs deliberations probability continued even after 2010.⁴ However, the tariff elimination was done in four stages with equal tariff reductions: the first stage when it was initiated in July 1997 and the second began on January 1st, 1998; the third from January 1st, 1999 and the fourth and the final stage was in the month of January 1st, 2000.

For developing countries who were the initial signatories of ITA-1, tariff elimination schedule agreed to be specified differently under the S&D principles: Costa Rica, Indonesia, India, Korea, Malaysia, Chinese Taipei, and Thailand have been granted flexibility in cutting their tariffs on a few products to zero after the year 2000 but not beyond 2005. India on its part eliminated tariffs for all the ITA products by 2005. So the actual impact of the agreement on India was felt only by 2005 when the tariffs on 62 % of the total products were reduced to zero.

As the ITA-1 relates to the area of managing technology and spans a wide variety of areas that include computer software, information systems, computer hardware, programming languages, but are not limited to things such as processes, and data constructs. In short, anything that renders data, information or perceived knowledge in any visual format whatsoever, via any multimedia distribution mechanism, is considered part of the information technology (IT) domain.

² In the 2003, the ITA Committee after identifying and examining non-tariff measures (NTMs) for ITA products. The workshop in 2003 suggested for a forum for regulators responsible for electromagnetic compatibility/electromagnetic interference (EMC/EMI) measures and trade policy representatives to discuss the survey results and consider what could be the next steps in this exercise.

³ Conformity assessment means nothing but the compliance with a very high standard as indicated by the national compliance authority under its guidelines of Electronic Emissions Guidelines. This can be very tricky issue for the electronic industry.

⁴ In 2010, the committee continued its deliberations on the non-tariff measures (NTMs) work programme, in particular a pilot project relating to conformity assessment procedures for electromagnetic compatibility (EMC) and electromagnetic interference (EMI). The committee noted that 24 of the 46 participants in the EMC/EMI project had provided details of their conformity assessment procedures and encouraged those who had not provided the information to do so without further delay. In considering ways to advance and expand its work on other NTMs, the committee heard reports and updates by participants on their contributions to the work programme, including in other bodies of the WTO such as the Negotiating Group on Market Access. There is issues related EC compliance in the context of “*CE Compliance Testing Delays Launch of Raspberry Pi Mini PC*”, this issue lingering even as late April 10, 2012.

The hardware industry is strategic for any country for a simple reason that it provides further business opportunities for a set of core services to execute the business strategy like, business process automation, providing information, connecting with customers, and productivity tools.⁵ The other reasons could be that the government in the past invested in the development of this sector in line with indigenisation process - realising the importance of this IT sector and its relationship with the other sectors of the economy.

Methodology and Section Scheme of the Paper

This paper provides an overview of the IT sector and describes the level of its impact on Indian economy from a specific point of view of the liberalisation of ITA-1. We propose to examine three fundamental questions: **firstly**, whether the liberalization of ITA-1 lead to increase in competition in the sector, trade and import dependence; **secondly**, whether the global diffusion of information technology was a reality;⁶ and **thirdly**, how was the global market access scenario for ITA products in terms of keeping a balance between tariff liberalisation and non-tariff measures harmonisation to the international standards.

These three fundamental questions would be answered primarily using India's case study of ITA-1 products. The first of the three questions is rather simple and straight forward and illustrated through tracing the history of Indian Information Technology and analysing whether there were any major shift in the direction of trade (DOT) in these goods. However, the second question of global diffusion would be attempted by providing some clues; however these may not be conclusive evidences. And, the last aspect is addressed through the Centre for WTO Studies database on the TBT and SPS measures (NTMs) in this paper. For this paper we have extensively used various databases like, WITS COMTRADE (both HS and SITC nomenclatures) and PROWESS of Centre for Monitoring Indian Economy (CMIE) and reports by the Planning Commission of India and various ministries of Government of India. We have also used GL-index to understand the trends in terms of intra industry trade calculated at 6 digit HS level. In these lines the paper further examines DOT of the ITA trade between 1996 and 2010, highlighting the changing composition of trade by leading exporting and importing nations and profiles ITA trade by product segment thereafter focusing the NTMs issues and the changing composition in terms of consumer, capital, intermediate and raw materials.

This paper is organized into seven sections. In section **two**, we shall be briefly examining the ITA negotiations process under WTO since 1996 and the additions thereafter on a yearly basis. **Section three** of the paper traces the history of hardware and software sector related policies and export success of India. **Section four** presents evidence on the growing importance of non tariff measures (NTMs) in the proposed ITA-1 at HS digit 6 tariff lines, leading to an imbalance in market access scenario. **Section five** explores the reasons for India's electronics hardware industry behind the dismal performance of India in terms of

⁵ The same was also expressed in the India's Recent "National Manufacturing Policy 2011" press note.

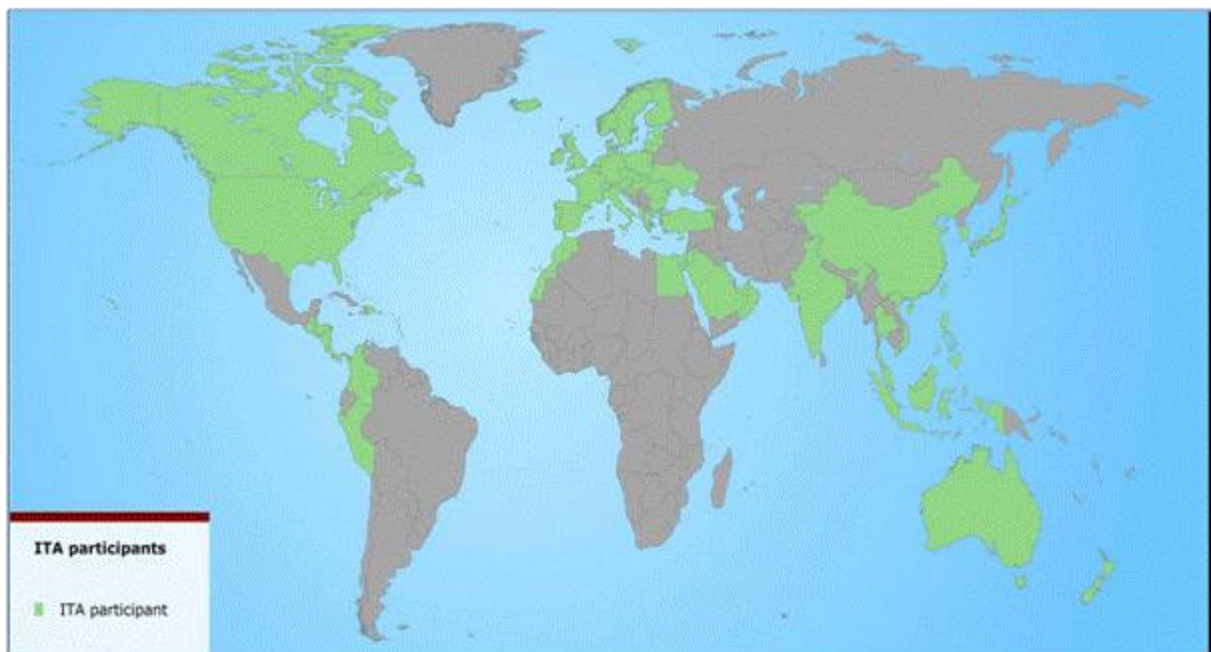
⁶

capturing even a minuscule share of the global electronics hardware as compared to her neighbouring Asian countries like the People's Republic of China, Taiwan, and South Korea etc. This is done using actual trade data, dividing it into two phase analysis: the long run analysis was done using the SITC nomenclature while the short run analysis was done using the HS nomenclature. **Section six** would be focusing on the growing import dependence of Indian hardware sector. It would be using company level information to come to any conclusion on the nature of import dependence on total raw material and sales. Finally, section **seven** would be giving an overarching conclusion to the whole ITA-1 liberalisation and its impact on India.

2. Information Technology Agreement Negotiations

One of the important WTO Agreements of the Singapore Ministerial Mandate has been the Information Technology Agreement (ITA). Presently there are 74 signatories to this plurilateral agreement which accounts for about 97 percent share of total world trade in Information Technology (ITA-1) products.

Figure 1: Map of ITA members of WTO



Source: WTO website downloaded as on 04-04-2012, http://www.wto.org/english/tratop_e/inftec_e/ita_map_e.htm.

Considering the key role of information technology as an agent of economic and social transformation and recognizing the need for promoting IT diffusion, the ITA aimed at expanding world trade in information technology products. The ITA came into force in 1997 and required primarily the elimination of tariffs, other duties and charges on the goods covered by the ITA in maximal four stages until 2000. However, as discussed earlier some developing countries were given special and differential treatment under this agreement, therefore these countries got some additional years over 2000.

The participants are required to abide by the Most Favoured Nations (MFN) principle, unlike the Government Procurement Agreement (GPA) under the WTO. Hence, the benefits of zero tariffs are extended to the non-ITA members of the WTO. While the ITA is open to non-WTO members, it is not mandatory on their part to be a signatory of the plurilateral Agreement. Even in 2012, the ITA-1 has been an agreement under which only tariff cutting has happened successfully, as the status of national level of harmonisation on the issue of non-tariff barriers has been inconclusive.⁷

Table 1: ITA member countries by economic status, 1996–2011

Year Joined ITA	High Income ^(a)	Upper Middle Income ^(a)	Lower Middle Income ^(a)	Low Income ^(a)
1996	Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Hong Kong, Iceland, Ireland, Italy, Japan, South Korea, Liechtenstein, Luxembourg, Netherlands, Norway, Portugal, Singapore, Spain, Sweden, Switzerland, Chinese Taipei, United Kingdom, United States	Turkey	Indonesia	
1997	Czech Republic, Estonia, Israel, Macao, New Zealand, Slovak Republic, Italy	Costa Rica, Malaysia, Poland, Romania	El Salvador, India, Philippines, Thailand	
1998		Panama		
1999	Croatia	Latvia, Lithuania, Mauritius	Albania, Georgia, Jordan	Kyrgyz Republic
2000	Cyprus, Oman, Slovenia			
2001		Bulgaria	Moldova	
2003	Bahrain		China, Egypt, Morocco	
2004	Hungary, Malta			
2005			Nicaragua	
2006	Saudi Arabia	Dominican Republic	Guatemala, Honduras	
2007	United Arab Emirates			Vietnam
2008		Peru	Ukraine	
2011			Colombia	

Source: Michael Anderson and Jacob Mohs, 2009, The Information Technology Agreement: An Assessment of World Trade in Information Technology Products (Table 1). The 2011 information was added by the author based on WTO ITA information in order to complete the list of ITA members.

Note: EU members in italics. a= Based on World Bank income classification.

Of the total 74 signatories only a few have been active participants in this plurilateral agreement. This is evident from the “*Report on Implementation and Monitoring of the WTO Agreements*” of 2010, wherein under ITA-1 only 24 of the 46 participants in the EMC/EMI project had provided details of their conformity assessment procedures. Other members were also requested to follow similar conformity assessment procedures. So with less than half of the signatories only 83 percentages of original signatories of 1997 were active members which is not a healthy way forwards.

⁷ Refer to footnote 4 of this paper.

Till date the disputes have been limited to the developed countries only, with developing country members being affected as third party only. Even in terms of the products choices of the ITA-1 list, the concerns of developing countries like India were not considered, as it was primarily based on the original membership of ITA-1 countries. Therefore, it could be said that some of the concerns of developing countries may not have been addressed in the process of negotiations from the very beginning.

The first dispute cases were DS 62, 67 and 68 which were all targeted against European commission. Almost all were related to customs classification of certain computer equipments and the complainant was the United States. The third parties to these disputes were India; Japan; South Korea and Singapore. The product under dispute was Computer equipment associated with LAN namely, (i) LAN equipment such as network or adaptor cards and (ii) multimedia PCs. The ITA was brought against the European Union by the United States, Japan and Taiwan involves three sophisticated IT products: set-top boxes, flat screen monitors and multifunctional printers. All three have several functions and can be used for different purposes. A TV set-top box can provide internet access, a flat screen monitor can be plugged into a computer or be used for TV and a multifunctional printer can make photocopies. Further the EU's argument was partially weakened by the February 20, 2009 ruling by the European Court of Justice, which found that wide-screen LDC monitors with multiple connection possibilities do fall under the scope ITA and thus should be imported free of duty.⁸ Negotiated in 1996, the ITA eliminated tariffs on eight major categories of ICT products such as semiconductors, computers, and telecommunication equipment. However, as visionary as it was, the initial ITA agreement still did not cover a number of core ICT products such as DRAMs (dynamic random access memory chips) nor dozens of every-day consumer electronic products, including many types of audio-visual equipment such as audio speakers, DVD players, and video cameras.⁹

Keeping in view the importance of information technology in international trade, fourteen participants' submitted proposals on expansion of trade in IT products (referred to as ITA-II). These proposals were discussed extensively in various meetings of the WTO during April-June 1998 and subsequently. The updated list of products proposed to be covered under ITA II includes a few consumer electronic items and certain security related products which is one of the main reasons why it has not been possible for the members of ITA to come to a consensus yet.¹⁰ Further, what may be emerging from the Doha Round is the deadlock to the increasing role of the **Plurilateral** Agreements like Government Procurement Agreement (GPA) and Anti-Counterfeiting Trade Agreement (ACTA).

⁸ Bridges Review, 2009, "*Trade in Information Technology: Is the ITA Still Relevant?*", **News and Analysis**, Volume 13, Number 1, March, International Centre for Trade and Sustainable Development (ICTSD).

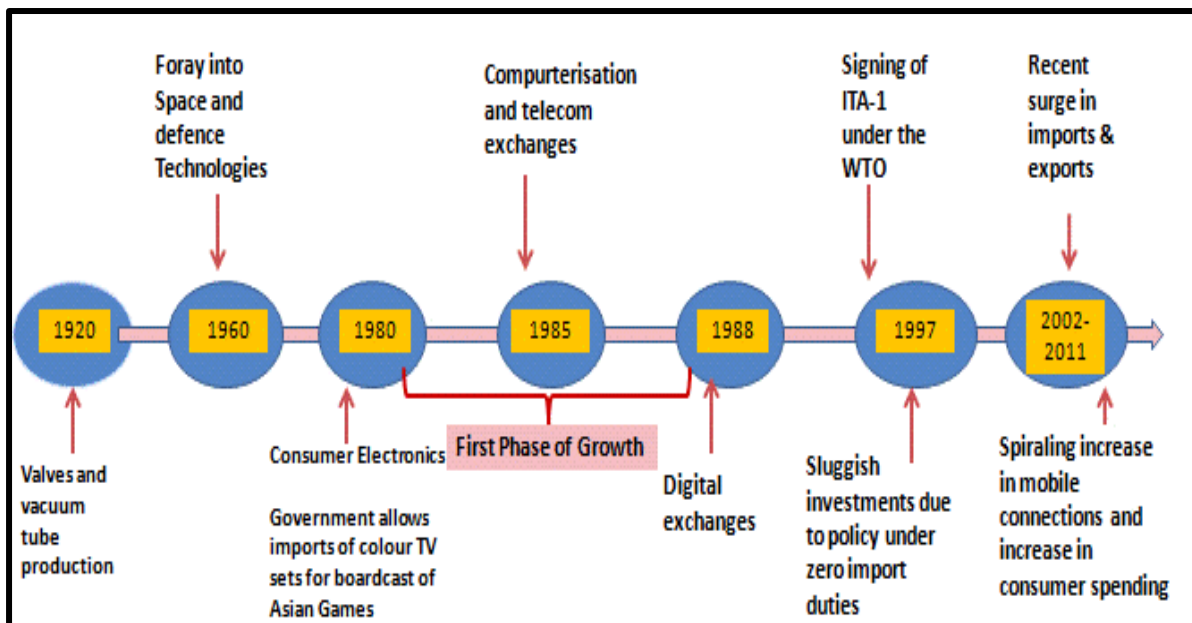
⁹ Ezell Stephen, 2012, "Boosting Exports, Jobs, and Economic Growth by Expanding the ITA", Information Technology Industry Foundation, March 15, http://www.itic.org/index.php?src=blog&srctype=blog_detail_techlect&refno=180&category=TechElect&print=y

¹⁰ Department of Commerce, GoI, "Brief note on Status Regarding Information Technology Agreement (ITA-II)" Department of Commerce, New Delhi.

3. Tracing the History of India's Information Technology Sector

India's first proximity with information technology (IT) began with the import of EVS EM computers (hardware enabled with software) from the Soviet Union, which was used in large companies and research laboratories. The concept of IT as an industry began to take root in India in the late 1960's. Roughly forty years ago in 1968, the Tata Consultancy Services was established in Santacruz Electronics Export Processing Zone (SEEPZ)¹¹ located in Mumbai. It was the first by the Tata Group (a private sector) and it was the country's first largest indigenous software producers.

Figure 2: Evolution of India's Information Technology (IT) Hardware Industry



Source: Figure 3 from the Report Human Resource and Skill Requirements in the Electronics and IT Hardware Industry, p.7.< http://www.mit.gov.in/sites/upload_files/dit/files/Electronics_IT_Hardware_NSDC_Report_1732011.pdf>

It should be noted that majority of such efforts were as part of direct outcome of government supported programme and policies. These efforts were carried out by the government to emancipate the economically beleaguered country to build a large scientific workforce. The National Informatics Centre was established in 1975 and was followed by a boom of indigenous IT companies such as Tata Infotech, Patni Computers and Wipro.

A series of government funded supports to institutions, both private and public sectors, since mid 1960s made India one among the three countries to produce super computers. During the

¹¹ Santacruz Electronics Export Processing Zone (SEEPZ) is a Special Economic Zone in Mumbai, India. Situated in the Santacruz East area, it is subjected to liberal economic laws as compared to the rest of India to promote rapid economic growth using tax and business incentives and attract foreign investment and technology[1]. Seepz was created in 1973 and was seen as export processing zone[2]. Since then many other SEZ's have been created in rest of India. SEEPZ mainly houses Electronic Hardware Manufacturing Companies, Software Companies and jewellery exporters of India. More than 40 percent of India's total jewelry exports (\$2,222.31 million) out of \$5,210.69 million during year 2006-2007 came from units within SEEPZ[3]. Despite its name, it is not located near the suburb of Santacruz, rather it is located closer to Andheri that lies further north.

sixties, India was the third country after the United States of America and the Soviet Union to have such capacity.

After attaining independence in 1947, India invested heavily in science and technological institutions, like the Indian Institute of Technology (IIT).¹² This led to the creation of an army of trained engineers and with the relaxed immigration law in the United States of America (1965), it was the perfect breeding ground for today's software successes. The US attracted a number of skilled Indian professionals aiming for research in this new area. By 1960 as many as 10,000 Indians were estimated to have settled in the US. By the 1980s a number of engineers from India were seeking employment in other countries. In response, the Indian companies realigned wages to retain their experienced staff.

The United States technological lead was driven in no small part by the brain power of brilliant immigrants, many of whom came from India. The inestimable contributions of thousands of highly trained Indian migrants in every area of American scientific and technological achievement culminated with the information technology revolution most associated with California's Silicon Valley in the 1980s and 1990s.

The Indian government created three wide-area computer networking schemes: INDONET – which was intended to serve IBM networks across the country, NICNET- the network created for the NIC, and Education and Research Network (ERNET) which was oriented towards educational research; in the years 1986-1987. With the birth of the 90's, India saw massive changes in the IT industry. The Department of Electronics created Software Technology Parks of India (STPI) in 1991, which is basically an export oriented scheme for the development and export of computer software, including export of professional services. The decade saw a massive stride in India's economic growth, partly due to the extensive internet connectivity provided all over the country at that time.

Indian Software Industry and the Role of Government

The first Computer Policy of 1984 and Software Policy of 1986 emphasized the concept of software development and export through data communication links. The objective of this policy was to develop software in India using Indian expertise on sophisticated computers, which were being imported duty free. This way, one could make use of the low cost expertise available in India and avoid the expense of time and cost in travelling abroad.

