

Performance and Export Competitiveness Analysis of Information and Communication Technology (ICT) Industry: A Comparative Study of India and China

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Abstract: *Information and Communication Technology (ICT) industry is a promising sector of India and China. The present study is the performance of goods and service segments of ICT industry of both the emerging economies of India and China. The study also assesses and compares export competitiveness of IT sector of both countries by using the popular Balassa Revealed Comparative Advantage (RCA) index, the Revealed Symmetric Comparative Advantage (RSCA) index and Trade Specialisation Index (TSI) based on data extracted from UNCTAD. It has been observed that India and China both have been enjoying a comparative export advantage in ICT service and ICT goods segments respectively. The contribution of China to global ICT services is limited due to high absorption of domestic market. On other hand India could achieve global recognition in ICT service related sector, but India's comparative advantage in export of ICT services has been decreasing gradually in the recent years. In trade competitiveness, China gains comparative advantage in both ICT goods and service segments and the values are increasing gradually.*

Key Words: *Export Competitiveness, ICT goods and Service, ICT industry.*

I. Introduction

Information and Communication Technology (ICT) Industry has been playing a key role in the production structure of China and India which are two developing countries with similar resources and good GDP (Gross Domestic Product) growth rate in last several years. ICT sector consists of all goods and services that process, transmits and receive information. It includes various segments like software, hardware, Software and Hardware related services, Business Process Outsourcing, etc.,.

Service sector has achieved an important role in Indian economy in last four decades. The Indian IT-BPO (Information Technology-Business Process Outsourcing) industry has become one of the important sectors of Indian economy and transformed the lives of its people in both urban and rural areas. The rapid growth of IT-ITES (Information Technology-Information Technology Enabled Services) industry has helped the service sector in increasing its contribution to India's GDP and India has achieved the global recognition as a „soft“ power. In the field of software and related services export, country has been considered as an IT Super power. A large number of Multinational IT Companies are operating in different segments of Indian IT industry; many of them have obtained international quality certification like ISO and SEI-CMM and PCMM .

China has achieved dominant position as an exporter of ICT goods in global ICT industry. Electronic and Hardware segment of ICT industry has a great role in Chinese Economy. Even though Software production in China is higher than that of India, its performance in the area of software export is very limited. In China, domestic market absorbs around 90% of total software production due to its primary focus on serving domestic needs of software. According to United Nation Conference on Trade and Development (UNCTAD) Information Economy Report 2012, “China has developed a vibrant software industry that is primarily geared towards the domestic market. Much of the local production is either embedded in ICT goods and other products manufactured in China (and often subsequently exported to the world market) or developed to meet rapidly growing ICT use in the domestic economy”.

Objectives of the Study:

The main objective of the research study is to examine the performance of service and goods segments of IT industry of India and China. It also compares export competitiveness of IT sector of both countries. Also checks the export competitiveness of IT industry.

II. Data and Methodology

The research is based on secondary data which are collected from various reports of the National Association of software and service companies (NASSCOM), Department of Electronics and Information Technology (Government of India), UNCTAD, China Software Industry Association (CSIA) etc. The data are used to analyze the performance of Indian and Chinese IT industry in both goods and service segments. Data extracted from UNCTAD data source have been used to measure trade and export competitiveness of both goods and service segments of ICT industry. The list of ICT goods has been revised by UNCTAD based on definition of OECD, which consists of 95 goods defined at the 6-digit level of the 2007 version of the Harmonized System.

As far as ICT service trade data is concerned, UNCTAD is following the concepts and definitions of fifth edition of the IMF Balance of Payments Manual (BPM5, 1993). Three indices were used in this study for comparing competitiveness of India and China in ICT industry

2.1 Revealed Comparative Advantage (RCA)

Revealed Comparative Advantage (RCA) is a powerful tool and widely accepted approach developed by Balassa (1965) to analyse industry competitiveness and international trade specialization. RCA index is the ratio of share of a given sector in national exports to the share of that sector in world export. RCA value reveals the comparative advantage or disadvantage of a country in a particular product or service. The formula to measure RCA is

$$CA = \frac{(X_{ij} / X_i)}{(X_{wj} / X_w)}$$

where,

X_{ij} = Exports of country i of commodity j

X_i = Total Exports of country i =

X_{wj} = Exports of world of commodity j

X_w = Total Exports of world

If the value of RCA is >1 country has comparative advantage in that commodity,

If the value of RCA is <1 country has Comparative disadvantage in that commodity.

