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FDI AND GLOBAL COMPETITIVENESS OF INDIAN MANUFACTURING SECTOR

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Abstract: *Manufacturing sector plays a significant role in Indian economy. In this paper, we have tried to analyse the export competitiveness of the manufacturing sector and the pattern and role of FDI along with the other macro and micro economic factors that affect the export performance of the sector. For this purpose, we have computed the Normalised Revealed Comparative Advantage (NRCA) to analyse the export competitiveness. Further, along with the nature and role of FDI in manufacturing, we have taken macro variables like lagged GDP (as a proxy of size of the economy), exchange rate and foreign exchange reserves (as a proxy of financial position) and FDI to see its impact on manufacturing export. We have also tried to see the impact micro economic factors like firm size, productivity and capital intensity on manufacturing export performance. To see the short run dynamics, the regression analysis reveals that except FDI, the rate of growth of manufacturing is increasing with respect to lagged GDP and firm productivity and decreasing with respect to firm size, capital intensity, exchange rate and foreign exchange reserves.*

Keywords*:* FDI, revealed comparative advantage, competitiveness, manufacturing sector

JEL Classification: *F14, L6, C22.*

INTRODUCTION

Export-led economic growth is a development model which offers the emerging markets a chance to grow via increased integration with the world economy. Hence, expanding exports is a means to an end – economic development. To achieve this end, promotion of export oriented Foreign Direct Investment (FDI) should be an integral part of the overall developmental strategy. There are many ways in which FDI can help to enhance a country's manufacturing and export competitiveness. The most prominent role played by FDI in the exports of developing countries is in the manufacturing sector. Empirical evidence shows that FDI has complementary relationship with exports. Data shows that nearly one-third of world trade is among TNCs and their foreign affiliates, with much of this trade in intermediate goods

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(Subramanian, 2003). In this context, it can be argued that attracting and increasing foreign direct investment (FDI) is viewed as an important companion strategy to market liberalization, a way of jump-starting labour-intensive, export-oriented economic activity in the absence of sufficiently high domestic savings and investment (McMillan *et al.* 1999).

The export composition of India has been changing in favour of manufacturing over years as the industry holds a key significance in the Indian economic trajectory. Export success can serve as a measure for competitiveness of an industry for achieving faster growth and thus a more optimistic view has evolved on the role of FDI on export performance. Government of India has perceived FDI as a potential non-debt creating source of finance and a bundle of assets, viz., capital, technology, market access (foreign), employment, skills, management techniques, and environment (cleaner practices), which could solve the problems of low income growth, shortfall in savings, investments and exports and unemployment. It was argued that FDI would also help India in the expansion of production and trade and increase opportunities to enhance the benefits that could be drawn from greater integration with the world economy (Prasanna, 2010). Given this background, it is imperative to study the export competitiveness of the manufacturing sector and the pattern and role of FDI along with the other macro and micro economic factors that affect the export performance of the sector. This is the main focus of our paper.

The rest of the paper is organised as follows: section 2 deals with the concerned literature review; section 3 comprises the FDI trajectory in Indian manufacturing sector. In section 4 we have computed the export competitiveness indices of manufacturing sector, section 5 we have studied the role of FDI and other micro & macro-economic factors that affects the export performance of the Indian manufacturing sector. Finally section 6 concludes the study.

LITERATURE REVIEW

In the context of globalization and liberalization, the studies of impact and role of FDI in the export performance of the industries in host countries have gained significant importance. Looking into the cross country literature, it is worth mentioning the study of Aitken *et al.* (1997) on Mexican manufacturing firms for the period 1986-90. According to their study, the export decision of Mexican firms is positively related to the presence of foreign firms; which is measured using two separate variables - MNEs' production and their exports. They found that the export performance of Mexican firms is positively influenced by the presence of MNEs with their production and export activities.