However, there was a substantial cost involved in the data communication links. As per the policy, companies were allowed to establish data communication links by their own initial investments. The ownership of the equipment and the operations of the same Gateway would remain with VSNL and VSNL would pay back to the user over a prescribed period after deducting the operational maintenance costs. Following the economic liberalization of 1991,

¹² In August 1951, the minister of education Maulana Abul Kalam Azad inaugurated the Indian Institute of Technology at Kharagpur in West Bengal, possibly modeled after the Massachusetts Institute of Technology.

the government of India established the software technology parks of India (STPI) scheme and opened numerous software parks around the country. These parks have played a critical role in the growth of India's software sector.

India's strength lies in its availability of pool of scientists and engineers and quality of maths and science education along with quality of business schools.¹³ India also ranked quite high in terms of cluster development, foreign technology licensing and Government prioritization of ICT. However, Information and communication technologies (ICT) have brought about revolution in India particularly since 1990s.

The emergence of a strong Indian software industry occurred due to the concerted efforts on the part of the Government, particularly since 1980s, and host of other factors like Government-Diaspora relationships, private initiatives, emergence of software technology parks, clustering and public private partnerships. Looking into the past and present trends of the Indian IT industry has strengthened the needs of IT sector to act as a catalyst of growth and development.

India's software export growth does have enough lessons for other countries to model their IT policy which may help them to shape their IT industry as driver of growth and development. IT firms were actually required to export software in the early days of the industry. This arose in the context of a shortage of foreign exchange in India in the 1970s and early 1980s. Software firms that needed imported inputs were required to earn foreign exchange themselves through export of software. This also enabled them to get an idea of global markets at a very early stage of development.

Besides formulating the national vision to promote software industry in India in the early 1980s by the government, there were deliberate attempts by the companies to promote software production like compilers, device drivers and operating system to cater to the domestic hardware sector. The high tariffs for the hardware sector had meant that the production of domestic hardware segment (including PCs which were introduced in the same period) had to be sustained, requiring necessary software's like operating system and drivers.

Subsequently by mid 1980s, software started coming up unbundled with the hardware. This further gave fillip to the software industry and exports. The 1990s and early 2000 saw the rise of Software Technology Parks and formation of the Ministry of Information Technology, respectively. Despite liberalization of the 1991, the software industry flourished signifying the inherent strength that it developed due to benign and enabling environment provided over a period of time and also the fact that the 1990s saw the dramatic decline in telecommunication costs (government explicit intervention) and the commercialization of the internet along with the Y2K "problem".

¹³ This was owing to the visionary efforts by government of India, when in August 1951, the minister of education Maulana Abul Kalam Azad, inaugurated the Indian Institute of Technology at Kharagpur (West Bengal) and modeled after the Massachusetts Institute of Technology.

Besides the external demand emanating from the Y2K problem over the years there was considerable demand generated within the domestic economy as result of E-Governance of the corporate sector and the government, E-Commerce and Railway and Online Air bookings and Net banking. The role of government from facilitator to regulator continues to remain very vital in any of the development in the Software sector in India.¹⁴

In fact, when the Govt. announced the first Software Policy in 1986, many such issues were addressed. The STP scheme is a 100 percent export oriented scheme for the development and export of computer software, including export of professional services using communication links or physical media. This scheme is unique in its nature as it focuses on one product/sector, i.e. computer software. The scheme integrates the government concept of 100 percent Export Oriented Units (EOUs) and Export Processing Zones (EPZs) and the concept of Science Parks/Technology Parks, as operating elsewhere in the world. With STPI presence, orderly implementation of STP Scheme and the Govt. initiatives, in general, the offshore software exports from the country during 1991-92, which was mere 20-35% has grown to more than 70% during 2009-10. In fact, countries like Mauritius, Sri Lanka, Nepal, Algeria, Indonesia, etc. are taking the help of STPI to set up similar technology parks with the same concept.

Even though, STPI Centres have come-up across the country in as many as 46 locations, the major Industry concentration is at Bangalore, Noida, Mumbai, Chennai, Hyderabad and Pune, reflecting the natural technology clustering effect that has taken place in other technology clusters like Silicon Valley, Boston, Dallas, Ireland, Sweden and Tokyo. First Phase: In 1991-92, there were very few Indian companies who were doing software exports from India. Those exporting software included few multinational companies like Texas Instruments, Hewlett Packard, and Digital. One could term this as the first phase of the developmental process. Second Phase: In the second phase of the developmental process, the concept of the "Offshore Development Work" took birth. This second phase of the development, which started in 1993, took India, in fact Bangalore, Mumbai in particular, to greater heights by 1998-99. By the end of March 2001, the Industry has grown to US \$ 5.7 billion in software exports with 380 multinational companies establishing base here, the largest concentration of the technology services. All the Global Leaders in Hi-Tech areas like IC Design, Communication Software and System Software have setup a base for their operations in India. Third Phase: The success of the 2nd phase paved the path for the third phase of development to take place. The third phase of development led to very close and intimate relations with the Silicon Valley start-up companies. In fact, every small Hi-Technology Start-up Company in Silicon Valley valued at millions of dollars in US market, started establishing their development Centres in Bangalore, Pune, etc. Fourth Phase: During the fourth phase of the development many Indian companies started owning the intellectual property within India and earning the royalty from the global players.

¹⁴ Kumar, Mathur, Somesh, 2007, "*Indian IT industry: a performance analysis and a model for possible adoption*", Munich Personal RePEc Archive, RIS <http://mpra.ub.uni-muenchen.de/2368/>

The liberalisation popularly brought down the tariffs on the ITA hardware, which in turn promoted the use of these by private industries for software exports. Analysing the year of establishment of top 10 leading exporter in India of software services like, Infosys (1981), WIPRO (1945), TCS (1969), Satyam computer (1987), Tech Mahindra (1986), HCL (1976), Patni Computer Systems (1976), i-flex Solutions (1991), MphasiS (2000) and L&T Infotech (1997). Thus majority of the firms were set-up before the ITA agreement came in full existence by 2005.

Table 2: Software Centres of India and their Ranking

Ranking	City	Locational Advantages
1	Bangalore	Popularly known as the capital of the Silicon Valley of India is currently leading in Information Technology Industries in India.
		Bangalore has close to 16 public sector companies operating within the vicinity. It has the largest hub public sector technology companies directly related to information technology in India, for example like Hindustan Aeronautical Limited (1964), Antrix Co. Ltd. (1992), Bharat Electronics Limited (1954), HMT Ltd., HMT Machine Tools Limited, HMT Watches Ltd. and HMT (International) Limited (1953) and ITI Ltd (1948).
2	Chennai	It is the second largest exporter of software next to Bangalore. It has the privilege of being the capital city of Tamil Nadu. It has the largest operations for India's top software company TCS, Infosys (has world's largest development centre with 25,000 employees in Mahindra world city at Baranur near Chengalpattu, and many centers in IT corridor), and other software companies like Wipro, CTS, Patni, L&T Infotech and many companies have major operations in IT corridor, Ambattur and other places in Chennai.
3	Hyderabad	Hyderabad called as Cyberabad, which has good infrastructure and good government support is also a good educational and technology base in India. The Government of AP has built a separate township of IT Industry called theHITEC City.
		The presence of public sector has begun since 1964 with the establishment of HMT Bearings Ltd. Since then there has a number of such government initiatives the Electronics Corporation of India Ltd. (1967); Bharat Dynamics Ltd. (1970) etc.
4	Pune	Pune, a major industrial point in India. It was declared as Gamma-Global City recently. As one of the largest cities in India, and as a result of its many colleges and universities, Pune is emerging as a prominent location for IT and manufacturing companies to expand.
		It is also referred to as Education Hub of India.
5	Coimbatore	It is the Manchester of South India, second largest city in the state of Tamil Nadu, India and one of the largest industrial city in India. It becomes an upcoming major IT hub of India.
		There was no major software supporting public sector in Coimbatore. But the one thing which it can be proud of is the abundance of engineering colleges and other educational support systems.
6	National Capital Region (NCR)	The National Capital Region of India comprising Delhi, Gurgaon, Faridabad, Noida, Greater Noida and Ghaziabad are having ambitious projects and are trying to do every possible thing for this purpose.
		The public sector presence in the NCR also dates back to 1964 when Bharat Heavy Electricals Limited was established. The others were like CMC Ltd. (1977), Engineering Projects (I) Ltd. (1970), Engineers India Ltd. (1965), Mahanagar Telephone Nigam Ltd. (1911), National Informatics Centre Services Inc. (1976) and Telecommunications Consultants India Ltd. etc.,
7	Mumbai	Popularly known as the commercial, entertainment, financial capital of India. This is one city that has seen tremendous growth in IT and BPO industry, it recorded 63% growth in 2008. TCS, Patni, L&T Infotech, I-Flex WNS and other companies are headquarters here.
		Having 27 public sector companies in metro city like Mumbai having an advantage which is in addition to of being the financial headquarter. Besides these public sector companies which are of general nature the Millennium Telecom Ltd. established in 2000.
8	Kolkata	Kolkata is a major IT hub in eastern India. All major IT companies are present here. The city has tremendous potential for growth in this sector with upcoming areas like Rajarhat.
		With close to 32 public sectors the government support has been for considerably long period. The establishment of Garden Reach Shipbuilders & Engineers Ltd. (1960), Bharat Bhari Udyog Nigam Ltd. (1986), National Instruments Ltd. (1957), etc.

Source: Author based on the Wikipedia.

The success of the software sector has, for the most part, been a combination of factor like resource endowments, a mixture of benign, neglect and active encouragement from a normally intrusive government, and good timing. The substantial part of the Indian software exports have consisted of mundane services such as low level programming and maintenance. However, the leading Indian firms are making strong efforts to move up the value chain by acquiring better software project management capability and deeper knowledge of business domains, and reducing costs and improving quality by developing superior methodologies and tools. Moreover, the greatest impact of the software industry on the Indian economy may well be indirect, in its role as an exemplar of the new business organisational form and as an inspiration to other entrepreneurs.¹⁵

Major developing players in the sector of “other business services” are all Asian, and many of them reached impressive levels of exports during the last decade. During the subsequent period, characterized by the emergence of the regional financial crisis, Singapore’s exports of “other business services” declined, as did those of two other strong exporters: Korea and the Philippines (exports from the latter, which had reached almost US\$8bn, actually collapsed in 1995–1999). Conversely, exports of “other business services” from India, Malaysia, and Saudi Arabia increased also in the late 1990s. “Software exports have been India’s most dynamic export sector”, the Indian software industry, in fact, is probably the most well-known success story of a developing country exporting highly human capital intensive services. Software services exports from India have been growing at an extraordinary rate of over 40 per cent per year in the late 1990s, reaching over US\$8bn by the end of the decade and they presently constitute a sizeable share of the country’s total exports.¹⁶ Paradoxically however, India’s performance in IT software and service export in terms of the rate of growth has been unprecedented in India’ recent economic history.

Table 3: India’s Software Exports: A comparison Pre and Post ITA-1

Phase-wise	Total Value (Rs. Crore)	Growth Rates	
		Exponential	Average Annual
1985-1997	17,269.0	1.6	53.7
1998-2007	6,92,790.0	1.3	37.4

Source: Authors calculation based on: a) Nasscom; b) Department of Information Technology, Government of India

Table 3 clearly suggest that exponential growth rate was higher during Pre ITA-1 period at 1.6 percentages compared to Post ITA-1 of 1.3 percentages. Comparing the average annual growth would show a 16 percentage points drop in the growth rates observed during the ITA liberalised phase (1998-2007). Therefore the increasing in software exports was not associated with the ITA liberalisation, but rather it is proved that Indian exports suffered under the ITA-1 liberalisation phase.

¹⁵

¹⁶ Gabriele Alberto, 2004, Exports of Services and Economic Growth in Developing Countries, United Nations Conference on Trade and Development, 3 June 2004, UNCTAD/DITC/TNCD/MISC/2003/6, http://unctad.org/en/docs/ditctncdmisc20036_en.pdf

This so-called performance of IT software and service sector in India has, however, coincided with the debacle of the hardware capacities in India. Therefore the “*Source India*” campaign was launched by Electronic Industries Association of India (ELCINA) in 2009 to accelerate development of the Indian electronics supply chain. ELCINA recognises that a strong supply chain is the back bone of any engineering manufacturing industry and more so of the electronics industry due to the huge variety of materials and components required for electronics equipment manufacturing. The growth of India's industry and to some extent market expansion has been restricted due to the lack of supply chain support. This situation needs urgent correction by the government. Development of local supply sources and increased value addition is necessary and imperative if this market is to be serviced efficiently. “Source India” is an event which may enable this and accelerate development of the Indian electronics supply chain.

What emerges from the above analysis is that software successes of India, in terms of exports, cannot be directly associated to the Information Technology Agreement (ITA) liberalisation. There is a long history of government support to the Information Technology and related sectors as it was considered as one of the strategic industry since long. It is not only difficult but unrealistic to give all credits to ITA-1 for the successes of India in software export as it was only a tariff cutting mechanism. However, if liberalisation has to be given credit for software sectors performances, it was the 1991 general liberalisation which gave the private sector a greater say in the economic activities of India.

4. Performance of Hardware Sector in India and the ITA-1

The process of industrial de-licensing, which began in 1985 in India marked a discrete break from a past of centrally planned industrial development. Similar liberalization episodes are taking place across the globe. However, it is well known that firm responses, even within the same industrial sector, are likely to be heterogeneous leading to an increase in industry inequality.

Technologically advanced firms and those located in regions with pro-business institutions are more likely to respond to the threat of entry by investing in new technologies and production processes, Table 2 of earlier section provides sufficient evidence on this account.¹⁷ Hence, the Indian liberalisation of 1991 and the industry response in term of performances can be summarised as the debate between the limitations to minimise the underling theoretical understanding and the grounded policies both domestically and externally.

¹⁷ Aghion Philippe, Robin Burgess, Stephen Redding and Fabrizio Zilibotti, 2005, “*Entry Liberalization and Inequality in Industrial Performance*”, **Journal of the European Economic Association**, volume 3, issue 2-3, pp 291–302, April-May.

As a result the total organised sector employment of India saw a fall in workforce by about 15 percent between 1995-96 and 2000-01.¹⁸ The liberalisation efforts of 1991 led to certain sectors underperforming while others sectors grew with vigour. The scenario of the IT sector is perceived to be grimmer than the other sub-sectors of Indian manufacturing sector. This is highlighted in the Planning Commission Report of 2001, wherein, it calls for a clear comprehensive national policy for hardware manufacturing industry for making the Indian manufacturing sector globally competitive.¹⁹ It further called for revival plan for the IT hardware industry, as it is seen as strategic and core for overall manufacturing sectors long run survival. The “*Source India*” scheme proposed for the electronic industry by the industry association was an outcome of these initiatives and the new direction of thinking by the industry association and policy makers.

The ITA-1 liberalisation is unique in the way it has preceded over the years. As we understand liberalisation at the MFN basis would necessitate reduction/elimination of tariff and non-tariff measures – given that the developing countries continue to enjoy the benefit of S&D Treatment. The ground realities are that tariffs have been brought down to zero in all the 74 countries²⁰ of the WTO members on a MFN basis. However, the sticky issues since the 1996 has been “how to address the issue of non-tariff measures (TBTs)” which till date remain to be harmonised at the multilateral levels under the International Standards Organisation (ISO).

It exposed the weakness of the WTO negotiation process, (even under a plurilateral setup like the ITA-1) in addressing the tariff elimination corresponding with the harmonisation of non-tariff measures. This was important from the point of view of the negotiations on non agricultural market access for the leaders and laggards in the IT technology, to be brought to a minimum common platform. It seems to have miserably failed in this process as is discussed in this section of the paper. The market access scenario in the present ITA-1 for the developed countries (technology leaders or those countries already linked to the international production network- the classic case is East Asian countries) in the ITA products *vis-a-vis* any developing countries with no industry level standards has proved fatal for the domestic home grown industries in the IT hardware.

Faced with national barriers in the developed market the developing country producers may find it unviable to produce and sell at a competitive price. The negotiations on the NTMs were disassociated with tariffs, for a simple reason that tariffs in the developed countries were a non issue and it was all about the national standards.²¹

¹⁸ Nagaraj R. , 2004, “*Fall in Organised Manufacturing Employment: A Brief Note*”, Economic and Political Weekly, vol. 39, no. 30 (Jul. 24-30), pp. 3387-3390.

¹⁹ Planning Commission, 2001, “Report of the Working Group on Information Technology for the Formulation of the Tenth Five Year Plan”, http://planningcommission.nic.in/aboutus/committee/wrkgrp/wg_it.pdf.

²⁰ EC has been taken as individual countries and not as a block.

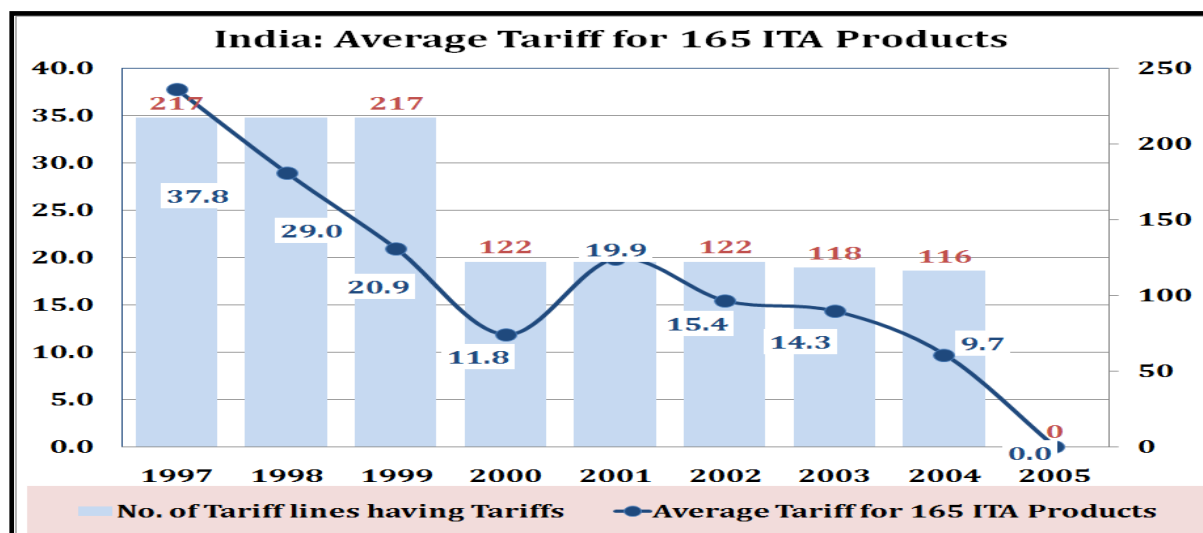
²¹ See Annexure 4 for a detailed understanding on negotiations on NTMs under the ITA Committee on EMI/EMC and yearly notifications of National Standards *Vis-a-Vis* International Standards over the time.

Gradually, with the influx of imports into the domestic markets under the new tariff of zero under the ITA-1, the existing domestic producers may become domestic assemblers/traders in the IT products.²² This will have a major socio-economic impact. The minimal value addition through the assembling activity will have an impact on both organised sector but more importantly it may adversely impact the unorganised and Small and Medium Enterprises (SMEs). Unfortunately for the unorganised sector we do not have regular information flow to assess the impact. We feel this is exactly what could have happened in the case of India as a direct outcome of unbalance approach to the sectoral Agreement of the ITA-1.

Tariff Elimination and Sequencing under the ITA-1

A total of 165 products²³ were part of the ITA Agreement in which the members were mandated to reduce tariff and harmonise the non-tariff measures. However, for reasons unknown, a clear-cut schedule was laid out only for tariff elimination ignoring the issue of NTM's completely. The average MFN applied tariff for India's 165 ITA-1 products has seen scheduled reduction as per the commitments made under Information Technology Agreement. India had an average base duty of 66.4 percentages in March 1998 it further dropped to the level of 37.8 percentages half of the base rates in July of 1997. The average tariff continued to drop at regular intervals to 12 percentages in 2000 to 10 percentages in 2004 and completely eliminated by 2005, see Figure 3.