2.2 Revealed Symmetric Comparative Advantage

RCA is basically not comparable on both sides of score one due to the problem of asymmetry. Revealed Symmetric Comparative Advantage (RSCA) is the methodology suggested by Dalum, Laursen and Villumsen(1998) to make free from the problem of skewness. This index can be measured by the following formula

$$C A = \frac{(RCA - 1)}{(RCA + 1)}$$

This measure ranges between -1 and +1. If the RSCA score is positive, country has comparative advantage in export of that particular commodity and if negative, country has comparative disadvantage

Trade competitiveness index (TCI)/Trade Specialisation Index (TSI)

RCA index does not consider import variable in analysing trade competitiveness. Trade Specialisation Index (TSI) is a modified RCA index which has been suggested by Greenaway and Milner (1993) to address this problem. It is a ratio between net exports to total trade, the formula of Trade Specialisation Index is:

$$I = \frac{(X_{ij} - M_{ij})}{(X_{ij} + M_{ij})}$$

X_{ij} : Exports of country i of commodity j

M_{ij} : Imports of country i of commodity j

The index ratio will be between -1 and +1.

If the value of TSA is >0 country has trade advantage in that commodity,

If the value of RCA is <0 country has trade disadvantage in that commodity.

III. Performance Analysis

The ICT industry has significant role in these two emerging economies in various ways. This sector attracts foreign direct investment, contributes to the growth of national income and export, strengthens foreign reserve and it has high employment potential. According to the estimate of The National Association of Software and Service Companies (NASSCOM), "IT-BPO industry has contributed to the Services segment of GDP maximum incremental growth of 10 per cent between 2001-02 and 2008-2009, where contribution by other segments either declined or remained almost flat". This rapid evolution of ICT industry is mainly due to the accelerated growth of software and service export in India and of ICT goods export in China.

3.1 Software production

Software industry of India and China caters both the domestic as well as foreign market. Even though Software production in China is higher than that of India, there is a limited contribution to Global Software industry by China due to high absorption capacity of domestic segment of Chinese ICT Industry. This feature of Chinese software sector is clear from the analysis table 1;

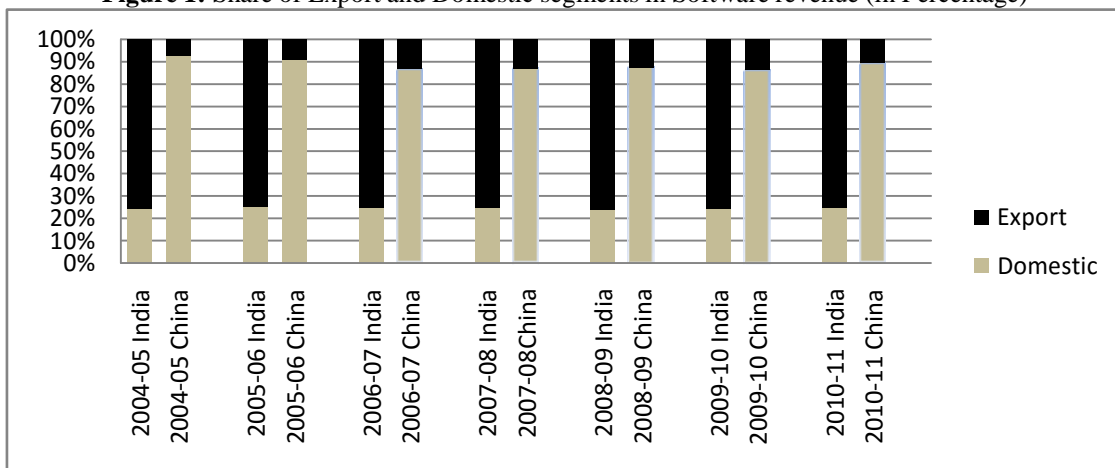
Table 1: Software Output (US\$ Billion) of India and China

Year	India			China		
	Domestic	Export	Total	Domestic	Export	Total
2004-05	4.2	13.1	17.3	44.8	3.6	48.4
2005-06	5.8	17.3	23.1	58	6	64
2006-07	7.1	22	29.1	66.8	10.2	77
2007-08	10.1	30.5	40.6	94.8	14.2	109
2008-09	10.9	35.4	46.3	127.4	18.5	145.9
2009-10	12	37.3	49.3	170.7	26.7	197.4
2010-11	14.5	44.8	59.3	255.5	30.4	285.9

Source: UNCTAD Information Economy Report 2012 and Various reports of NASSCOM

Total revenue of China's software industry (including domestic and export segments) has grown from US\$ 48.4 billion in 2004-05 to US\$ 285.9 billion in 2010-11 out of which 255.5 US\$ billion is domestic. India's software revenue in 2010-11 is \$59.3 billion out of which \$14.5 billion is only domestic.