Another study done by Kokko *et al.* (2001) who examined the association between FDI spillovers and the export behaviour of domestic firms in Uruguay in a cross sectional firm level framework. Their study reveals the higher export

intensity of the domestic firms who operate in sectors where the presence of foreign firms is relatively high. Their study also pointed out that the type of trade regime (controlled or liberalised) may influence the ability of MNEs in generating positive export spillovers. It is generally believed that FDI in manufacturing have a positive and significant effect on a country's economic growth (Alfaro, 2003). However, in his empirical analysis he has found that the impact of FDI on growth is ambiguous where he has used country FDI flows data for the years.1981-1999. In the primary sector, the FDI have a negative impact on growth, while investment in manufacturing has a positive effect, and the impact of FDI in services is ambiguous. In another study, Greenaway *et al.* (2004) have used a two-step Heckman selection model to determine the influence of FDI spillovers on the export decision of domestic firms. They have found positive FDI spillovers on the probability of a United Kingdom firm being an exporter. The most important channel of export spillovers is the increased competition resulting from foreign firms. According to Borenzstein *et al.*, 1998, FDI plays more of a complementary role than of substitution for domestic investment. FDI tends to expand the local market, attracting large domestic private investment. This "crowding in" effect creates additional employment in the economy (Jenkins and Thomas, 2002).

In case of India, a number of studies have attempted to analyse the impact of FDI in manufacturing sector. India-specific studies on FDI have dealt with determinants of FDI, technology spillovers, export growth and good governance practices transferred from foreign to domestic firms (Banga, 2003; Kumar et al., 2002; Pant, 1995; Siddharthan and Nollen, 2004). These effects have been estimated through firm-level case studies and through cross- section industry data. Banga (2003) have found a significant impact of FDI on the export intensity of non-traditional export industries in India. In the post liberalisation period, studies like Aggarwal, 2002; Kumar and Pradhan 2003 have suggested significant higher performance of foreign firms than domestic firms. Aggarwal (2002) compared the export performance of MNE affiliates and domestic firms in Indian manufacturing after the 1991 liberalisation by analysing the determinants of their export intensities. The Tobit model has been used for 916 Indian manufacturing firms for the period 1996-2000 to examine the relationship between FDI and export performance. Aggarwal found that the liberalisation measures of the 1990s enhanced the export role of MNE affiliates, especially in the late 1990s. However, she could not find any evidence of a positive relationship between foreign equity share and export performance of firms. Kumar and Pradhan (2003) looked at the important factors that influence the export competitiveness of Indian manufacturing firms with an emphasis on knowledge-based industries. Their study concluded that the liberalisation policies of the 1990s have definitely improved the export competitiveness of Indian manufacturing, especially in the technology-intensive segments.

However, the impact of FDI on the economy is still not clear and there is little evidence on the economy-wide impact of FDI in India. Nevertheless, there is great interest among academics and policy makers to critically examine the impact of FDI on the different sectors of the economy and various regions of the country. Hence, in our present paper we have tried to study the sectoral competitiveness of the manufacturing industries and the role of FDI and other macro and micro economic factors affecting the manufacturing export performance using time series data for the period 1998-2012.

FDI INFLOWS IN MANUFACTURING SECTOR OF INDIA

In case of Manufacturing FDI, government has permitted upto 100 per cent on the automatic route in all manufacturing sector except Defence industry and in Cigars & Cigarette industry. Out of total 63 sectors, India is receiving FDI in 39 manufacturing sector. In last 15 years (2000 to 2014) the percentage share of FDI equity inflow to total FDI inflow in manufacturing sector varies between 20 to 42 per cent (see table-1). The growth rate of FDI inflow in manufacturing sector in last 154 years is 21.7 per cent significant at 5 per cent level of significance (Table 2).