Figure 3: Average MFN Tariffs of India on ITA Products and Count of HS 6 Digits Tariff Lines



Source: Authors calculations based on India's commitment under the ITA-1.

Exponential growth rate of India's imports were 23.7 percentages for the period between 1996 and 2005. However, imports grew at slower pace in the first phase (1997-2000) at 18 percentages while in the second phase (2001-2005) it almost doubled to touch nearly 38

²² Empirical evidences based on firm level data provided in Section 6.

²³ After removing the duplicates 165 lines, originally the numbers of tariff lines under the ITA were 217 HS 6 digit lines. Some of these lines were ex-post belonging to the same 6-digit HS Classification.

percentages. This surge in total imports seen in ITA-1 products can have a detrimental impact on the domestic firms who indulged in the production of corresponding, similar or even the substitutes. This could even have had long term impact on the total production, investment and all the other associated activities.

From the point of view of Indian domestic producers, there were two years of shock, the first was 2000 and the second was 2005. In these years, the tariff on certain number of products was brought down to zero. In 2000, some 96 lines were reduced to zero tariffs as per the commitments under the ITA. These targeted products were from the base duties of 12.0, 31.7, 45.0, 50.0, 55.0, 61.7, 70.0, 83.4 percentages. Tariff on 20 ITA products having an average base duty of 46.2 percentages were completely reduced to zero. The second phase targeted base duty tariffs like, 22.0, 32.0, 35.0, 40.0, 42.0, 52.0, 61.7, 66.7, 70.0, 76.7, 90.0, 110.0 and 116.7. This was unprecedented in the history of India as further reduction of 63.0 percentages, over and above the 46.2 percentages reduction that was achieved during 2000 was executed during 2005. This scheduling process eliminated all the tariffs under the ITA agreements to zero tariff on an MFN basis.

Table 4: Tariff Reduction Schedules under the ITA-1

Sl.no	Base duty (%)	2000	2005	Total ITA-1 lines
1	12	6	0	6
2	22	-	3	3
3	31.7	7	0	7
4	32	-	6	6
5	35	5	5	10
6	40	8	5	13
7	42	-	10	10
8	45	1	0	1
9	50	2	0	2
10	52	1	25	26
11	55	1	0	1
12	61.7	15	2	17
13	66.7	12	26	38
14	70	6	1	7
15	76.7	2	13	15
16	83.4	3	0	3
17	90	10	3	13
18	110	11	17	28
19	116.7	6	5	11
Number of ITA Lines Reduced to Zero		96	121	217

Source: Authors calculations based on India's commitment under the ITA-1

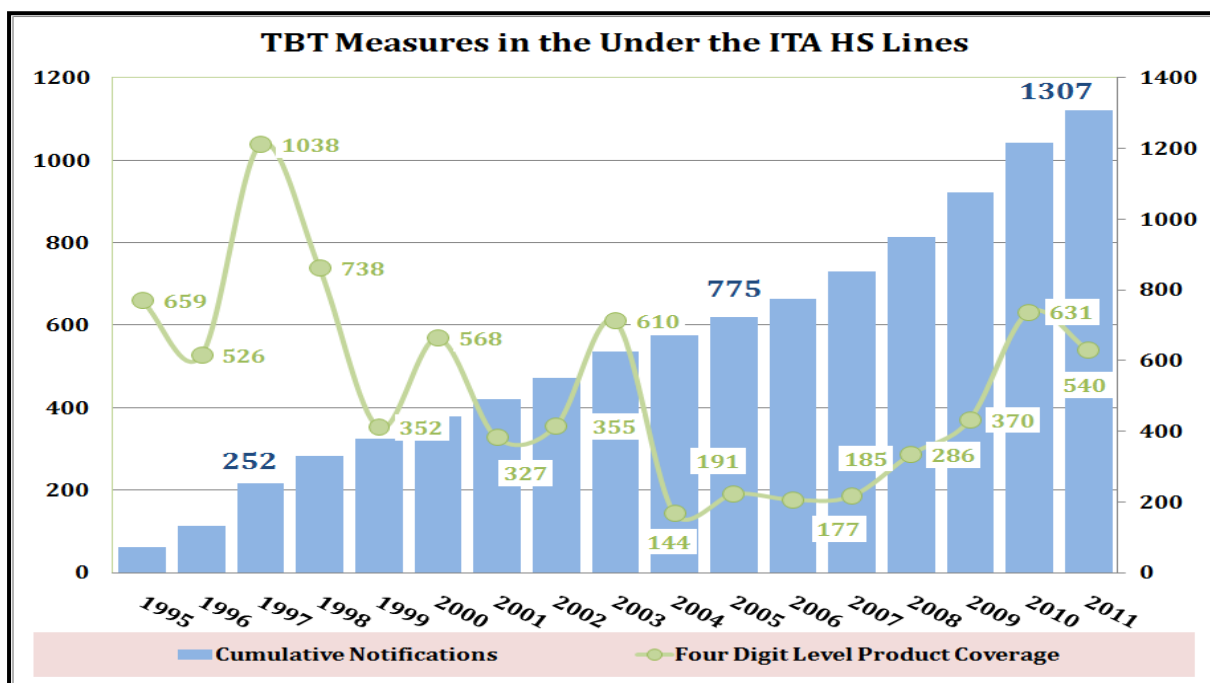
In terms of tariff reduction commitments India made no mistakes barring for few cases of tariff lines exceeding time scheduled under the ITA agreement. Thus in term of tariff elimination there was substantial achievements from India, as the 165 ITA lines (after removing the duplicates) having average base tariff of 57.5 percentages were eliminated to zero tariff in a period of 10 years. While the other side of the coin namely the market access achievements under, the non-tariff measures (standards/regulations) still remained

unresolved.²⁴ In next sub section we would be addressing some of the concerns of liberalisation of NTMs.

Technical Standards: TBT notifications under the WTO

The Technical Barriers to Trade (TBT measures) is the most significant standard/regulations faced by ITA-1. These can vary from standards/regulation on mobile/radio/telecommunication services offered within the domestic market in terms of frequency, technically referred to in hertz (Hz) whereas some of technical standard can be as common as the labelling text details. Over the years, it is observed that the TBT notification from all the WTO members have been increasing to replace the reductions in tariffs under ITA commitments.

Figure 4: TBT Measures: Cumulative and Product Coverage under the Yearly Notification



Source: Centre for WTO Studies Web Portal <http://cc.iift.ac.in/tbt/index.asp>

As shown in Figure 4, the total TBT notifications by the WTO membership countries (ITA signatories and non signatories) have been increasing since 1996. This is indicated by the exponential growth rates of year-wise notifications by nearly 3.0 percentages and on cumulative basis by 15.0 percentages. This is significant in the context that the ITA signatories which have been reducing the tariff downward, the standards/regulations have been going the other way. Nearly 82 percentage of the notification by the ITA signatories, suggests a substantial increased protectionism by way of domestic regulations, creating market access barriers in the ITA-1 Plurilateral agreement of the WTO.

²⁴ See the discussion of the status of the pilot project on EMC/EMI under the ITA Committee in Section 1.

The other aspect is the large **Product Coverage**²⁵ observed in the period coinciding with a large share of National Measures notified by developed country signatories of ITA-1. This can be interpreted based on the Figure 4 which indicates high product coverage at 4 digits level and the Annexure 4 which shows a larger proportion of yearly notifications by the developed countries within the classification of National Measures. Therefore, it could be argued that these countries were busy notifying all their national measures before any disciplining came out of the WTO negotiation process under the ITA committee.

Table 5 analyses the TBT notifications of 31 countries on the basis of National and International standards. The national standards/measures are those specific legislations, which need to be adhered to operate or sell in the markets and these may be different from the international harmonised standards by the ISO.

Table 5: TBT Measures: On Specific Four Digits Product Coverage (Top 31 Countries)

Product Coverage based on TBT notifications	Developing			Developed			Grand Total
	International	National	Sub Total-Dev.g	International	National	Sub Total-D'ped	
Japan					669	669	669
Belgium					636	636	636
South Korea	7	490	497				497
European Communities					423	423	423
China	209	206	415				415
Canada				212	198	410	410
Netherlands					332	332	332
The SCT of TPKM		326	326				326
Switzerland					317	317	317
Czech Republic		256	256				256
Mexico*	2	197	199				199
Israel	189	2	191				191
Norway					191	191	191
Finland					163	163	163
Brazil*	9	149	158				158
South Africa*	89	51	140				140
France					139	139	139
Sweden					135	135	135
Philippines	8	123	131				131
Argentina*		130	130				130
Thailand	82	45	127				127
United States				86	38	124	124
Australia					111	111	111
Colombia		111	111				111
Chile*		107	107				107
Spain					104	104	104
Hungary		93	93				93
Hong Kong, China		88	88				88
Saudi Arabia	82	1	83				83
Malaysia	45	36	81				81
Slovak Republic		80	80				80
Total TBT notifications	722	2491	3213	298	3456	3754	6967

Note: * and shaded in orange colour are not ITA signatory

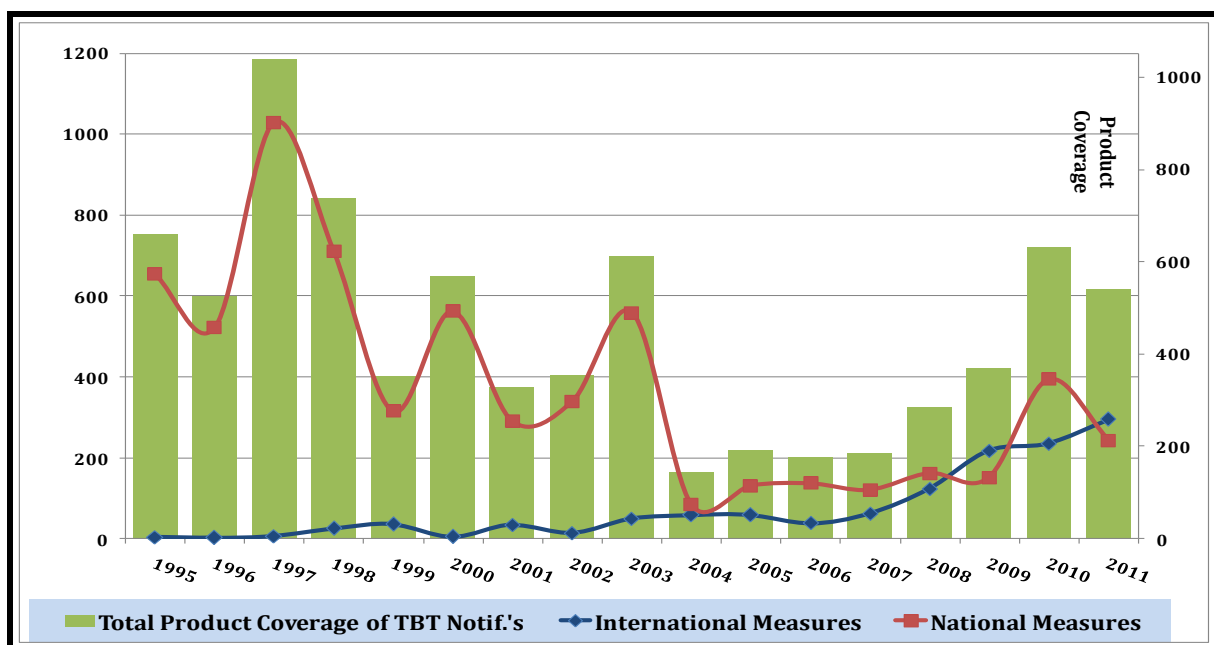
Source: Authors calculations from Centre for WTO Studies Web Portal <http://cc.iift.ac.in/tbt/index.asp>

The harmonisation process basically involves bringing different standards existing in different countries at a point of time/periods, to a level which is agreeable by everyone as the international level. The Table 5 indicates that the developed countries with technological advantage had 92 percentages of national standards as compared to developing countries with 77.5 percentages. Only countries like Canada (51.7 %) and United State (69 %) had more

²⁵ The product coverage in a single notification is the number 4 digit HS code tariff lines covered by that notification. For example let's take the case of the first country in Table 5, Japan has 102 notifications (including additions/revisions/corrigendum), during the period between 1995 and 2011, then product coverage for Japan is 669 products. To put in simple terms 7 products (HS 4 digit) are being covered under each notification made by Japan.

share to international standards. If we eliminate these two countries, the 11 countries had 100 percent national standards. It is alarming that the ITA-1 which has been fully implemented in terms of the tariff commitments has such an imbalance in the usage of NTMs like the TBT measures. However, this moderately high average usage does not prove anything substantively. One needs to look beyond this myopic view, both in terms of usage over the years and the nature objective in the TBTs measures. The long run trends reveal a great deal of information about the nature of protection in the developed members market for ITA-1 products in comparison to the developing country members like India who are operating on very low technological base, especially when we try to identify the industry standards for the masses production.²⁶ Further it is to be observed that India does not figure in the top 31 WTO notified users of TBT measures for the selected products of ITA-1.

Figure 5: Usage of National Vs International TBT Measures under the ITA



Source: Authors calculations form the Centre for WTO Studies Web Portal <http://cc.iift.ac.in/tbt/index.asp>

In terms of the usage over the years, the Figure 5 analyses this pattern across the national and international standards for the complete WTO membership. The trends clearly suggest very high levels of national standards in the initial years, when the developed countries were required to bring down their tariffs at an MFN basis. It should also be noted that there was higher product coverage during this period, suggesting that these countries were in a hurry to notify all the measures before the disciplines on the use of NTMs are put.

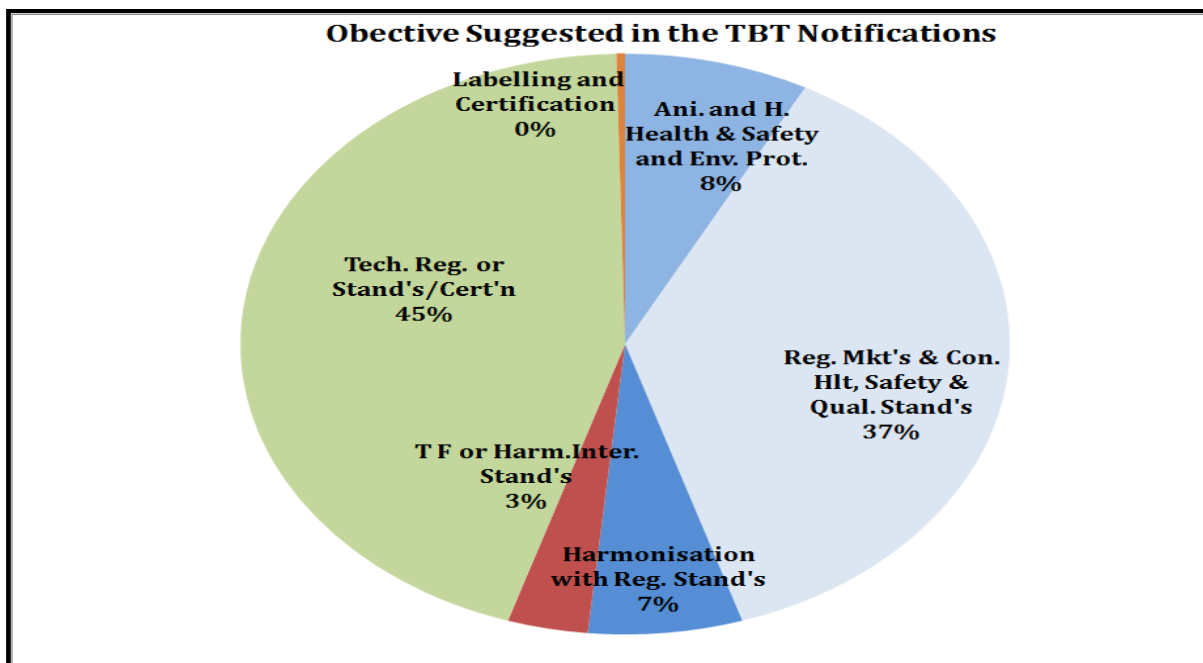
What is alarming is very high use of national standards during the early period of 1997 to 2000. Of the total of 456 TBT notifications from 1995 to 2000 by all the WTO members, the developed member had 356 TBT notifications, which was 78 percentages of the total notifications. In terms of the product coverage around 3881 products were covered by the 456 TBT notifications, of which 3800 were protected by national measures. This is a telling

²⁶ In the space technology India may be a leader however this has not been translated as successfully like in the US or EC into the Information technology sector for the benefit of general consumers.

story of how ‘Market Access’ has been denied to the developing countries during the phase of tariff liberalisation. It would be useful to have detailed understanding on the various types of TBT standards.²⁷

A closer look at the 45 different types of standardised²⁸ standards identified as per the *Centre for WTO Studies* database on the TBT measures. This exercise of standardisation was carried out to derive meticulous observations and reading the complete nature of objectives. The objectives were as diverse as possible, incorporating all the needs of different countries which were the ITA members for example Technical Regulations/Standards; Safety and Quality Standards; Labelling; Regulating Market and Consumer Health and Safety; Revitalisation of Economy and Make use of Private Sector Capacity; Trade Facilitation; Human Safety and Environmental Protection; Environmental Protection and National Security; Animal and Human Health; Safety and Environmental Protection & Consumer Protection and Fair Trade.

Figure 6: TBT Standardised Objectives: by the Members of ITA Signatories



Source: Authors calculations from Centre for WTO Studies Web Portal <http://cc.iift.ac.in/tbt/index.asp>

The TBT standards for the WTO signatories of ITA-1 for the period between 1995 and 2011 suggest that technical regulations or standards or certification had the highest share of 45 percentages with 489 measures. The second in the list of TBT measures was the regulating market and consumer health or safety and quality standards with 37 percentages (408). At the third and fourth places are the measures like animal and human health and safety and environmental protection with 8 percentages and harmonisation with regional standards at 7 percentages respectively. Harmonisation with international standards or trade facilitation was

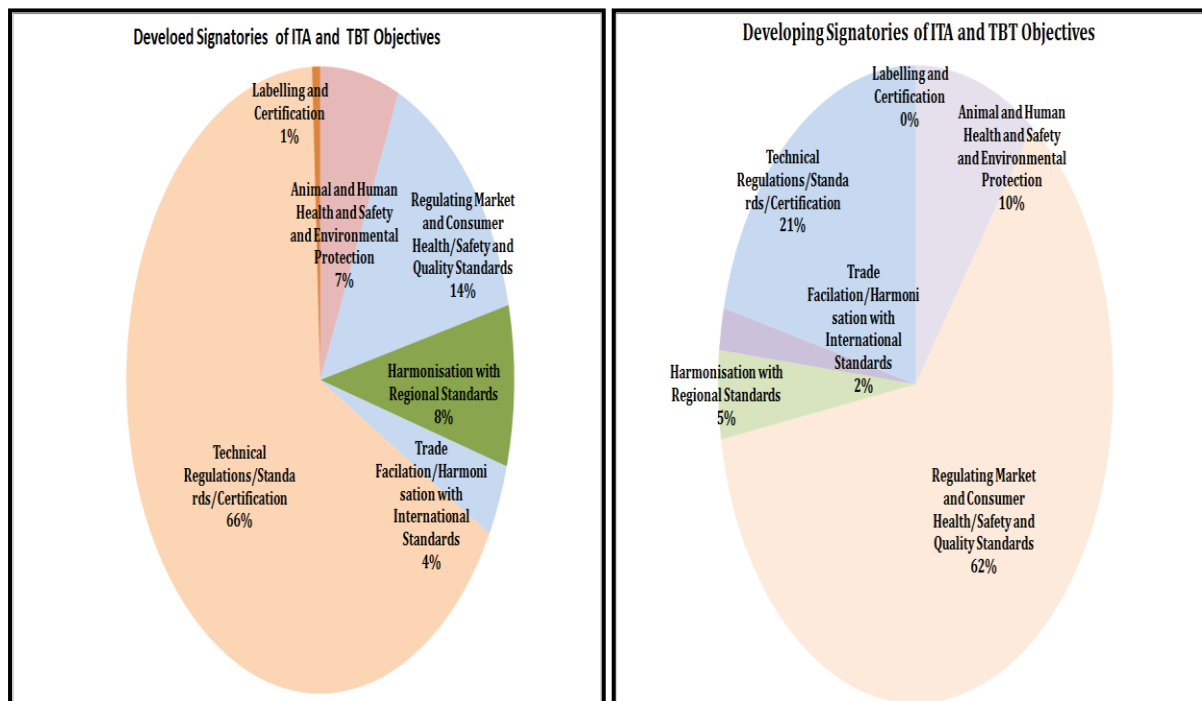
²⁷ See Annexure 4 for the detailed illustration into the trend in national and international measures from the point of view of developed and developing countries.