Figure 1: Share of Export and Domestic segments in Software revenue (in Percentage)



Source: Based on Table 1

Figure 1 show that domestic market of China absorbs around 90% of total software production and share of domestic segment of Indian software industry is only less than 25% of total software production due to expansion of foreign market and less absorption capacity of Indian economy for information technology services.

3.2 Export of Computer and Information Service

Computer and information service consists of hardware and software-related services, data-processing and other information services cover database services such as database conception, data storage and dissemination of data. UNCTAD doesn't include Information Technology Enabled Services (ITES)/ Business Process Outsourcing Services (BPO) in computer and information service which have been considered as other business services.

Table 2: Export of Computer and Information Services of India and China (in US\$ Million)

Year	India			China		
	Export in US\$ million	Growth rate	%share in Total Export	Export in US\$ million	Growth rate	%share in Total Export
2000	4048	-	6.75	356	-	0.13
2001	5947	46.91	9.57	461	29.49	0.15
2002	6582	10.68	9.32	638	38.39	0.17
2003	8562	30.08	10.1	1102	72.73	0.23
2004	12133	41.71	10.44	1637	48.55	0.25
2005	16079	32.52	10.39	1840	12.4	0.22
2006	21362	32.86	11.04	2958	60.76	0.28

2007	27476	28.62	11.41	4345	46.89	0.32
2008	35868	30.54	11.73	6252	43.89	0.4
2009	32332	-9.86	12.4	6512	4.16	0.49
2010	38996	20.61	11.2	9256	42.14	0.53
2011	45474	16.61	10.19	12182	31.61	0.59
2012	47178	3.75	10.63	14454	18.65	0.64
2013	49518	4.96	10.67	15426	6.72	0.64

Source: Calculated on the basis of UNCTAD (United Nations Conference on Trade and Development) data. Data on ITES/BPO are not included in Computer and Information service.

India has been doing significant contribution to the global ICT service sector. Indian ICT service sector generated export revenue about US\$ 49518 million in 2012-13 with 10.67% of total Indian export. In case of China, ICT service sector has grown from US\$ 356 million in 2000-01 to US\$ 15426 million in 2012-13. Share of IT service industry in total export of China is less than 1 percentage due to the high domestic needs of ICT services in China.

2.3 Export of ICT Goods

In its broad sense the ICT goods Industry comprises both Computer hardware and other electronic goods which are used in information gathering and dissemination. According to UNCTAD classification, ICT goods industry includes

- Computer and peripheral equipments
- Communication equipments
- Consumer electronic equipments
- Electronic components and
- Miscellaneous

Table 3: Export of ICT goods of India and China

Year	India			China		
	Export in US\$ million	Growth rate	%share in Total Export	Export in US\$ million	Growth rate	%share in Total Export
2000	714	-	1.19	44135	-	15.79
2001	858	20.17	1.38	53221	20.59	17.8
2002	781	-8.97	1.11	78243	47.02	21.41
2003	957	22.54	1.13	121365	55.11	25.02
2004	1082	13.06	0.93	177742	46.45	27
2005	1132	4.62	0.73	234086	31.7	27.97
2006	1344	18.73	0.69	297653	27.16	28.04
2007	1567	16.59	0.65	357974	20.27	26.67
2008	1770	12.95	0.58	396424	10.74	25.06
2009	6099	244.58	2.34	356301	-10.12	26.8
2010	4404	-27.79	1.27	459522	28.97	26.38
2011	6580	49.41	1.47	508012	10.55	24.47
2012	5734	-12.86	1.29	554310	9.11	24.62

Source: Calculated on the basis of UNCTAD (United Nations Conference on Trade and Development) data

Even though Service and Goods are complementary in use, the goods segment of ICT industry is less robust than its services counterpart in India. But China could achieve dominant role in goods segments of global ICT industry. ICT goods export has accounted one fourth of total export of china with US\$ 554310 million in 2011-12 where as ICT goods contribute only 1.29% to total export of India with US\$ 5734 million.