Table 1
Industry-wise Break-up of FDI Inflows in Manufacturing Sector#

Rank	*2000-2005*	*2006-10*	*2011-14*
	Sector (Share as per cent of total foreign investment)		
1	Automobile Industry 6.799	Automobile Industry 3.946	Chemicals (Other Than Fertilizers) 6.322
2	Drugs & Pharmaceuticals 3.380	Metallurgical Industries 3.240	Drugs & Pharmaceuticals 6.008
3	Chemicals (Other Than Fertilizers) 3.375	Chemicals (Other Than Fertilizers) 1.952	Automobile Industry 5.550
4	Cement and Gypsum Products 3.210	Electrical Equipment 1.658	Food Processing Industries 5.244
5	Electronics 2.549	Cement and Gypsum Products 1.457	Metallurgical Industries 3.739
6	Food Processing Industries 2.422	Drugs & Pharmaceuticals 1.048	Industrial Machinery 2.097
7	Metallurgical Industries 1.892	Industrial Machinery 0.898	Miscellaneous Mechanical & Engineering Industries 1.504

contd. table 1

Rank	*2000-2005*	*2006-10*	*2011-14*
8	Electrical Equipment 1.791	Textiles (Including Dyed, Printed) 0.636	Rubber Goods 1.354
9	Miscellaneous Mechanical & Engineering Industries 1.128	Food Processing Industries 0.625	Electrical Equipment 1.323
10	Fermentation Industries 0.993	Miscellaneous Mechanical & Engineering Industries 0.583	Fermentation Industries 1.232
11	Textiles (Including Dyed, Printed) 0.898	Fermentation Industries 0.492	Prime Mover (Other than Electrical Generators) 0.881
12	Rubber Goods 0.710	Ceramics 0.333	Cement and Gypsum Products 0.741
13	Paper and Pulp (Including Paper Products 0.564	Paper and Pulp (Including Paper Products 0.287	Soaps, Cosmetics & Toilet Preparations 0.612
14	Machine Tools 0.525	Electronics 0.286	Textiles (Including Dyed, Printed) 0.587
15	Glass 0.487	Medical and Surgical Appliances 0.279	Medical and Surgical Appliances 0.476
16	Industrial Machinery 0.482	Machine Tools 0.256	Railway Related Components 0.451
17	Soaps, Cosmetics & Toilet Preparations 0.405	Diamond, Gold Ornaments 0.227	Electronics 0.412
18	Agricultural Machinery 0.380	Printing of Books (Including Litho Printing Industry) 0.188	Paper and Pulp (Including Paper Products 0.403
19	Medical and Surgical Appliances 0.377	Vegetable Oils and Vanaspati 0.162	Fertilizers 0.321
20	Earth-moving Machinery 0.322	Commercial, Office & Household Equipment 0.154	Vegetable Oils and Vanaspati 0.307

contd. table 1

Rank	*2000-2005*	*2006-10*	*2011-14*
21	Commercial, Office & Household Equipment 0.312	Rubber Goods 0.146	Machine Tools 0.289
22	Fertilizers 0.272	Railway Related Components 0.126	Glass 0.273
23	Diamond, Gold Ornaments 0.212	Prime Mover (Other Than Electrical Generators) 0.104	Printing if Books (Inclu. Litho Printing industry) 0.236
24	Ceramics 0.186	Soaps, Cosmetics & Toilet Preparations 0.094	Agricultural Machinery 0.210
25	Printing of Books (Including Litho Printing Industry) 0.135	Fertilizers 0.063	Ceramics 0.191
26	Vegetable Oils and Vanaspati 0.097	Agricultural Machinery 0.063	Diamond, Gold Ornaments 0.169
27	Leather, Leather Goods and Pickers 0.088	Earth-moving Machinery 0.057	Scientific Instruments 0.153
28	Railway Related Components 0.082	Industrial Instruments 0.049	Commercial, Office & Household Equipment 0.105
29	Scientific Instruments 0.049	Photographic Raw Film & Paper 0.046	Leather, Leather Goods and Pickers 0.085
30	Sugar 0.048	Glass 0.039	Earth-moving Machinery 0.080
31	Industrial Instruments 0.045	Sugar 0.028	Timber Products 0.060
32	Photographic Raw Film & Paper 0.033	Leather, Leather Goods and Pickers 0.022	Dye-stuffs 0.060
33	Glue and Gelatin 0.031	Timber Products 0.019	Boilers and Steam Generating Plants 0.046
34	Dye-stuffs 0.013	Dye-stuffs 0.011	Glue and Gelatin 0.028

contd. table 1

Rank	*2000-2005*	*2006-10*	*2011-14*
35	Timber Products 0.003	Boilers and Steam Generating Plants 0.009	Sugar 0.025
36	Boilers and Steam Generating Plants 0.003	Scientific Instruments 0.003	Mathematical, Surveying and Drawing Instruments 0.006
37	Coir 0.002	Glue and Gelatin 0.002	Industrial Instruments 0.004
38	Prime Mover (Other than Electrical Generators) 0.000	Mathematical, Surveying and Drawing Instruments 0.001	Coir 0.003
39	Mathematical, Surveying and Drawing Instruments 0.000	Coir 0.001	Photographic Raw Film & Paper 0.001