²⁸ Standardization was required because of very large number of objectives (1065 different) identified by the notifying WTO members. However, marginally lower number of 932 objectives was identified in the case of ITA signatories.

the lowest level of measures at 3 percentages. The only other measure which was lower in priority was labelling and certification which recorded 4 TBT measures. Clearly, the issue of harmonisation at the international level was given the lowest priority by the ITA signatories. However, if the signatories were serious about market access issues, this issue should have received the highest priority.

The distinctions in priorities by the developed and developing members belonging to the ITA are clearly evident in the Figure 7. While the developed member believed in the usage of technical regulations or standards or certification (66 %) the developing members were using the measure of regulating markets and consumer health or safety and quality standards with 62 percentages.

Figure 7: Developed and Developing Countries Usage of the Objective



Source: Authors calculations from Centre for WTO Studies Web Portal <http://cc.iift.ac.in/tbt/index.asp>

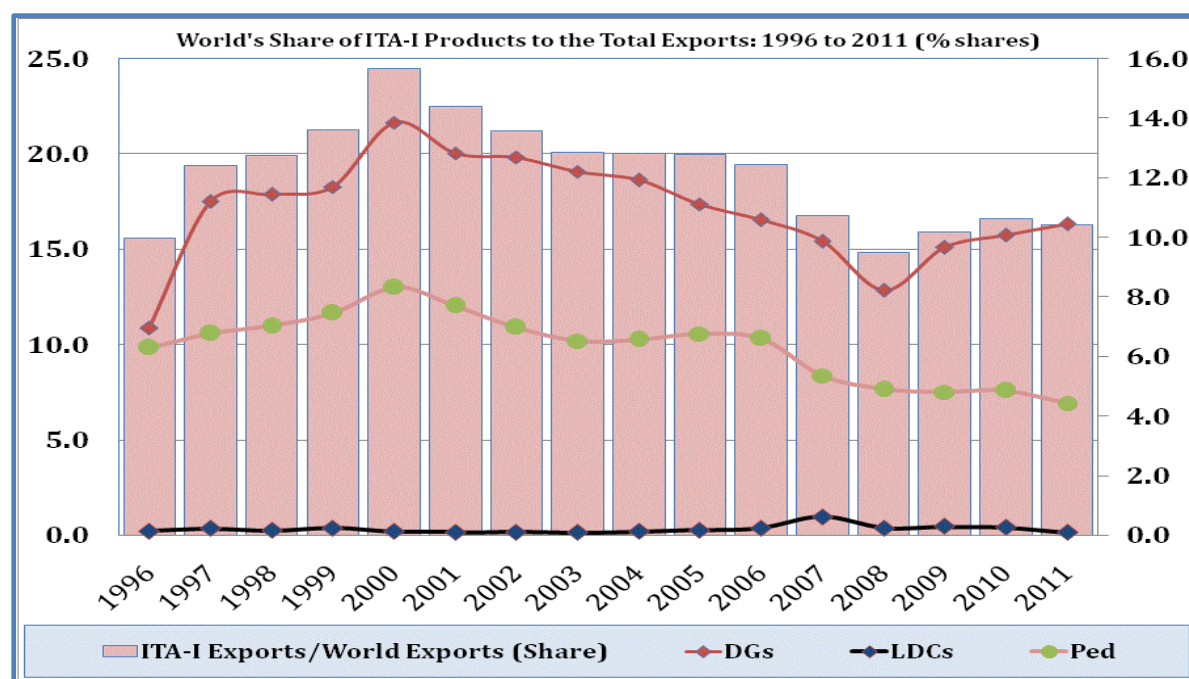
Both the developed and developing signatories of ITA were not very serious about the issue of harmonising their own national standards/regulations with the international standards. Ironically, this issue was the one which got the lowest priority recording a share of 4 percentages and 2 percentages respectively for developed and developing members. In terms of NTMs liberalisation, the ITA-1 is the best example of inaction by both developed and developing countries. This calls for an immediate attention to the area of NTMs (TBT), when we are looking for liberalisation and market access gains through other sectoral initiatives. The direct impact of this growing imbalance would be discussed in detail in next section of this paper, in terms of its impacts on trade (import and export).

5. Trade Liberalisation of Information Technology Products

We discuss the impact of trade in ITA-1 products in this paper, using two nomenclatures Standard International Trade Classification (SITC) and the harmonised system (HS). The SITC is used to understand the long-run dynamics and the HS is to analyse the relatively short-run dynamics in the trade of ITA-1 products. They are then used to draw a common understanding on the impact of ITA-1 liberalisation - specifically on Indian hardware sector and generally on the Indian economy.

Finally, when we compare share of ITA-I products exports at the category level to understand which category benefited the most from the information technology agreement it is evident that the developing countries (DGs) gained the most. It was followed by the developed countries (Ped) and finally least developed countries (LDCs). The developing countries showed an increase by 6 percentage points, from 10 percent in 1996 to 16 percent by 2011. However, after 2000 there has been a slide in the global shares of ITA products from 13 percent in 2005 and touching nearly 10.4 percent shares – this was the original share of ITA products in the global exports, see Figure 8. While, both developed countries and least developed countries have been losing market shares in the long term series analysis of 1996 to 2011. At 10 percent shares the developed country's export was almost at the same level as developing countries. The LDCs also suggested a declining trend in shares - the share was 0.2 percent in 1996 and declined to 0.1 percent in 2011.

Figure 8: Total Exports: Category-wise Share of ITA-1 Products



Note: DGs refer to developing countries; Ped refers to developed countries and LDCs refer to the least developed countries grouping.

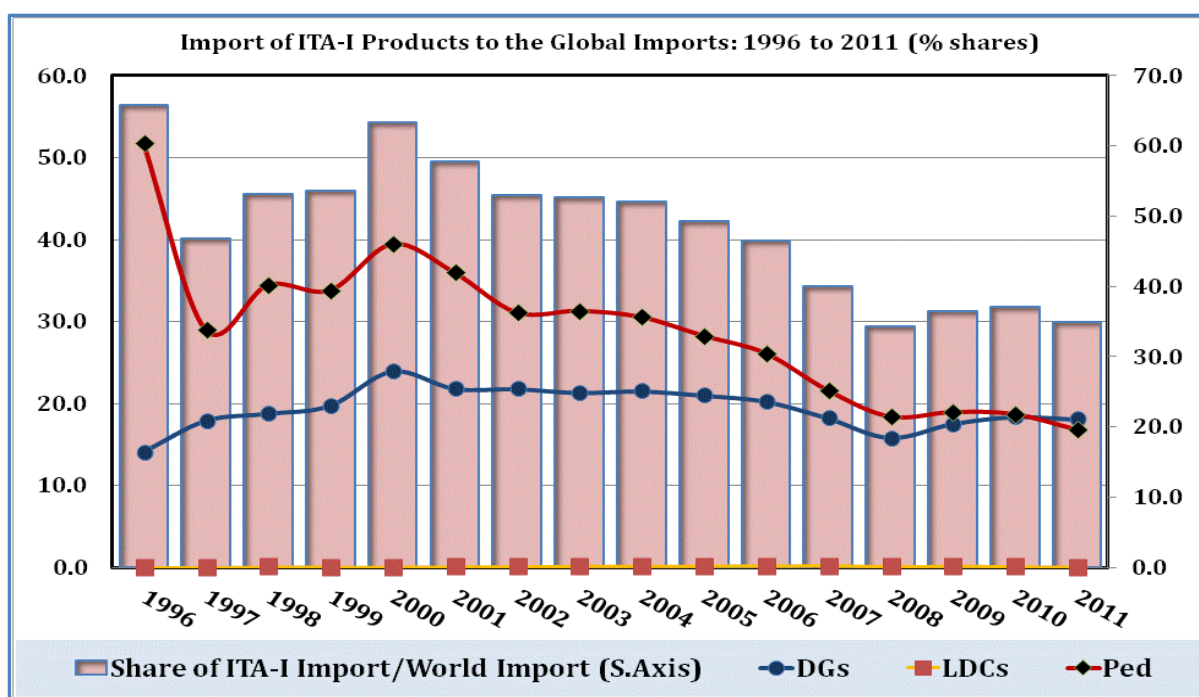
Source: Author based on online WITS COMTRADE database.

With the exports and imports of ITA-1 products of the world suggesting an average annual growth of 12 percent the trends in share reflect a domination of developing countries in correspondence with tariff liberalisation in exports.

In simple terms the market access scenario can be captured with the use of global imports scenarios and the behaviours of three categories comparative shares. It is interesting to note that the developed countries did not concede any additional market access as its shares remained below 10 percent throughout the period of study.

This is clearly indicated in terms of the shares rising from 9.8 percent in 1996 to 13 percent in 2000. However, we can observe that it dropped in the later years from 11 percent in 2005 to 7 percent in 2011. This suggests that the impact of tariff liberalisation in the developed countries was not felt as much as the impact of rising non tariff measures like the TBT measures in these countries.

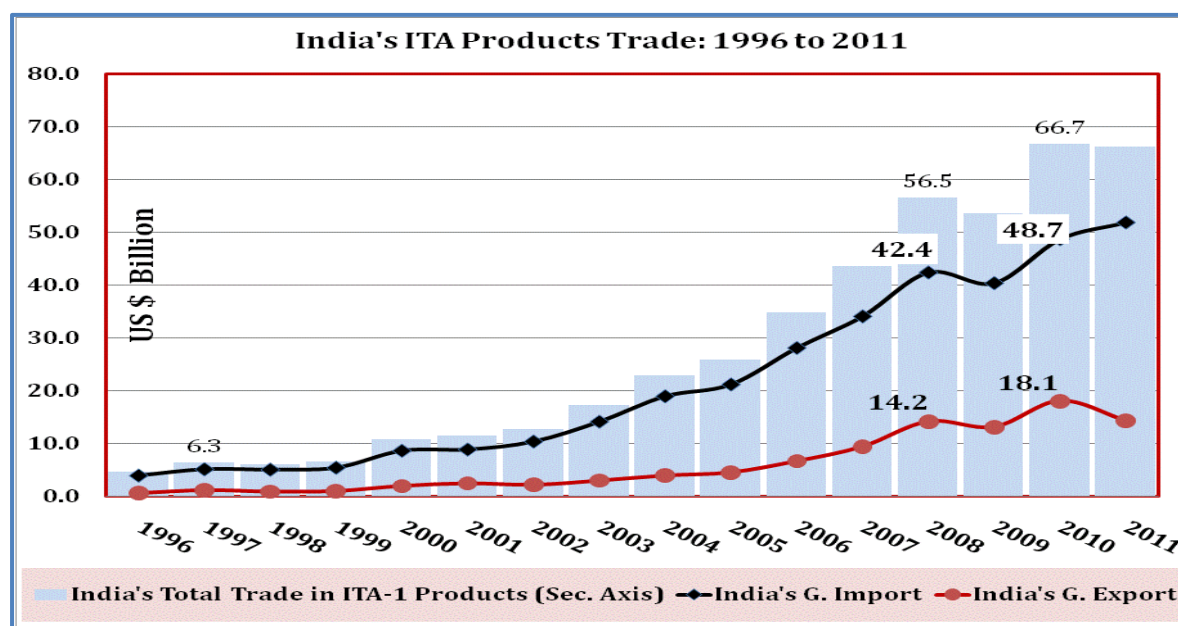
Figure 9: Total Imports: Category-wise Share of ITA-1 Products



Source: Author based on online WITS COMTRADE database.

There was a general declining trend in the overall import shares, with virtually no additional market access in developed countries. A further deterioration was seen in the import shares of least developed countries in the total world imports of ITA-1 product. Thus, the increasing global trade in ITA-1 products seen in terms of trade values as observed earlier was largely supported by a surge in the developing countries imports. The developing countries showed an overall increasing trend in imports of ITA 1 products during the period. It increased from 11 percent in 1996 and almost doubled to 22 percent in 2000 thereafter, there was a slow downward trend when it touched 16.3 percent share in 2011.

Figure 10: Trends in India's Total Trade of ITA-1 Products



Source: Author based on online WITS COMTRADE database.

Figure 10, analyses the relatively short run trends (1996 to 2011) in ITA-1 products. India was clearly a market provider with the imports suggesting a reluctance to drop in terms of percentage shares to the total India's trade in ITA-1 products, this needed to be analysed further. The widening gap between the exports and imports of India is a matter of concern for the policy makers. So we have analysed these trends based on a relatively longer time series 1962 to 2010 using the standard international trade classification (SITC). For the long-run understanding purposes, we have used the standard international trade classification (SITC-Rev.1), while for the short run understanding HS 1996 nomenclature has been used.

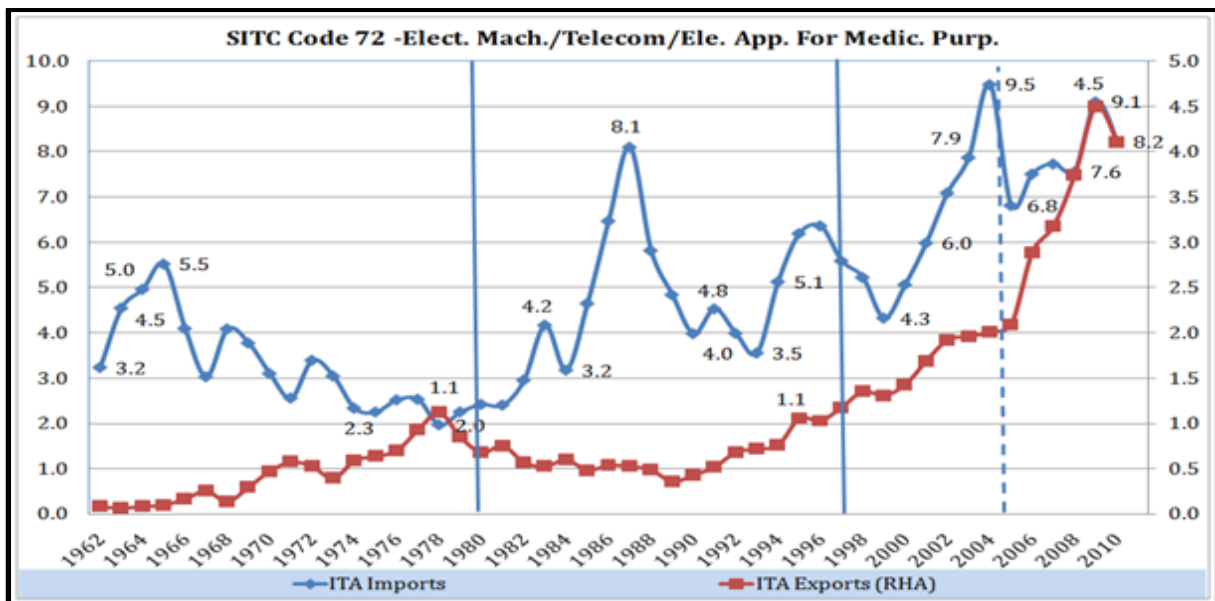
While, discussing the long run trends we would be focusing only on first level manufactured imports and export in the context of India. We would not be discussing issues related to agricultural and mineral oils. In this paper for this purpose we here introduce the standard international trade classification (SITC. Rev1). We would be analysing exports and imports dynamics of the SITC-72³⁰ over the past five decade in this section.

It can be observed from Figure 11; there are three distinct phases in India's exports and imports trends, if we were to ignore the yearly variations that can be observed in the Figure 8. However, out of the five decade two trends stand out, with the imports have hovered around the band of 2 to 9 percentage while the exports have shown an increasing trend over the years

³⁰ The complete information technological (IT) products under SITC 72 the electrical machinery, apparatus and equipment further divided into six classifications like: **SITC 722 Electric power machinery and switch**; **SITC 723 Equipment for distributing electric**; **724 Telecommunications apparatus**; **SITC 725 Domestic electrical equipment**; **SITC 726 Electrical apparatus for medical purpose** and **SITC 729 Other electrical machinery and apparatus**. Thus clearly any analysis of SITC 72 will give some idea about the IT sector in India.

from 0.1 to 4.5 percentages. This is clearly a good sign in terms of performance of the industry.³¹

Figure 11: Shares Exports and Imports of Machinery and Transport Equipment (SITC-7) to India Total



Source: Based on data from the WITS COMTRADE online database, extracted on 12-04-2012

As shown in the Figure 11, we can analyse these five decadal trends in three major phases based on the interaction between the exports and imports of Electrical Machinery/Telecommunication /Electronic Appliance used for Medical Purposes. During the **first phase** between 1962 and 1980 imports showed a decreasing trend from close to 5.5 percentages of India's total imports to 2.0 percentages in the 1978. On the other hand exports shares gained in terms of total exports of India from 0.1 percentages in 1962 to 1.0 percentage in 1980. Therefore, during the first phase indications suggest a narrowing of the gaps suggesting an improvement in terms of competitiveness of Electrical Machinery/Telecommunication /Electronic Appliance used for Medical Purposes.³²

In the **second phase**, which was from 1981 to 1997³³, there was widening of this gap suggesting some lack of competitiveness of the domestic machinery and transport equipment sector. The exports shares dropped to a low of 0.4 percentage (1989) this was lowest point ever since it recorded a high of 1.1 during (1995). While on the other hand, imports continued showing a rising trend gaining from the decline observed in the first phase, to touch highest recorded share of nearly 8.1 percentages of total imports of India. Thus there was clearly a widening of the gap during this phase suggesting a continued import dependence and lack of

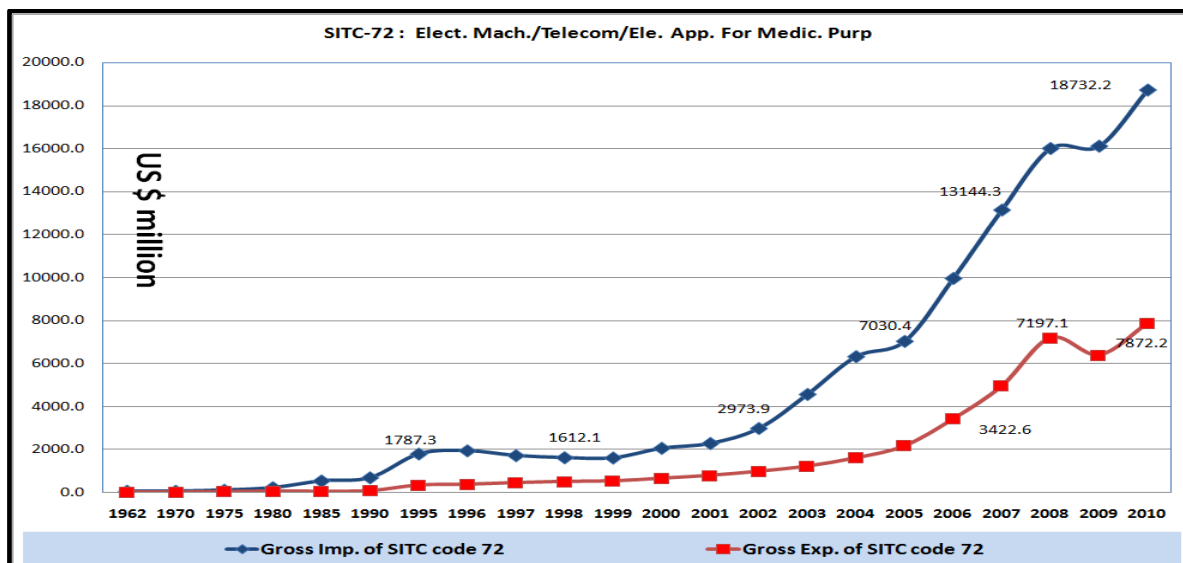
³¹ It should be noted that exports are shown on the right hand axis (RHA), while imports are shown in the Figure 8 on the left hand axis (LHA).