IV. Export competitiveness

Export competitiveness of ICT industry of both countries is being analysed by estimating Revealed Comparative Advantage Index, Revealed Symmetric Comparative Advantage Index, Trade Specialisation Index of both computer and information services and ICT goods segments.

4.1 Revealed Comparative Advantage Index

RCA in Computer and Information services

$$= \frac{(E_{T a} / T a)}{(E_{T c} / T c)} \frac{a_{I a}}{a_{I a}} \frac{I a}{I a} / T a E$$

RCA in ICT goods

$$= \frac{(E_{T a} / T a)}{(E_{T c} / T c)} \frac{E_{T a}^{ICT}}{E_{T a}^{ICT}} \frac{I a}{I a} / T a E$$

Table 4 shows the RCA score of India and China in both service and good segment of ICT industry.

Table 4: RCA scores of India and China

Year	ICT services		ICT goods	
	India	China	India	China
2000	11.75	0.22	0.09	1.26
2001	13.84	0.22	0.12	1.57
2002	12.65	0.24	0.1	1.92
2003	12.6	0.28	0.1	2.31
2004	12.7	0.3	0.09	2.49
2005	12.94	0.27	0.07	2.62
2006	13.09	0.33	0.07	2.64
2007	12.68	0.36	0.07	2.92
2008	11.93	0.4	0.07	3.04
2009	10.39	0.41	0.26	3.03
2010	9.94	0.47	0.14	2.91
2011	9.16	0.53	0.18	3.02
2012	9.22	0.56	0.16	3.1
2013	8.67	0.52	-	-

Source: Calculated on the basis of UNCTAD data

It is clear from the comparison of RCA index between China and India that index of India is superior to China in case of Computer and Information services. So we can say that India has comparative export advantage and China has comparative export disadvantage in Computer and Information services. The disparity between China and India has decreased from 11.53 to 8.15 from 2000 to 2013. India's comparative export advantage in export of ICT services has been decreasing gradually from 11.75 in 1999-2000 to 8.67 in 2012-2013.

In the case of ICT goods industry, Chinese RCA index superior to Indian in all years from 2000. The disparity between China and India has enlarged from 1.17 in 1999- 2000 to 2.94 in 2011-2012. China's comparative advantage in export of ICT goods is increasing gradually and it has accounted 3.10 in 2011-12. India's value is increasing, but still it is around 0.5.

3.2 Revealed Symmetric Comparative Advantage Index(RSCA)

Values of RSCA index in various years of both countries also reveal comparative export advantage of India in ICT services and China in ICT goods. RSCA value of Indian Export advantage in ICT services is around 0.8 in all years and RSCA value of China in ICT goods industry has increased from 0.11 in 1999-2000 to 0.51 in 2011-12.

Table 5: RSCA Scores of India and China

Year	ICT Services		ICT goods	
	India	China	India	China
2000	0.84	-0.64	-0.83	0.11
2001	0.87	-0.64	-0.78	0.22
2002	0.85	-0.62	-0.82	0.31
2003	0.85	-0.56	-0.81	0.4
2004	0.85	-0.54	-0.84	0.43
2005	0.86	-0.57	-0.87	0.45
2006	0.86	-0.5	-0.88	0.45
2007	0.85	-0.47	-0.87	0.49
2008	0.85	-0.43	-0.87	0.5
2009	0.82	-0.42	-0.58	0.5
2010	0.82	-0.36	-0.76	0.49
2011	0.8	-0.31	-0.69	0.5
2012	0.8	-0.28	-0.72	0.51
2013	0.79	-0.32	-	-

Source: Calculated on the basis of UNCTAD data

3.3 Trade competitiveness index (TCI)/Trade Specialisation Index (TSI)

RCA and RSCA indices have been calculated by considering only export of concern country to the rest of the world. However, Trade Specialization Index is considering both export and import of concern industry in calculating Trade competitiveness

Table 6: Trade Specialisation Index (TCI) Scores of India and China

Year	TSI in ICT service		TSI in ICT goods	
	India	China	India	China
2000	0.75	0.15	-0.6	-0.01
2001	0.73	0.14	-0.56	0.02
2002	0.76	-0.28	-0.68	0.07
2003	0.85	0.03	-0.73	0.1
2004	0.86	0.13	-0.77	0.14
2005	0.85	0.06	-0.81	0.17
2006	0.83	0.26	-0.82	0.18
2007	0.77	0.33	-0.82	0.21
2008	0.81	0.33	-0.76	0.25
2009	0.87	0.34	-0.55	0.24
2010	0.88	0.51	-0.67	0.23
2011	0.92	0.52	-0.62	0.24
2012	0.9	0.58	-0.64	0.22
Average	0.83	0.24	-0.69	0.16

Source: Calculated on the basis of UNCTAD data

From the analysis of Trade specialization index of India and China, we can say that China has comparative trade competitiveness in both service and goods segments of ICT Industry with average value of 0.24 and 0.16 respectively. India has comparative trade competitiveness in ICT service Industry only with an average value 0.83. As far ICT goods industry is concerned, India has Comparative disadvantage with average value -0.69.