Percentage of Manufacturing FDI to Total FDI Inflow	2000- 05	2006-10	2011-14
	34.30	19.60	41.60

Source: SIA Newsletters, *Department of Industrial Policy and Promotion*, Govt. of India

During 2006 to 2010, the overall FDI inflow has dropped to 19.6 per cent from 34.3 per cent in 2000-05. During 2011-14 we have found an again boost up inflow of 41.6 per cent in the sector. The Automobile, Chemicals and Drugs & Pharmaceuticals are among the top ten FDI recipient sectors in India. During the 2011-14 tenure, Automobile, Chemicals, Drugs & Pharmaceuticals and Food Processing industries are receiving 5-6 per cent of total FDI inflow of India.

Table 2
Sectors that are showing significant positive growth rate

S. No.	*Manufacturing Sector*	$\hat{\beta}$	*t-stat*#
1	Automobile Industry	0.20	4.33
2	Chemicals	0.20	4.36
3	Metallurgical Industries	0.30	6.29
4	Drugs & Pharmaceuticals	0.24	6.16
5	Food Processing Industries	0.21	4.24
6	Rubber Goods	0.32	4.52
7	Fertilizers	0.29	3.15
8	Railway Related Components	0.32	3.73
9	Timber Products	0.54	2.76
10	Prime Mover (Other than Electrical Generators)	0.91	6.07
	Total Manufacturing FDI Inflow	0.22	9.51

Source: Own calculation from the data
all are significant at 5 per cent level.

But if we look into the overall picture of the FDI inflow in manufacturing sector, we can identify only 10 sectors among the 39 manufacturing sector that are showing significant positive growth rate in last fourteen years (Table-2). Further, out of these 10 sectors, Automobile, Metallurgical, Drugs & Pharmaceuticals and Food Processing Industries are receiving 3-5 per cent of FDI on an average during 2000 to 2014 and the growth rate of inflow in these sectors are significant. The rest sectors are receiving less than 1 per cent of equity capital of total FDI equity and most of them are showing insignificant growth rate. Sectors like rubber goods, fertilizer, railway components, timber products and prime movers exhibit significant positive growth of FDI inflow in last 15 years even if their share is less than one per cent. In Prima Mover sector, we find the growth rate is quite high as 91 per cent significant at 5 per cent level. Hence, looking into the industry-wise percentage of FDI inflow in the manufacturing sector, it can be argued that in India very few manufacturing industries are receiving decent foreign equity capital among all 39 sectors under consideration.

Higher competitiveness of a product gives a better leverage of utilization of the foreign equity capital. Hence, it is imperative to study the export competitiveness of the products of the sector to understand its export performance. In our next section we have studied the international competitiveness of the manufacturing products.

EXPORT COMPETITIVENESS OF INDIAN MANUFACTURING SECTOR

In the empirical trade research, one common measure of comparative advantage/ international competitiveness is "Revealed Comparative Advantage (RCA) Index". The most popular index is the Balassa's RCA index (BRCA)[1]. RCA alone, however, only shows which goods countries tend to specialize in their trade. It does not reveal the origins of comparative advantage.

The concept of Revealed Comparative Advantage (RCA) is grounded in conventional trade theory. Based on comparative advantage, two theories of trade exist primarily: the Ricardian theory & Heckscher-Ohlin theory (H-O theory). The Ricardian theory assumes that comparative advantage arises from differences in technology across countries while the H-O theory suggests that technologies are the same across countries. That is, according to the Heckscher-Ohlin theorem a given country's comparative advantage (or disadvantage) is determined by its factor endowments. A country has a comparative advantage in those sectors that use intensively the productive factors that are abundant in the country. However, it is well known that measuring comparative advantage & testing the Hecksher-Ohlin (H-O) theory have some difficulties (Balassa, 1965) since relative prices under autarky are not observable.