³² It is to be noted that while the discussion of performance of SITC 7 is analysed it is always relative to other sectors performance in terms of exports and imports within the Indian economy. So the general mood of India's exports and imports are captured.

³³ In the 1996 Information Technology Agreement was proposed in Singapore Ministerial Declaration of the WTO's Ministerial Mandate. However it was only in 1997 it was formally launched, after attaining the critical mass of 90 percentage of the world trade.

exports by the Electrical Machinery/Telecommunication/Electronic Appliance used for Medical Purposes.

Figure 12: Trend in India's Exports and Imports in terms of Values



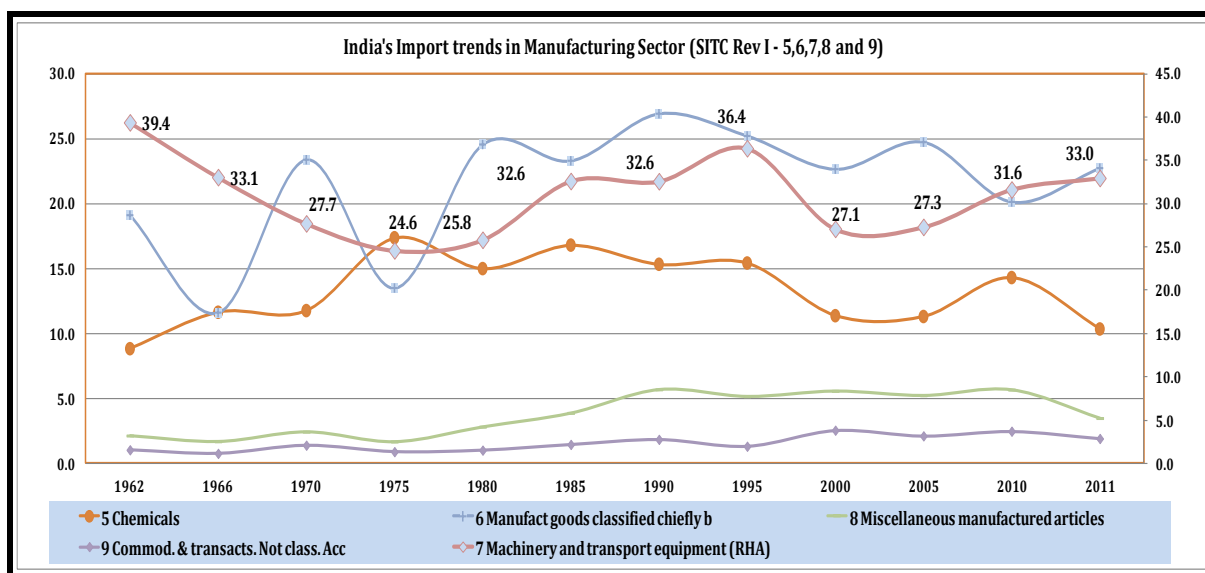
Source: Based on data from the WITS COMTRADE online database, extracted on 12-04-2012

The **third phase** spanned between the actual implementation of ITA liberalisation after achieving the required critical mass as per the ITA agreement to 2011, and is further divided into two periods to better understand whether complete liberalisation of MFN tariffs in 2005 did make any difference or not. What can be observed during this phase is that imports shares continued to be rather stable but increasing towards the end of the phase while, the exports shares kept on increasing from 9 percentages recorded in 1997 to 4.5 percentages in 2008. However, one can observe that thereafter exports have shown a decreasing trend, this could be due to the global meltdown after the sub-prime crisis in the US.

Export and import trends of the Indian economy during the first, second and third phases is analysed in the Figure 9 above. The imports and exports till 1980s both grew at almost the same pace, with imports showing a marginal growth over the Indian exports. The second phase there was a remarkable increase in the imports to US \$ 1,787.3 million; it continued to hover around same level and later toward the end of the phase US \$ 1708.4 million in 1997. India's exports showed some increasing trend only after the 1991 liberalisation when it touched US \$ 134.7 million in 1992 from US \$ 53.9 million in 1989. It was the liberalisation of India in July 1991, which had some short-term favourable impact on the Indian hardware exports. However, the third phase saw a significant increase in imports value as in the Figure 9. It increased from US \$ 1,708.4 million in 1997, the year ITA got launched, to US \$ 18,732.2 million in 2010 suggesting an unprecedented increase. However, the exports did show a marginal increase in import values from US \$ 445.5 million to US \$ 7877.2 million in 2010.

The SITC (Rev.1) classification for the manufacturing sectors like: chemicals and related products, n.e.s. (SITC 5); manufactured goods classified chiefly by material (SITC 6); Machinery and transport equipment (SITC 7); miscellaneous manufactured articles (SITC 8) and commodities and transactions not classified elsewhere in the SITC (SITC 9) imports shares, to India's total imports over five decades between 1962 and 2011, see Figure 13.

Figure 13: Import Trends in Manufacturing Sector in India (percentage shares)



Source: Based on data from the WITS COMTRADE online database, extracted on 12-04-2012.

Only the manufactured goods classified chiefly by material (SITC 6) imports had a comparable trend to that of Machinery and transport equipment (SITC 7). This sector varied in range of within band of 10 percentage points ranging between 15 percentages to 25 percentages. The other prominent sector was the chemicals and related products, n.e.s. (SITC 5) which also showed some dynamism in total imports.

Table 6 provides insights about the change in the composition of India's suppliers of the import demand and the main benefiter and losers from the ITA liberalisation. We have seen some top player's being replaced by China by 2010; in two digit shares these were countries like USA (22.5 %), Japan (18.1 %) and Singapore (12.1 %) while in single digit share prominent suppliers were Germany (8.5 %) followed by UAE (7.2 %) and UK with 5.8 percentages.

All these prominent suppliers were replaced by China, accounting for 46.0 percentage share of India's total imports under the ITA-1 lines. The main gainers are China which increased its share in India's imports market from 1.6 percentages in 1996 to 46 percentages followed by Republic of Korea (6.1 %), and Malaysia (3 %) who's share in 2010 increased significantly.

Table 6: Top Thirty Suppliers of ITA products to India

Sl. No.	Suppliers'	1996 (US \$ 000)	% Share to Total ITA Imports	2010 (US \$ 000)	% Share to Total ITA Imports	Count of ITA Products Supplied	Total imp 1996 to 2010 (US \$ billion)
1	China	5494.456	1.6	11397837.35	46.0	162	48.8
2	USA	78499.409	22.5	1451286.44	5.9	162	16.5
3	Singapore	42211.312	12.1	1447800.69	5.8	160	14.4
4	Rep. of Korea	9030.141	2.6	1513567.78	6.1	158	11.0
5	Germany	29518.096	8.5	993744.68	4.0	162	9.0
6	Japan	62963.286	18.1	873900.46	3.5	163	7.2
7	Malaysia	5617.61	1.6	752482.30	3.0	156	6.9
8	Sweden	2266.179	0.7	370935.16	1.5	151	5.4
9	Other Asia, nes	12211.773	3.5	831623.00	3.4	160	4.9
10	China, Hong Kong SAR	13197.361	3.8	533410.77	2.2	159	4.5
11	United Kingdom	20205.11	5.8	321428.54	1.3	161	3.3
12	France	5131.233	1.5	417929.09	1.7	159	2.9
13	Italy	11923.547	3.4	300030.39	1.2	157	2.8
14	Finland	1299.599	0.4	785886.58	3.2	141	2.8
15	Thailand	860.365	0.2	354965.58	1.4	155	2.1
16	Israel	369.602	0.1	226376.00	0.9	148	2.0
17	United Arab Emirates	25056.346	7.2	86937.35	0.4	157	1.7
18	Switzerland	7042.181	2.0	178288.36	0.7	160	1.6
19	Netherlands	5160.634	1.5	150420.70	0.6	152	1.6
20	Canada	1523.845	0.4	91580.64	0.4	156	1.0
21	Philippines	319.884	0.1	185171.96	0.7	133	1.0
22	Ireland	1005.412	0.3	57247.63	0.2	139	0.8
23	Australia	1758.642	0.5	45129.02	0.2	155	0.7
24	Mexico	95.12	0.0	172912.67	0.7	129	0.6
25	Austria	1015.212	0.3	93197.21	0.4	147	0.5
26	Hungary	171.67	0.0	227524.89	0.9	133	0.5
27	Viet Nam			344905.13	1.4	99	0.5
28	Norway	465.92	0.1	31579.70	0.1	132	0.5
29	Indonesia	31.795	0.0	56188.64	0.2	134	0.5
30	Belgium			64320.51	0.3	150	0.5
31	Others	4011.3	1.2	435244.5	1.8	44	3.5
149	World	348457.03	100.0	24793853.72	100.0	163	160.2

Note: Total import 1996 to 2010 includes all 165 ITA-1 products.

Source: WITS online Database and TRADESIFT Software.

This clearly suggested that with regard to the Indian experience the ITA-1 liberalisation has not been very positive from the point of view of increases in competition and trade. However, the evidence we are staring at is one of increasing monopoly of a single country and further does not support in any manner the global diffusion, as perceived by the proponents of the Information Technology Agreement. The next Table 7 will reveal as to why the ITA-1 supporting more diffusion of ITA products, was not found to be true in the Indian case.

Table 7: Top 50 Imported Product under the ITA-1 list by India

Sl. No.	Product code and Description	Import Value in US \$ Mil.				GL-Index		
		1996	2000	2005	2010	1996 to 2000	2001 to 2005	2006 to 2010
1	841989 Machinery for treatment by temperature change nes	32.0	11.8	68.1	160.5	0.58	0.85	0.82
2	841990 Parts, laboratory/industrial heating/cooling machi...	39.9	15.6	55.4	140.8	0.28	0.74	0.78
3	846693 Parts, accessories nes, metal cutting machine tool...	22.2	20.0	75.6	153.7	0.82	0.81	0.73
4	847130 Portable digital data pr	8.7	45.4	298.3	1081.6	0.17	0.13	0.05
5	847141 Dig auto data proc w/cpu	13.0	35.9	110.9	45.2	0.54	0.42	0.35
6	847149 Dig auto data proc units	15.2	47.2	83.4	54.4	0.01	0.04	0.11
7	847150 Digital process units wh	3.3	43.4	271.3	455.3	0.07	0.02	0.05
8	847160 I/O units w/n storage u	30.6	103.7	446.4	507.2	0.12	0.09	0.09
9	847170 Storage units	42.6	227.8	489.3	752.7	0.35	0.10	0.26
10	847180 Units of auto data proce	8.7	23.7	119.7	65.2	0.11	0.08	0.21
11	847190 Automatic data processin	62.4	135.2	100.5	38.2	0.26	0.89	0.87
12	847330 Parts and accessories of data processing equipment...	167.8	658.6	1287.6	1289.8	0.46	0.38	0.21
13	847710 Injection-moulding machines for rubber or plastic	25.2	18.7	64.0	151.9	0.67	0.78	0.47
14	847989 Machines and mechanical appliances nes	147.8	63.2	377.6	736.9	0.43	0.49	0.32
15	847990 Parts of machines and mechanical appliances nes	61.0	36.1	145.8	341.6	0.69	0.89	0.65
16	850440 Static converters, nes	15.6	34.6	204.4	515.9	0.32	0.46	0.86
17	850490 Parts of electrical transformers and inductors	16.2	28.2	77.0	222.3	0.76	0.86	0.76
18	851719 Telephone sets, nes	0.5	4.9	33.8	51.1	0.42	0.14	0.34
19	851730 Telephonic or telegraphic switching apparatus	23.2	35.0	132.3	0.0	0.28	0.10	0.05
20	851750 Apparatus for carrier-cu	7.9	64.6	664.9	382.9	0.12	0.07	0.03
21	851780 Elect apparatus for line	6.0	10.0	80.3	2099.2	0.24	0.10	0.13
22	851790 Parts of line telephone/telegraph equipment, nes	23.4	79.0	323.8	2810.5	0.23	0.15	0.16
23	852290 Parts and accessories of recorders except cartridg...	45.0	31.0	60.4	112.4	0.06	0.05	0.03
24	852390 Unrecorded sound recording media except photo/magn...	7.1	15.2	45.4	1294.0	0.42	0.38	0.23
25	852431 Recorded discs for laser	0.0	2.4	182.2	0.0	0.33	0.18	0.11
26	852491 Recorded media for ot/so	4.7	8.0	654.4	0.0	0.06	0.21	0.51
27	852499 Recorded media for sound	50.6	212.5	78.3	0.0	0.72	0.79	0.80
28	852520 Transmit-receive apparatus for radio, TV, etc.	38.8	178.8	3259.3	5418.4	0.10	0.05	0.32
29	852540 Still image video camara	0.2	4.2	63.8	365.8	0.10	0.02	0.02
30	852910 Aerials and aerial reflectors	17.7	13.6	99.5	112.4	0.38	0.20	0.29
31	852990 Parts for radio/tv transmit/receive equipment, nes	92.8	119.6	400.2	790.1	0.11	0.18	0.29
32	853229 Electric capacitors, fixed, nes	19.4	28.5	62.7	157.3	0.35	0.32	0.22
33	853400 Electronic printed circuits	26.4	22.5	46.8	129.2	0.92	0.77	0.72
34	853650 Electrical switches for < 1,000 volts, nes	18.6	28.6	54.5	123.9	0.20	0.51	0.74
35	853690 Electrical switch, protector, connector for < 1kV ...	20.9	37.8	109.8	232.0	0.23	0.54	0.67
36	854110 Diodes, except photosensitive and light emitting	15.2	37.3	71.1	140.9	0.36	0.12	0.04
37	854129 Transistors, except photosensitive, > 1 watt	15.0	22.7	65.3	139.6	0.07	0.05	0.06
38	854140 Photosensitive/photovoltaic/LED semiconductor devi...	5.6	11.9	53.8	298.9	0.74	0.60	0.86
39	854212 Cards incorp elect integ	3.7	9.0	79.9	198.7	0.25	0.17	0.28
40	854219 Monolithic integrated circuits, except digital	94.6	212.7	0.0	0.0	0.12	0.01	
41	854230 Monolithic integrated ci	11.2	21.9	272.6	1024.8	0.23	0.03	0.05
42	854389 Electrical machines and	11.8	35.9	138.8	280.8	0.08	0.16	0.20
43	854390 Parts of electrical machines and apparatus nes	13.9	31.4	60.9	122.9	0.16	0.24	0.29
44	854449 Electric conductors, nes < 80 volts, no connectors	5.7	13.5	71.0	0.0	0.18	0.26	0.38
45	901380 Optical devices, appliances and instruments, nes	1.3	3.3	9.2	278.0	0.04	0.20	0.07
46	902720 Chromatographs, electrophoresis instruments	5.3	15.2	82.0	132.8	0.01	0.01	0.04
47	902730 Spectrometers, spectrophotometers, etc using light	12.5	19.4	73.4	119.5	0.07	0.03	0.05
48	902780 Equipment for physical or chemical analysis, nes	16.8	42.3	86.1	180.7	0.03	0.05	0.09
49	902790 Microtomes, parts of scientific analysis equipment	10.5	18.2	80.0	190.9	0.04	0.06	0.11
50	903190 Parts and access for measuring, checking equipment...	14.5	16.1	98.0	119.5	0.04	0.10	0.16
Top 50 Products total / Average for GL index		1353.2	2956.2	11869.9	24020.3	0.29	0.30	0.33
Total 164 ITA-1 products / Maximum for GL index		1737.9	3563.8	13175.0	26452.1	0.92	0.89	0.87
Share of Top 50 (%) / Median for GL index		77.9	83.0	90.1	90.8	0.23	0.17	0.23

Note: GL-index average across the

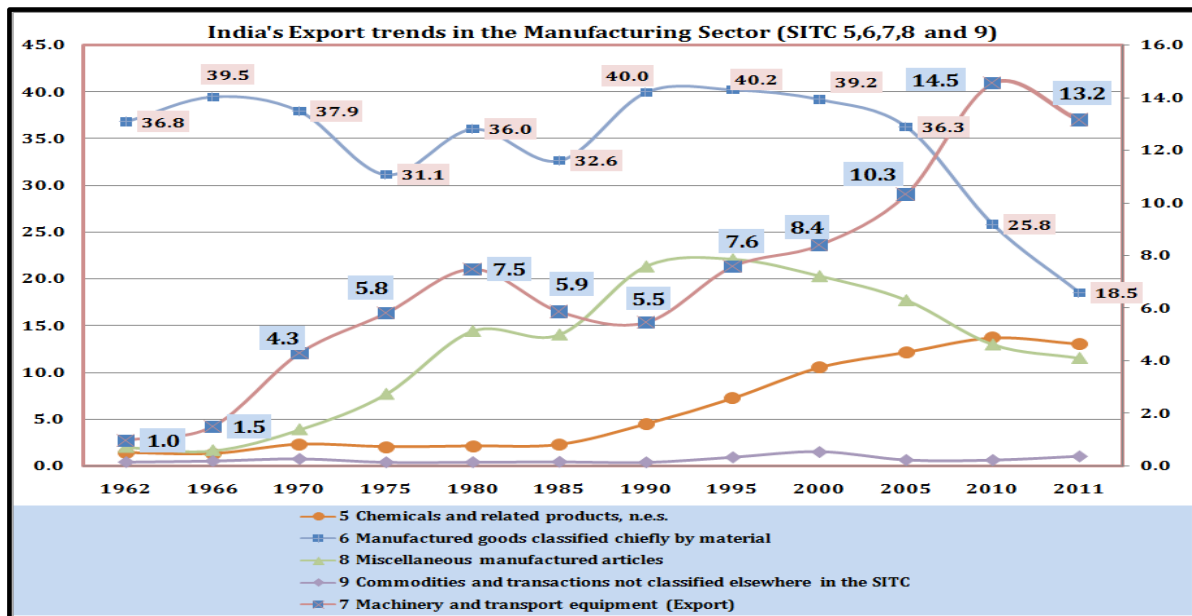
Source: WITS COMTRADE online Database, extracted on 02-03-2012.

Table 7, analyses the HS code-wise trends over the period of 1996 to 2010. This analysis is done looking at two components the total imports values and the corresponding GL index (suggesting the intra-industry trade). The gist from this table is that the selected top 50 ITA products had a coverage of 78 percentage in 1996, which got concentrated to 91 percentages by 2010. This shows an increasing import concentration within India with very low average GL index value of 0.21. Further the concentration of imports does not support the process of diffusion of information technology products in the case of India's imports.

Similarly the share of India's exports were also analysed in this paper, to understand the impact on exports of India in the long run using SITC Rev.1 classification. The

manufacturing sectors export by India is analysed using the SITC classification like: chemicals and related products, n.e.s. (SITC 5); manufactured goods classified chiefly by material (SITC 6); Machinery and transport equipment (SITC 7); miscellaneous manufactured articles (SITC 8) and commodities and transactions not classified elsewhere in the SITC (SITC 9) imports shares, to India's total imports over five decades between 1962 and 2011, see Figure 11.

Figure 14: Export Trends in Manufacturing Sector in India (% shares)



Source: Based on data from the WITS COMTRADE online database, extracted on 12-04-2012.