V. Conclusion

The present study shows that both India and China have significance role in the global ICT industry. India and China have been enjoying a comparative export advantage in ICT service and ICT goods segments respectively. Contribution of China to global ICT services is limited due to high absorption of domestic market and India could achieve global recognition in ICT service related sector, but India,s comparative export advantage in export of ICT services has been decreasing gradually in the recent years. Goods segment of ICT industry contributes around 25% to total export of China and only. In trade competitiveness, China gains advantage in both ICT goods and service segments and the values are increasing gradually.

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Appendix

Trade statistics of India (UNCTAD Data : in US\$ Million)

Year	Total Trade			ICT services Trade			ICT goods trade		
	Export	Import	Trade Balance	Export	Import	Trade Balance	Export	Import	Trade Balance
2000	59932	73705	-13773	4048	577	3471	714	2886	-2172
2001	62130	71311	-9181	5947	911	5036	858	3008	-2150
2002	70619	75742	-5123	6582	905	5677	781	4044	-3263
2003	84795	92959	-8164	8562	686	7876	957	6096	-5139
2004	116220	131180	-14960	12133	932	11201	1082	8223	-7141
2005	154703	181979	-27276	16079	1266	14813	1132	10757	-9625
2006	193498	225268	-31770	21362	1957	19405	1344	13633	-12289
2007	240713	279416	-38703	27476	3583	23893	1567	16133	-14566
2008	305729	380089	-74360	35868	3787	32081	1770	12907	-11137
2009	260847	328257	-67410	32332	2267	30065	6099	20749	-14650
2010	348035	439059	-91024	38996	2532	36464	4404	22081	-17677
2011	446375	553062	-106687	45474	1856	43618	6580	27622	-21042
2012	443629	579406	-135777	47178	2518	44660	5734	25970	-20236
2013	464188	559767	-95579	49518	2648	46870	-	-	-

Trade statistics of China (UNCTAD Data: in US\$ Million)

Year	Total Trade			ICT services Trade			ICT goods trade		
	Export	Import	Balance	Export	Import	Balance	Export	Import	Balance
2000	279561	256688	22873	356	265	91	44135	45454	-1319
2001	299049	271325	27724	461	345	116	53221	51171	2050
2002	365396	328012	37384	638	1133	-495	78243	68401	9842
2003	485030	449208	35822	1102	1036	66	121365	99255	22110
2004	658306	607131	51175	1637	1253	384	177742	133664	44078
2005	836888	712261	124627	1840	1620	220	234086	166849	67237
2006	1061688	852769	208919	2958	1739	1219	297653	206325	91328
2007	1342266	1034231	308035	4345	2208	2137	357974	234686	123288
2008	1581810	1232974	348836	6252	3165	3087	396424	239961	156463
2009	1329476	1112856	216620	6512	3233	3279	356301	220214	136087
2010	1742165	1523321	218844	9256	2965	6291	459522	284783	174739
2011	2076422	1898068	178354	12182	3844	8338	508012	313798	194214
2012	2251430	2021204	230226	14454	3843	10611	554310	355563	198747
2013	2428245	2194734	233511	15426	5939	9487	-	-	-

World trade Data (UNCTAD: in US\$ Million)

Year	World Total Export	World ICT Goods Export	World ICT Service Export	Year	World Total Export	World ICT Goods Export	World ICT Service Export
2000	7940643	998791	45650	2007	17336226	1585266	156120
2001	7682321	873370	53150	2008	19845088	1637478	195190
2002	8018001	896457	59080	2009	15924040	1409547	189950
2003	9352836	1013847	74970	2010	18968720	1721994	213810
2004	11365459	1230191	93410	2011	22438886	1814891	249530
2005	12925674	1378023	103820	2012	22662355	1800182	261370
2006	14877488	1580031	125510	2013	23316288	-	286810