Given this fact, Balassa (1965) proposes that it may not be necessary to include all constituents effecting country's comparative advantage. Instead, he suggests

that comparative advantage is "revealed" by observed trade patterns, & in line with the theory, one needs pre-trade relative prices which are not observable. Thus, inferring comparative advantage from observed data is named "revealed" comparative advantage (RCA).

The BRCA index suffers from a number of shortcomings (Hillman, 1980; Yeats, 1985; Benedictis & Tamberi 2001). Various alternative RCA indices have been proposed to address the shortcomings inherited in Balassa's RCA index (e.g. Vollrath 1991, Laursen 1998, Hoen & Oosterhaven 2006). A recent work of Run Yu et al. (2008) proposes a *Normalised Revealed Comparative Advantage Index* (NRCA) as a new measure alternative to the traditional RCA Index. This NRCA index is capable of systematically revealing changes in the comparative advantage of a particular product over time.

The Model

The key to the derivation of the *NRCA* index is the comparative-advantage-neutral situation/point.

Under this neutral situation, country i's export of commodity j is

$$\hat{E}_{ij} = E_i E_j / E \tag{1}$$

Where, $E_i = \Sigma_i E_{ij}$ = country i's export of all commodities i.e. country *i*'s export market.

$E_j = \Sigma_j E_{ij}$ = export of commodity *j* by all countries i.e. commodity *j*'s export market.

$E = \Sigma_i \Sigma_j E_{ij}$ = export of all commodities by all countries i.e. the world export market.

& E_{ij} = country *i*'s actual export of commodity *j* in the real world.

Now, E_{ij} would normally differ from $\hat{E}_{ij,}$ & the difference can be stated as:

$$\Delta E_{ij} = E_{ij} - \hat{E}_{ij} = E_{ij} - (E_i E_j / E) \tag{2}$$

Now *NRCA* index can be obtained by normalizing ΔE_{ij} by the world export market *E*, i.e.

$$NRCA_{ij} = Eij/E - (E_i E_j / E.E) = E_{ij}/E - (E_i/E)\ (E_j/E\ ) \tag{3}$$

It measures the degree of deviation of a country's actual export from its comparative-advantage-neutral level in terms of its relative scale with respect to the world export market.

$NRCA_{ij} > 0$ implies country *i*'s actual export of commodity *j* (E_{ij}) is higher than its comparative-advantage-neutral level ($\hat{E}_{ij}$) i.e. country i has comparative advantage in commodity *j* & $NRCA_{ij} < 0$ implies country *i*'s actual export of

commodity j (E_{ij}) is lower than its comparative-advantage-neutral level ($\hat{E}_{ij}$) i.e. country i has comparative disadvantage in commodity j. The greater (or lower) the $NRCA_{ij}$ score is, the stronger the comparative advantage (or disadvantage) would be.

The size of the export market for each commodity & country under the hypothetical comparative-advantage-neutral situation would be the same as that of the actual export market in reality.

i.e. $$\Sigma_i \Delta E_{ij} = \Sigma_i (\hat{E}_{ij} - E_{ij}) = 0 \quad (4)$$

& $$\Sigma_j \Delta E_{ij} = \Sigma_j (\hat{E}_{ij} - E_{ij}) = 0 \quad (5)$$

According to equations (2) & (3), the sum of NRCA scores over all countries & over all commodities is summed to zero i.e.

$$\Sigma_i NRCA_{ij} = 0 \; \& \; \Sigma_j NRCA_{ij} = 0 \quad (6)$$

Therefore the NRCA index indicates that each country or each commodity as a whole is comparative advantage neutral & no country has comparative advantage (or disadvantage) in all commodities.

We have collected data of manufacturing goods from UN Comtrade statistics using SITC Rev 3 classification from the year 1998 to 2012.