An analysis of trends among the five major manufacturing categories, in terms of SITC Rev.1, suggests that the total India's machineries and transport equipment exports has remarkably increased from 1.0 percentage share in 1962 to 14.5 percentages in 2010. In fact after 1985 the only other category which showed an increasing trend was the chemicals and related products. All the other categories have showed a decreasing trend in export shares. With the category like the manufactured goods classified chiefly by material (SITC 6) and the miscellaneous manufactured articles (SITC 8) suggesting a sharp declining exports which recorded shares of almost half of the respective shares in 1990s. The office machines and automatic data processing machines (SITC 75); Telecommunications and sound recording and reproducing apparatus and equipment (SITC 76); Electrical machinery, apparatus and appliances, n.e.s. and electrical parts thereof (SITC 77) products fell under the broad category of machineries and transport equipment i.e., (SITC 7). Except for the professional, scientific and controlling instruments and apparatus, n.e.s. (SITC 87) which was part of the miscellaneous manufactured articles. The other sector which showed an upward trend is SITC 5 chemicals and related products n.e.s. which increased its share in the total exports from 1.4 percent share to 13.7 percent share in 2010. While, the exports shares of manufactured goods classified chiefly by material (SITC 6) has shown a declining trend from 40.2 percentages share in 1995 to 18.5 percentages share in 2010. Among the manufacturing

sector in India only two sectors indicated competitiveness and they are the Machinery and transport equipment (SITC 7) and chemicals and related products n.e.s. (SITC 5).

Table 8: Top Thirty Exports of ITA products to India

SL.No.	Row Labels	1996 (US \$ 000)	% Share to Total ITA Exports	2010 (US \$ 000)	% Share to Total ITA Exports	Count of ITA Products Supplied	Total Exp. 1996 to 2010 (US \$ billion)
1	USA	209066.523	28.00	768030.89	11.90	160	5.9
2	Singapore	82465.875	11.04	299918.21	4.65	162	2.5
3	United Arab Emirates	21898.004	2.93	461458.04	7.15	161	2.3
4	Germany	18013.442	2.41	316292.75	4.90	158	2.2
5	China, Hong Kong SAR	48662.89	6.52	279548.35	4.33	148	1.9
6	Netherlands	22461.278	3.01	354455.49	5.49	150	1.8
7	United Kingdom	123524.495	16.54	125162.95	1.94	158	1.6
8	Malaysia	62924.312	8.43	84369.76	1.31	152	1.2
9	China	1694.551	0.23	194192.89	3.01	148	1.0
10	Nigeria	2741.089	0.37	135958.22	2.11	149	0.7
11	Indonesia	3706.248	0.50	146521.64	2.27	143	0.7
12	Austria	534.053	0.07	524187.46	8.13	128	0.6
13	Italy	6008.764	0.80	201871.93	3.13	156	0.6
14	Spain	6327.932	0.85	102646.90	1.59	145	0.6
15	Saudi Arabia	3672.029	0.49	96002.00	1.49	153	0.6
16	Thailand	2875.921	0.39	98555.74	1.53	151	0.6
17	France	3816.077	0.51	136185.18	2.11	158	0.5
18	Kuwait	780.462	0.10	363514.53	5.63	143	0.5
19	South Africa	3102.405	0.42	128917.62	2.00	152	0.5
20	Romania	154.145	0.02	142601.70	2.21	104	0.5
21	Japan	9424.796	1.26	37794.62	0.59	154	0.4
22	Hungary	54.615	0.01	38923.23	0.60	118	0.4
23	Egypt	1951.485	0.26	80539.54	1.25	140	0.4
24	Australia	4659.657	0.62	53412.76	0.83	151	0.3
25	Bangladesh	8538.565	1.14	34176.18	0.53	155	0.3
26	Kenya	4683.801	0.63	55702.02	0.86	150	0.3
27	Russian Federation	21234.643	2.84	72069.23	1.12	125	0.3
28	Viet Nam	682.645	0.09	57003.46	0.88	127	0.3
29	Brazil	832.383	0.11	67166.29	1.04	135	0.3
30	Iraq			50569.01	0.78	98	0.2
31	Others	70174.031	9.4	943618.2	14.6	66	6.0
	World	746667.116	100.00	6451368.57	100.00	163	36.0

Note: Total Exp. 1996 to 2010 includes all 165 ITA-1 products.

Source: WITS and TRADESIFT Software

While in terms of import shares China gained a substantial part in the Indian market, like wise India also should have had a substantial share of ITA products to Chinese market. Hence, we should conclude that India and China has limited bilateral trade. However, if this does not hold true then we are looking at a scenario of imports from China, a substantial portion of which is being used for domestic consumption as India is not re-exporting these to the world. Further this is validated by simple CAGR for 14 years of India's import from the world was 35.6 percentages (1996 to 2010) when compared to CAGR of India's exports to world at 16.7 percentages.

Top 9 export destinations of India have seen substantial change over the ITA liberalisation period. USA ranked first amongst the top export destinations of India, having a share of about 11.9 percent in 2010 - a sharp drop from the 28 percentage in 1996. It was followed by Singapore with 4.65 percent shares in 2010 down from 11.04 percent shares. United Arab Emirates 7.15 percent shares in 2010 up from 2.93 shares in 1996. Germany had 4.90 percent shares in 2010 up from the shares of 2.41 percentages in 1996. Hong Kong was at the fifth place with 4.33 percent shares in 2010 while the share in 1996 was 6.52 percentages. Netherlands showed marginal gains in shares during the period from 3.01 percent in 1996 to 5.49 percent shares in 2010. United Kingdom showed a sharp decline in the share of 16.54 percent in 1996 to 1.94 percent shares in 2010. Malaysia showed a decline to 1.31 percent share of the total India's export to the world – in 1996 it had 8.43 percent shares. While,

China who topped the suppliers list recorded only 3.01 percent share in 2010 and a further lower share of 0.23 percent in 1996. From India's point of view, the bilateral trade between these two fastest growing economies in the 164 ITA-1 products can be described as follows, the exports of India grew by 115 times in comparison to 2075 times of Chinese imports.

Table 9: Top 50 India's Exported Values and Shares (164 Products of ITA-1)

Sl. no.	HS code/ Description	Value US \$ million				GL Index		
		1996	2000	2005	2010	1996 to 2000	2001 to 2005	2006 to 2010
1	852520 Transmission apparatus incorporating recept	2.2	6.3	27.4	1497.4	0.10	0.05	0.32
2	854140 Photosensitive semiconductor devices, includ	4.5	25.7	93.7	585.7	0.74	0.60	0.86
3	847330 Parts and accessories of the machines of head	123.4	134.9	221.3	140.1	0.46	0.38	0.21
4	850440 Static converters	2.9	3.7	158.5	354.3	0.32	0.46	0.86
5	852499 Other	142.0	294.9	55.0	0.0	0.72	0.79	0.80
6	841989 Other machinery, plant and equipment :- Oth	9.0	7.3	46.6	472.9	0.58	0.85	0.82
7	853400 Printed circuits.	19.7	31.6	71.4	600.1	0.92	0.77	0.72
8	847990 Parts	22.2	33.3	155.4	119.3	0.69	0.89	0.65
9	847989 Other machines and mechanical appliances :-	17.8	31.1	70.1	113.7	0.43	0.49	0.32
10	847170 Storage units	127.9	8.7	17.3	121.7	0.35	0.10	0.26
11	852390 Other	5.7	5.7	10.5	136.2	0.42	0.38	0.23
12	847190 Other	10.3	29.9	98.7	31.3	0.26	0.89	0.87
13	850490 Parts	7.4	29.8	54.8	108.5	0.76	0.86	0.76
14	853690 Other apparatus	3.2	5.3	67.1	182.7	0.23	0.54	0.67
15	846693 Other :- For machines of headings Nos. 84.56	13.6	26.1	82.8	61.6	0.82	0.81	0.73
16	852990 Other	5.1	8.8	39.3	77.3	0.11	0.18	0.29
17	851790 Parts	5.7	7.4	23.0	182.3	0.23	0.15	0.16
18	841990 Parts	6.8	4.7	39.2	109.2	0.28	0.74	0.78
19	852491 Other :- For reproducing phenomena other th	0.1	1.4	58.2	0.0	0.06	0.21	0.51
20	853650 Other switches	1.7	4.6	32.0	60.4	0.20	0.51	0.74
21	847710 Injection-moulding machines	9.2	20.1	42.1	35.8	0.67	0.78	0.47
22	851780 Other apparatus	1.2	0.5	3.6	175.6	0.24	0.10	0.13
23	852320 Magnetic discs	2.8	8.0	0.0	108.9	0.59	0.26	0.43
24	842119 Centrifuges, including centrifugal dryers :- Ot	1.4	3.1	14.0	59.4	0.58	0.74	0.75
25	847290 Other	0.4	3.5	28.3	46.5	0.26	0.49	0.86
26	847340 Parts and accessories of the machines of head	0.4	0.8	2.3	74.1	0.54	0.32	0.75
27	391810 Of polymers of vinyl chloride	6.8	3.9	18.4	76.5	0.24	0.80	0.44
28	847790 Parts	4.2	8.3	21.4	31.8	0.47	0.77	0.51
29	852439 Discs for laser reading systems :- Other	0.0	0.0	11.5	138.8	0.13	0.39	0.56
30	854470 Optical fibre cables	0.6	8.6	23.3	17.3	0.41	0.35	0.63
31	854150 Other semiconductor devices	4.7	11.6	25.5	19.7	0.78	0.56	0.77
32	851711 Telephone sets; videophones :- Line telephon	2.2	1.6	2.2	108.2	0.58	0.41	0.54
33	702000 Other articles of glass.	1.1	3.2	13.0	39.7	0.79	0.79	0.51
34	852910 Aerials and aerial reflectors of all kinds; parts	2.9	2.1	6.7	18.0	0.38	0.20	0.29
35	854449 Other electric conductors, for a voltage not ex	0.6	1.6	9.1	0.0	0.18	0.26	0.38
36	847160 Input or output units, whether or not containi	4.7	7.4	17.3	62.5	0.12	0.09	0.09
37	854212 Monolithic digital integrated circuits :- Cards	17.1	1.1	8.3	61.9	0.25	0.17	0.28
38	391890 Of other plastics	8.4	4.1	11.3	20.8	0.28	0.23	0.57
39	854389 Other machines and apparatus :- Other	0.3	1.8	18.7	43.0	0.08	0.16	0.20
40	847141 Other digital automatic data processing machi	11.3	5.2	13.3	19.9	0.54	0.42	0.35
41	854230 Other monolithic integrated circuits	22.1	0.8	2.9	32.3	0.23	0.03	0.05
42	902610 For measuring or checking the flow or level o	1.5	1.9	12.2	24.2	0.22	0.58	0.54
43	852510 Transmission apparatus	0.9	0.7	27.6	16.3	0.07	0.34	0.57
44	851829 Loudspeakers, whether or not mounted in the	6.1	7.6	21.8	9.2	0.67	0.56	0.26
45	847130 Portable digital automatic data processing ma	2.5	3.1	4.1	29.1	0.17	0.13	0.05
46	853229 Other fixed capacitors :- Other	2.6	5.8	8.1	6.0	0.35	0.32	0.22
47	854390 Parts	1.1	1.4	6.8	28.3	0.16	0.24	0.29
48	851430 Other furnaces and ovens	1.3	0.9	11.4	7.6	0.32	0.76	0.70
49	852431 Discs for laser reading systems :- For reprodu	0.0	0.8	31.7	0.0	0.33	0.18	0.11
50	853340 Other variable resistors, including rheostats a	0.6	2.4	13.0	11.1	0.31	0.85	0.56
Top 50 Products total / Average for GL index		650.1	823.0	1852.2	6277.6	0.39	0.46	0.49
Total 164 ITA-1 products / Maximum for GL index		783.3	929.1	2074.1	6833.5	0.92	0.89	0.87
Share of Top 50 (%) / Median for GL index		83.0	88.6	89.3	91.9	0.32	0.41	0.51

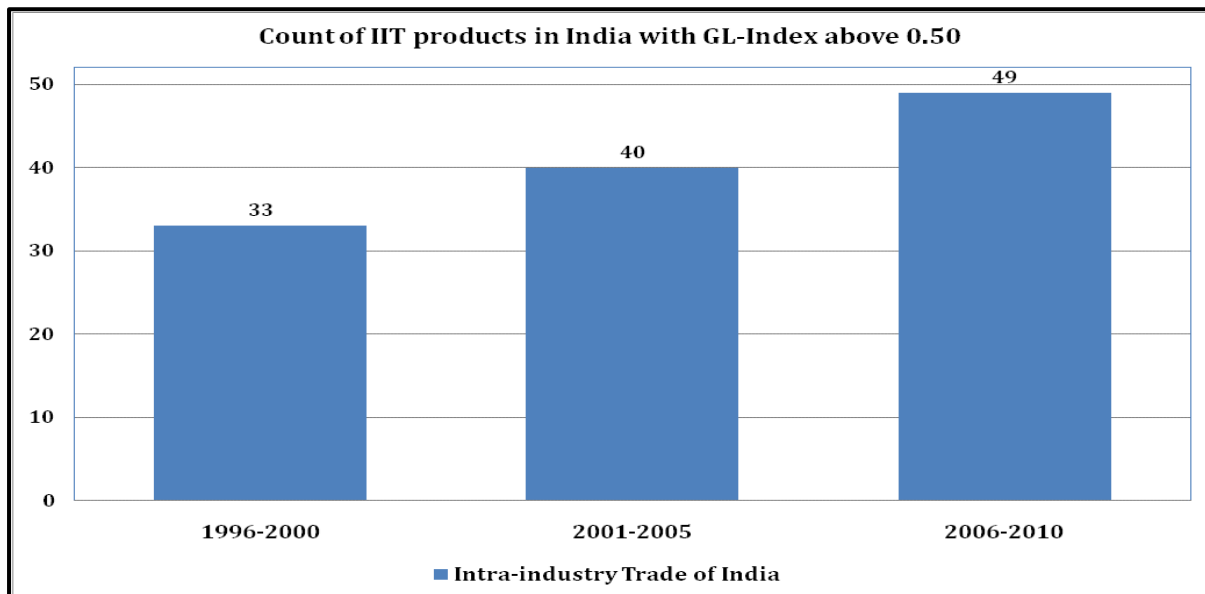
Note: columns 3 to 6

Source: WITS and TRADESIFT Software

Table 9 analyses the HS code-wise trends over the period of 1996 to 2010. This analysis is done looking at two components; the total exports values and the corresponding GL index (suggesting intra-industry trade). The gist from this table is that the selected top 50 ITA-1 products had a coverage of 83 percentage in 1996 this got concentrated to 92 percentages by 2010. Thus showing that just like imports the export are getting concentrated. For the top 50 exported items, which accounted for nearly 92 per cent of total ITA 1 products, had a very low GL index of 0.41. Figure 15, analyses the intra-industry trade in India in comparison to

the World. A bench mark of GL indexes more than 0.50 is chosen to count the number of tariff lines which fall under this criteria.

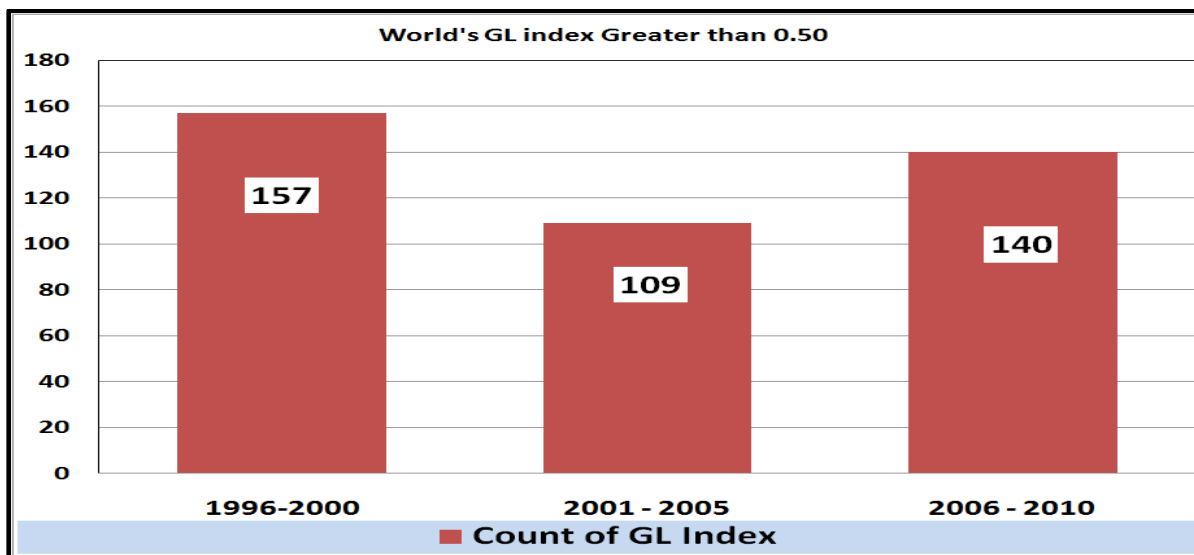
Figure 15: India’s Tariff lines with IIT (GL index >0.5): total ITA-1 Products



Source: WITS COMTRAD Online and used TRADESIFT for calculation of GL-Index

The count of ITA-1 products with more than 0.50 GL index has risen to 49 during 2006 -10 from 33 during the period 1996-2000. Therefore, there is an increasing trend seen in GL index above 0.50, signifying the rise of intra-industry trade in the ITA after liberalisation of the sector.

Figure 16: World Tariff lines with IIT (GL index >0.5): total ITA-1 Products

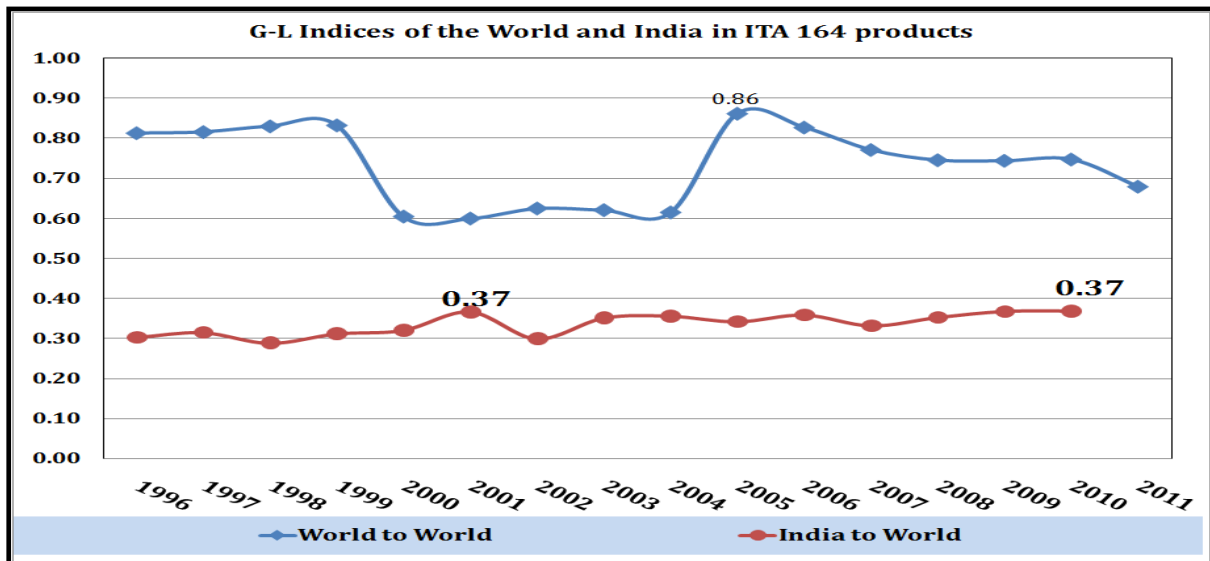


Source: WITS COMTRAD Online and used TRADESIFT for calculation of GL-Index

While the global GL index average for 1996 to 2010 was close to 0.74 values, India's Intra-industry trade index was very low at 0.34 values therefore, suggesting that most of India's trade was for domestic consumption purposes, see Figure 16. The counts of ITA-1 products (165 total lines) in the case of world it was 157 products between 1996 and 2000, however it

fell to 109 products only to rise again to 140 products. In comparison to world, India had far less number of tariff lines with intra-industry trade more than the value of 0.5.

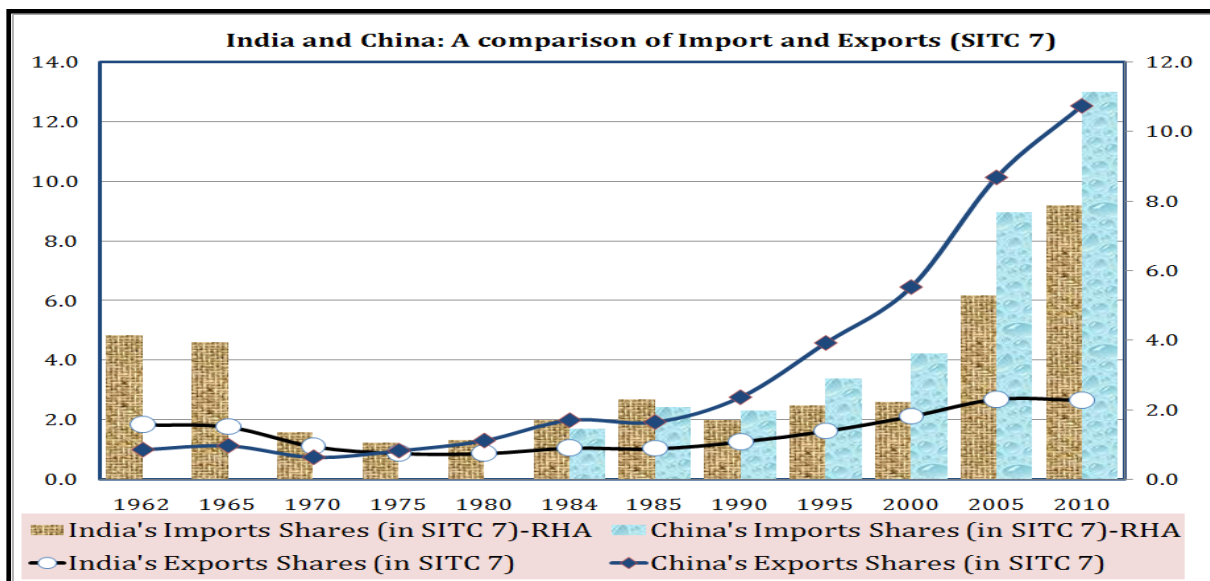
Figure 17: Intra-Industry Trade: Comparison of GL Indices of World and India



Source: Calculated by the Author based on WITS COMTRADE online Database

There is a clear evidence of shifting of a significant portion of ITA trade to China while ignoring the Eastern Europe, Japan and the United States. Anderson (2010) studied the significant developments in global ITA trade including, increasing diversification of ITA members' trade and economic profiles and expanding trade participation by developing countries. The emergence of complex global supply chains for IT products, rapid deployment of new technologies, and technology convergence since the ITA's inception, shed new light on the role of the ITA in global trade.

Figure 18: Comparative Exports and Imports of China and India to World:



Source: WITS online database.

India's domestic demand is indicated by surge in its imports from the world, if this result has to be read with the trends in GL indices. Such an interpretation needs to be carried out across the 165 ITA products and for the top 50 products. It would suggest that Indian has eliminated the tariff on the one hand but did not have sufficient industrial standards in place to protect and maintain the national production platforms. This happened because India has not been grounded with realities of the hardware industry. The distance between the two players increased also due to ITA-1 implementation as for these, it could not find standards that could be applied on national treatment basis across 165 ITA products. Hence, it could be said that there has been clearly a replacement of Indian electronic products with externally imported products mainly from China, see Figure 18.

6. Scenario of Indian Hardware Sector - Dependence on Imports

The growing importance of global value chains (GVCs) in the international organisation of production increasingly challenges the traditional way of measuring countries' export performance and hence international competitiveness. As a result of growing production fragmentation, a country's export bundle nowadays incorporates imports of intermediate goods representing a (large) part of its value. In this case, simply looking at the evolution of exports may misrepresent the international competitive position of a country. This paper discusses the export performance of countries along the value chain by distinguishing upstream activities (i.e. the production of intermediate inputs) and more downstream activities (e.g. the final assembly of products). The empirical analysis first shows how imports of intermediates increasingly determine the export competitiveness of countries in final products. Second, the paper analyses the developments at the intensive and extensive margins of trade and studies how structural changes in terms of geographical and sectoral composition, largely outside the influence of national policies, have contributed to countries' export performance.

These global value chains creations have been happening at faster pace in the Information and Technology sector. So the chance of exports and imports increasing because of crisscrossing of products at various stage of production like: raw, intermediate and final goods.

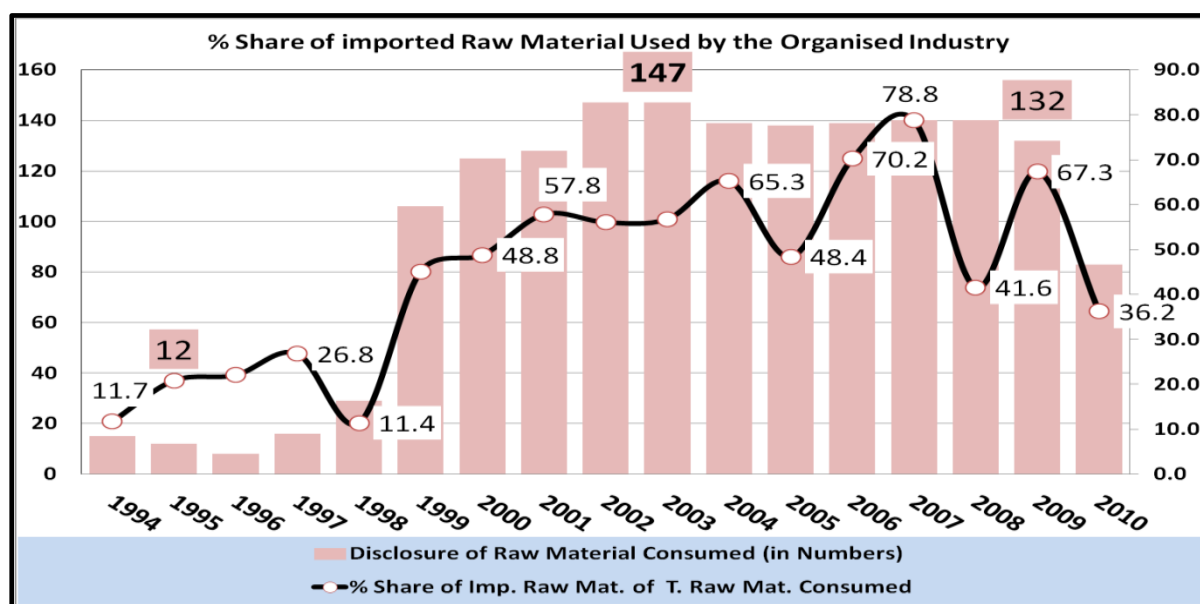
Estimation on the Growing Role of Imported Raw Materials in India

In this section, we have used the Centre for Monitoring Indian Economy (CMIE) PROWESS corporate firm level data. This dataset has total unique coverage of 27,000 corporate firms in India out of this close-to 5000 are listed companies. It gives a common sample size of 17000 companies that can be obtained with minor data loss for the last five years.

Indian hardware sector has a total of 483 firms belonging to organised/listed companies, of these, 39 companies had merged status. The total raw material used in the production of the final good is divided into two parts the imported and indigenous raw materials. While clearly

the information on total raw material disclosure has continued to increase over the years. This is especially true after 1999-00 when this crossed 106 firms from a low of 12 firms in 1995. Therefore, we have taken a set of 147 firms for the purpose of our analysis as common sample. Our main purpose is to understand the dynamics in the import content of India's electronic hardware industry and to understand whether there was any dynamic shift after the ITA-1 was implemented. Even though the exports of electronic hardware industry in India grew marginally since the liberalisation of 1991 (see Figure 9) this did not led to increase in imported contents to the total raw material – it was lower than 27 percentages. One major reason could be due to low disclosures during the period, which averaged around 16 firms out of the 147 common firms sample selected for analysis. This was less than 11 percentage of the total sample size.

Figure 19: Indian Hardware Sector: Trends in Disclosure and Imported Contents



Source: Authors calculation based CMIE PROWESS.

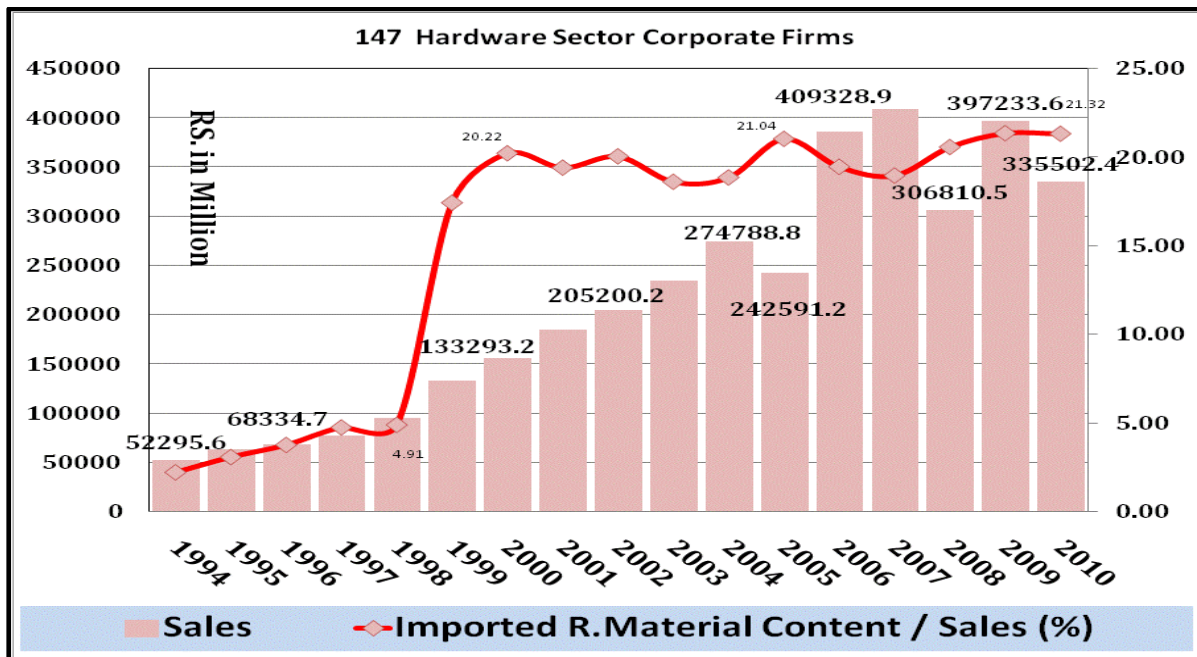
However, with India signing the ITA in 1997, the situation dramatically changed within two years, the imported contents to total raw material consumed shot up to 45.1 percent of the total raw materials used in these firms; it further gained momentum to 57.8 percentages in 2002.

The year of total elimination tariffs saw a rather moderate imported content of total raw materials which was close to 50 percent and by 2008 it went up to 80 percentages. This clearly indicates direction of the organised Indian hardware industries: that is to import intermediate/capital goods and assemble within the country leading to very low value addition and even lower employment creation as direct outcome of the route which the organised industry is taking.

Figure 20, provides detailed unadjusted trends on the total imported raw material to the sales of 147 firms as common sample of the hardware sector. The results are to crosscheck the trends in order to understand its relationship with total sales. The complete analysis is

undertaken without taking into consideration the impact of exchange rate variations on the sample firms.

Figure 20: Unadjusted Trends in Imported Raw Material Content to Total Sales



Source: Authors calculation based CMIE PROWESS

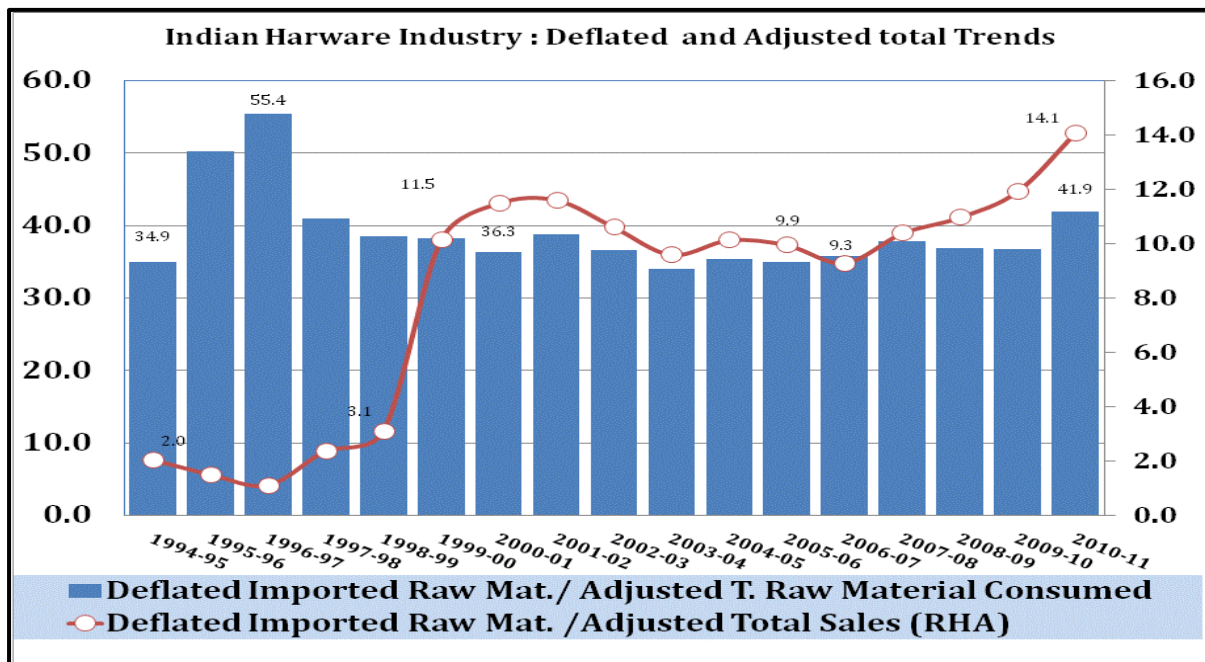
This showed that there was a gradual increase in the sales from 1997 to 2005 at an average increase of 15 percentages annually. When the Tariff was eliminated completely in 2005 the sales showed an annual average increase of nearly 30 percentages – almost ten percentage points higher.³⁴ It could be concluded that a complete liberalisation of a portion of the ITA sector provided a boost to the whole Indian electronic sector.

While the sales increased, so did the raw materials imported to sales percentages. During the ITA-1 there was spurt in the percentage from around 5 percentages to 20.2 percentages in 2000. The raw material imported to sales percentage was about 18.4 percentages in 2004, which was the lowest value seen for the rest of the period of analysis. So clearly, while comparison are drawn on the nature of imported raw materials consumed to the total raw materials and total sales, the percentage to sale have been lower, see Figures 19 & 20.

We have removed the export which is a portion of total sales in each firm to arrive at domestic sales and exports. The exports are then deflated using the currency deflator to arrive at adjusted exports. The adjusted exports when added to the domestic sales would give the final adjusted sales. A similar exercise is carried out on the total raw material consumed to arrive at adjusted raw materials. Then we have calculated individual percentages of deflated imported raw material to adjusted total raw material consumed and deflated imported raw material to adjusted total sales, see Figure 20.

³⁴ The total sale is inclusive of domestic sale and exports.

Figure 21: Adjusted Trends in Imported Raw Material and Total Sales

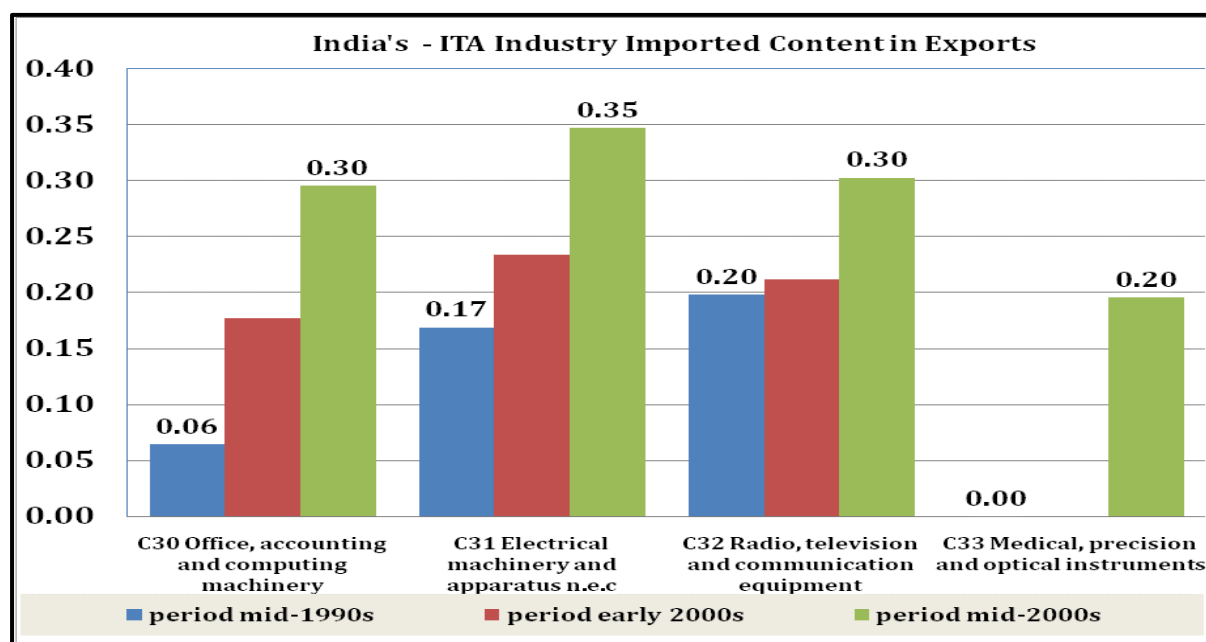


Source: Authors calculation based CMIE PROWESS

A relatively similar trend is observed in deflated raw material consumed to total adjusted raw material imported to sales, as seen in Figure 21. However, the trends seen in the case of imported raw materials to total raw materials in rupees (seen in Figure 16 as line graph) and the deflated imported raw material to the total adjusted raw material consumed (seen in Figure 19 in bar graph) are completely different. The difference is primarily due to low rate of disclosures by the firms operating with an average of 16 in the Indian hardware sector for the period 1994-05 to 1998-99. Otherwise, the industry average of deflated imported raw material to adjusted total raw material consumed by the Indian Hardware sector was at 37 percentages, with the exception to the initial few years having an average of 44 percentages. However, the deflated imported raw material to adjusted total sales, which is represented on the right hand axis, was very low in the initial years but later it increased in 1999-2000 to 10.1 percentages. This again could be a problem with very low disclosure. The average after this was around 11 percentages. What can be concluded is that while average imported raw material to sales have shown an increasing trend, its share in percentages to total adjusted raw material consumed have remained almost stagnant.

We have used completely independent source to verify our results of increasing import content in the Indian exports. Using the UN International Standard Industrial Classification (ISIC) the OECD has calculated the quantum of imported content in the total exports across all sectors for different sectors. We have used the ITA part in order to understand the results and put things in perspective in the Indian context. Of the report we have used, only portions concerning the ITA segments like: (ISIC-C30) Office, accounting and computing machinery; (ISIC-C31) Electrical machinery and apparatus n.e.s; (ISIC-C32) Radio, television and communication equipment; (ISIC-C33) Medical, precision and optical instruments are analysed.

Figure 22: STAN Input-Output Imports content of Exports (India)



Source: Author calculated based on the OECD StatExtracts iLibrary

These results show an increase in imported contents in the exports across product segments of India between the periods of mid-1990 and mid 2000s. For the office, accounting and computing machinery it has increased by 24 percentage points. This was highest across the ITA products exported from India. It was followed by medical, precision and optical instruments wherein the imported content has shown 20 percentage point increase. The third category was electrical machinery and apparatus n.e.s, wherein imported contents increased by 18 percentage points. The last category was the consumer electronics like radio, television and communication equipment wherein the increase was about 10 percentage points. Certainly, there is a strong case for domestic replacement of manufacturing bases in India by the imported products which is a direct outcome of ITA tariff alone liberalisation. Evidence from the data analysis suggests that there is no danger of “*hollowing-out*” in India as could be observed in the case of China.

7. Conclusion

There are many myths surrounding the software success in the India, one such myth is that the ITA brought about the liberalisation of tariff on import of hardware and this in turn supported the surge in software exports. The paper to some extent establishes that ITA induced liberalisation was partial and even this partial liberalisation was total only from 2005 - when tariff was reduced to zero for a substantial number of ITA products or complete elimination happened in the case of India.³⁵ It has been clearly demonstrated in this paper that many initiatives were taken by the government to support the software sector growth in

³⁵ The real indirect impact of ITA would to be felt from 2005 onwards when tariff was complete elimination on all the ITA lines. So expansion of the usage of computer and other enabling skills happened after 2005. This would have led to the creation of additional manpower equipped with the “technological” knowhow combined with the knowledge of English.

India, much before the ITA-1 was even conceived in 1996 (at the Singapore Ministerial). Thus it is clear that the Indian government had taken policy initiatives to support the software sector much before ITA 1 (in 1996) and even before the Uruguay Round (1986-1994). Therefore, India's software exports success has no direct links to the ITA-1 (hardware sector) liberalisation.³⁶ This was further corroborated by growth rates in exports in software services registering a higher growth during pre-ITA-1 period when compared to post-ITA-1. Besides this the top 10 performers in the software exports had began operations in India much before the agreement came into existence. Further, the government also supported and facilitated the growth of software sectors which began as early as in 1960s. It should be noted that the Information Technology Parks of today were actually created with the support from the Government of India in the 1990s. Thereafter, the liberalisation in the 1991, which in fact was an external liberalisation of the private sector operations, empowered them to unlock capacity which until then was restricted by the policies of "*licence raj*".

The ITA-1 was meant to be an Agreement under the WTO to eliminate tariffs and non-tariff measures; however, it simply remained another tariff cutting mechanism like all the other WTO Agreements.³⁷ Its product coverage was also restricted to those products that were in the interest of developed countries.³⁸ There has been clearly an indication that imports have surged in India and this has been demonstrated in this paper. India had eliminated its tariffs as per the ITA commitments in two phases 2000 (96) and 2005 (121) ITA products. However, on the contrary the trends on yearly basis suggest an ever increasing trend of non tariff measures.³⁹ It has been observed that the developed countries have put in mandatory measures like *technical regulation/standards/certification*, which has led to a "*domino effect*" in the developing countries. It was supported well by the increasing role of global

³⁶ It should be noted that for projects equipments were imported at zero or very nominal duties even before 1996 information technology agreement.

³⁷ The NTB work programme, which began at the end of 2000, had three phases. In November 2000, a "Non-Tariff Measures Work Programme" was launched by the Committee of Participants on the Expansion of Trade in Information Technology Products (ITA Committee) to identify NTM/Bs and assess their impact on IT trade. In the 11 submissions to the ITA Committee, the participating countries identified wide-ranging forms of NTM/Bs. Majority of the identified NTM/Bs fell within the standards and the conformity assessment area, customs procedures and import licensing were some of the more prominent among the other forms of NTBs. Following a Canadian proposal, the Committee took up a pilot project for specific standards-related NTBs regarding conformity assessment procedures for electromagnetic compatibility/electromagnetic interference (EMC/EMI). The EMC/EMI Pilot Project resulted in a set of "guidelines" for EMC/EMI conformity assessment procedures, prepared by the ITA Committee. Several participants in the ITA Committee commented on the likely linkages with the NTM/Bs agenda being pursued by the Negotiating Group on Market Access (NGMA) (WTO, 2004 and 2005). The key issue in this regard is the whether or not the approach followed in the EMC/EMI Pilot Project could be extended to cover other areas. This point assumes importance in view of the fact that, so far, there is no agreement within the ITA Committee to use the EMC/EMI Pilot Project experience in other areas. There seems to be some divergence of opinion in this regard, with some participating countries indicating that particular areas of concern for developing countries could be examined using the template provided by the EMC/EMI Pilot Project. It may appear that the EMC/EMI experience has limited applicability given that the progress achieved under ITA with regard to NTMs has not been satisfactory. The long list of unfinished standards under the ISO and looking at the similar number of other formalized standards that require an understanding at the multilateral level is testimony to this fact.

³⁸ The initial proponent countries of the ITA were QUAD Countries (USA, Canada, Japan and EU) the few developing countries proponents in list were Singapore and Hong Kong.

³⁹ Only one project has been initiated in 2001 on the harmonization of EMC/EMI standards.

supply chain (GSCs) in this sector and the need to create such enabling conditions in the developing countries. On the other hand the highest used standard among the developing countries was the so-called “*regulating market and consumer health/safety and quality standards*”. The developing countries have been attempting to introduce many such measures, but due to the consideration of “National Treatment” (NT) principle these standards are introduced in a much diluted manner.

It has been clearly demonstrated in the paper that the global trading arena for Indian ITA products was highly imbalanced, especially after 2005 when complete elimination of tariff was initiated. It was also evident that India has been denied “market access” by many developed and many other emerging developing countries. The developed countries have increasingly been using national standards, many of which were introduced even before 2004. The other aspect is the large product coverage observed in the period coinciding with a large share of National Measures being notified by developed country signatories of ITA-1. This can be interpreted based on the Figure 4, which indicates high product coverage at 4 digits level and Annexure 4, which shows a larger proportion of yearly notifications by the developed countries falling under the category of National Measures. Therefore, it could be argued that these countries were busy notifying all their national measures much before any disciplining came out of the WTO negotiation process under the ITA committee. The issue of harmonisation at international level was at the lowest level of priority for the developed signatories of ITA products. One other aspect which came to light in the context of trade was the increased concentration in both suppliers and importers of India. However, the original goal of the ITA Agreement was to create competition by increasing trade which has not been true in the case of India. It is been observed in the case of India that there has been an increase in concentration rather diversification of suppliers and exporters.

The last and most critical aspect which emerges from this study is the impact on the employment in the context of a decrease seen in the indigenous content in India’s export of the ITA sector, thus leading to a reduction in value addition and thereby subsequently leading to an impact on employment generation capacity of this sector. It has been noticed that during the period of mid 1990s to the period of mid 2000 the imported content in India’s export has increased substantially. Our examination of the hardware industry in India suggests that there is an increasing tendency of manufacturers turning into assemblers of the same products. Further, this could also have devastating impact on the employment status of the people employed in the ITA sector, increased casualisation of labour force. The decreasing value addition in the electronic hardware sector is having an impact on the employability in this sector in the long run as the IT sector has shown increase in import dependence. Further, the results of the paper suggest a marked decline in the growth rate of output in all the product segments wherein tariff got reduced - for both ITA and non-ITA products. But in case of ITA-1 production where tariff reduction was faster, the rate of deceleration was also faster.⁴⁰

⁴⁰ Joseph K J. and Vinoy Abraham, 2007, “*Information Technology Agreement of WTO and India’s IT Sector*”, Centre for Development Studies, *memio*.

Therefore, the National Manufacturing Policy of 2011 press note stressed the role for having a strong IT hardware sector as that one of “strategic significance” and in the interest of national security.⁴¹ Initiatives like “*Source India*” by the industry association like ELCINA have been introduced too late to have any real impact and it could further be challenged at the WTO. It was important in the context of building national capabilities to make India a major force in sectors like aerospace; shipping; telecommunication equipment; defence equipment; and solar energy. In these industries there is a need for IT products primarily besides the others sectors. In terms of manpower and machinery usage these are industries which require high-technological content.

Select Reference

- Aghion Philippe, Robin Burgess, Stephen Redding and Fabrizio Zilibotti, 2005, “*Entry Liberalization and Inequality in Industrial Performance*”, **Journal of the European Economic Association**, volume 3, issue 2-3, pp 291–302, April-May.
- Aghion Philippe, Robin Burgess, Stephen Redding, Fabrizio Zilibotti, 2006, “*The Unequal Effects of Liberalization: Evidence from Dismantling the License Raj in India*”, **NBER Working Paper** No. 12031, February.
- Anderson Michael, 2010, “*The Information Technology Agreement (ITA): An Assessment of World Trade in Information Technology Products*”, **U.S. International Trade Commission**, January 29.
- Arora Ashish and Jai Asundi, 1999, “*Quality Certification and the Economics of Contract Software Development: A Study of the Indian Software Industry*”, **National Bureau of Economic Research Working Paper** 7260, July, <http://www.nber.org/papers/w7260>.
- Arora Ashish, V.S. Arunachalam, Jai Asundic and Ronald Fernandes, 2001, “*The Indian software services industry*”, **Research Policy**, Volume 30, Issue 8, October, Pages 1267–1287.
- Beltramello Andrea, Koen De Backer and Laurent Moussiégt, 2012, “*The Export Performance of Countries within Global Value Chains (GVCs)*”, **OECD Science, Technology and Industry Working Papers**, no. 02.
- Bridges Review, 2009, “*Trade in Information Technology: Is the ITA Still Relevant?*”, **News and Analysis**, Volume 13, Number 1, March, International Centre for Trade and Sustainable Development (ICTSD).
- Dhar Biswajit and Murali Kallummal, 2007, “*Taming Non-Tariff Barriers: Can WTO find a Solution?*”, **Studies on Trade and Investment**, Trade and Investment Division, UN-ESCAP, no. 61, pp.131-180, Bangkok.
- Dicken Peter, 1998, *Global Shift: Transforming the World Economy*, Third Edition, Paul Chapman Publishers Ltd, London.
- Ezell Stephen, 2012, “*Boosting Exports, Jobs, and Economic Growth by Expanding the ITA*”, Information Technology Industry Foundation, March 15,

⁴¹ Government of India Ministry of Commerce & Industry Department of Industrial Policy & Promotion (Manufacturing Policy Section), “*National Manufacturing Policy 2011*”, Press Note no. 2 (2011 SERIES).

http://www.itic.org/index.php?src=blog&srctype=blog_detail_techelect&refno=180&category=TechElect&print=y

- Gabriele Alberto, 2004, Exports of Services and Economic Growth in Developing Countries, United Nations Conference on Trade and Development, Division on International Goods and Services, and Commodities, 3 June 2004, http://unctad.org/en/docs/ditctncdmisc20036_en.pdf
- Government of India Ministry of Commerce & Industry Department of Industrial Policy & Promotion (Manufacturing Policy Section), “*National Manufacturing Policy 2011*”, Press Note no. 2 (2011 SERIES).
- Grubel H. G. and Lloyd P. J., 1971, “*The Empirical Measurement of Intra-Industry Trade*” **Economic Record**, vol. 47, Issue 4, pp. 494–517, December.
- Illiyan Asheref, 2008, “*Performance, Challenges and Opportunities of Indian Software Export*”, **Journal of Theoretical and Applied Information Technology**, vol.4, no 11, pp.1088-1106.
- Jalava Jukka and Pohjola Matti, 2007, “*ICT as a source of output and productivity growth in Finland*”, **Telecommunications Policy**, Volume 31, Issues 8–9, September–October 2007, Pages 463–472
- Joseph K J. and Vinoj Abraham, 2007, “*Information Technology Agreement of WTO and India’s IT Sector*”, draft report (mimeograph), Centre for Development Studies, draft report (mimeograph).
- Kaiser Robert, 2001, “*Multi-level Governance and Global Market Liberalization: The Interdependence of National, European and Multilateral Telecommunications Policies*”, paper prepared for the ECSA’s seventh Biennial International conference, Wisconsin, May 21- June 2. http://aei.pitt.edu/2114/1/002243_1.PDF
- Kallummal Murali, 2007, “*Non-Tariff Barriers in the Doha Round: Is a Solution in Sight?*”, Focus WTO, IIFT, New Delhi, May-June 2007.
-,2006, “*Non-Agricultural Market Access Negotiations: Real Concerns*”, Social Scientist, Vol. 34, No. 9-10 September-October 2006.
-,2006, “*Non-Agricultural Market Access Negotiations: An Analysis of the Negotiation Dynamics*”, Focus WTO, IIFT, New Delhi, May-June 2006.
- Nagaraj R., 2004, “*Fall in Organised Manufacturing Employment: A Brief Note*”, **Economic and Political Weekly**, vol. 39, no. 30 (Jul. 24-30), pp. 3387-3390.
- Planning Commission, 2001, “*Report of the Working Group on Information Technology for the Formulation of the Tenth Five Year Plan*”, http://planningcommission.nic.in/aboutus/committee/wrkgrp/wg_it.pdf.
- WTO, 2010, “*Report on Implementation and monitoring of 2010*” http://www.wto.org/english/res_e/booksp_e/anrep_e/anrep11_chap3_e.pdf

Annexure 1: Broad Measure: Category-wise TBT notifications

Broad Measures	2001	2002	2004	2005	2007	2008	2009	2010	2011	Total TBT
All Products	1	1		1			7	1		11
Certification					7				1	8
Conformity Assessment Policy							1			1
Packaging & Labelling								1		1
Technical Regulations/Standards			2	1		8		1		12
Total Broad Measures (TBT)	1	1	2	2	7	8	8	3	1	33

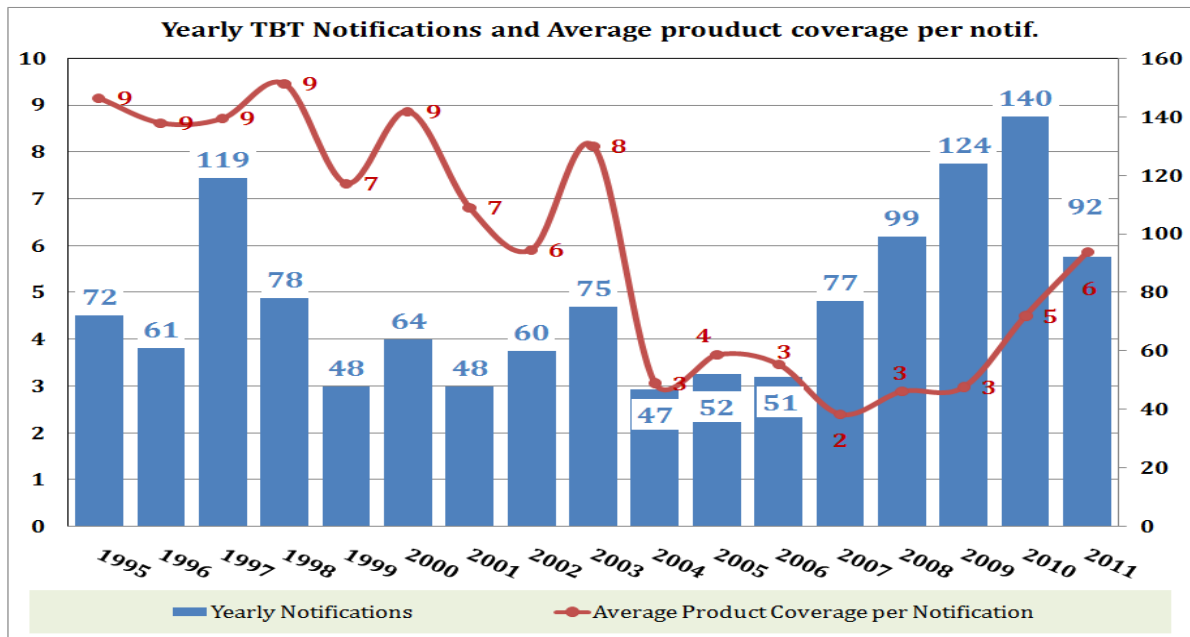
Source: Centre for WTO Studies Web Portal <http://cc.iift.ac.in/tbt/index.asp>

Annexure 2: Developing Countries with Broad Criteria for ITA Products (Notifications)

Country/Broad	2001	2002	2004	2005	2007	2008	2009	2010	2011	TBT Broad
Albania					1					1
Certification					1					1
Bahrain						2	1			3
All Products							1			1
Regulations/Standards						2				2
Brazil	1									1
All Products	1									1
China					3					3
Certification					3					3
Dominican Republic				1						1
All Products				1						1
Georgia								2		2
Packaging & Labelling								1		1
Regulations/Standards								1		1
Kuwait						2	1			3
All Products							1			1
Regulations/Standards						2				2
Kyrgyz Republic					2					2
Certification					2					2
Moldova					1					1
Certification					1					1
Oman						1				1
Regulations/Standards						1				1
Qatar						1				1
Regulations/Standards						1				1
Saudi Arabia						2	2			4
All Products							2			2
Regulations/Standards						2				2
South Africa							1			1
Policy							1			1
South Korea									1	1
Certification									1	1
Thailand			2	1						3
Regulations/Standards			2	1						3
Trinidad and Tobago		1								1
All Products		1								1
Ukraine								1		1
All Products								1		1
United Arab Emirates							3			3
All Products							3			3
Total TBT notifications	1	1	2	2	7	8	8	3	1	33

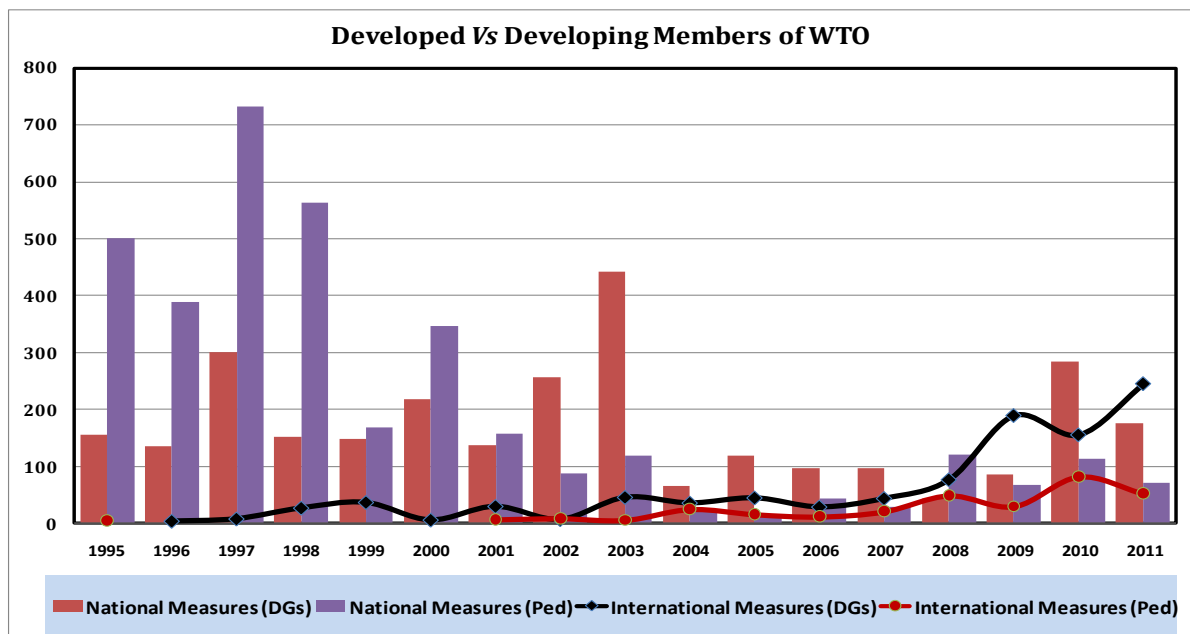
Note: This list has been arrived at after removing all the other products which are not relevant while addressing issues of ITA.

Annexure 3: Total Membership TBT Measures – (yearly notifications & Avg. Cov. per Notif's)



Source: Centre for WTO Studies Web Portal <http://cc.iift.ac.in/tbt/index.asp>

Annexure 4: Detailed Year-wise usage of National Vs International Standards in ITA-1 Products



Source: Authors calculations form Centre for WTO Studies Web Portal <http://cc.iift.ac.in/tbt/index.asp>