Table 3
Manufacturing Products and SITC Codes

Code	*Description*	*Code*	*Description*
51	Organic Chemicals	**71**	Power Generating. Machines
52	Inorganic Chemicals	**72**	Special Industry Machinery
53	Dyes, Colouring Materials	**73**	Metal Working Machinery
54	Medical, Pharma Products	**74**	General Industrial Machines
55	Essential Oils, Perfume, Etc	**75**	Office Machines, Adp Mach
57	Plastic Primary Form	**76**	Telecomm. Sound Equip Etc
58	Plastic, Non-Primary Form	**77**	Electrical Machines, Apparatus
59	Chemical Materials Nes	**78**	Road Vechiles
61	Leather, Leather Goods	**79**	Other. Transport Equipment
62	Rubber Manufactures	**81**	Prefab Buildings ,Fitting Etc
63	Cork, Wood Manufactures	**82**	Furniture, Bedding, Etc
64	Paper, Paperboard, Etc.	**84**	Clothing And Accessories
65	Textile, Yarn, Fabric	**85**	Footwear
66	Non Metal, Mineral Manufacture	**87**	Scientific Equipment Nes
67	Iron and Steel	**88**	Photo Apparatus, Clocks
68	Non-Ferrous Metals	**89**	Misc Manufactured Goods[2]
69	Metal Manufactures		

Source: UN Comtrade statistics

EMPIRICAL ANALYSIS

Using the above formula (equation 3), we have tried to calculate the NRCA for various commodities under the manufacturing sector of India. For this purpose we collected India's share of export in that industry and its total export year wise as well as World's share of export in that commodity as well as well as world's total exports is collected from UN Trade Statistics (SITC 5,6,7,8 under Rev 3).Thus we get the following results after the NRCA calculation shown in the table below.

Table 4
NRCA Scores[3] of Manufacturing Sector of India (1998-2012)

Year\SITC	*51*	*52*	*53*	*54*	*55*	*57*	*58*	*59*	*61*	*62*	*63*
1998	4.00	-1.65	3.31	13.67	-1.52	-8.04	-2.56	-0.98	5.54	0.03	-3.11
2002	8.78	-0.93	4.41	19.64	-2.65	-4.52	-2.48	-1.02	8.21	7.36	-4.04
2006	22.36	-2.29	3.36	18.34	-2.59	-3.31	-3.09	-0.67	4.67	1.10	-4.08
2010	18.58	-2.56	4.19	25.96	-4.47	-12.09	-4.73	-3.05	3.38	-1.53	-4.46
2011	18.38	-4.68	3.28	24.66	-4.55	-11.37	-4.22	-5.76	3.85	-1.78	-4.89
2012	28.33	-1.76	4.35	34.82	-1.63	-13.25	-4.89	-3.36	4.30	0.30	-4.75
Year\SITC	*64*	*65*	*66*	*67*	*68*	*69*	*71*	*72*	*73*	*74*	*75*
1998	-9.70	66.99	97.07	-1.66	-8.97	1.36	-12.95	-14.20	-3.31	-17.91	-34.31
2002	-9.58	73.83	125.89	9.44	-4.24	4.59	-16.68	-15.15	-2.53	-21.45	-41.62
2006	-8.69	55.16	91.83	23.67	5.98	4.1	-13.36	-14.99	-3.29	-18.34	-42.28
2010	-11.12	60.87	142.64	29.86	15.47	-2.08	-17.46	-21.57	-4.41	-20.39	-53.41
2011	-12.6	58.11	167.96	9.46	-12.67	-0.48	-21.46	-24.32	-6.07	-33.47	-53.31
2012	-11.65	61.19	117.17	16.9	-8.44	4.03	-21.81	-21.81	-6.19	-31.99	-54.41
Year\SITC	*76*	*77*	*78*	*79*	*81*	*82*	*84*	*85*	*87*	*88*	*89*
1998	-23.31	-47.46	-43.92	0.00	-2.06	-5.96	68.41	5.60	-9.86	-6.08	3.77
2002	-36.54	-56.13	-62.24	-19.72	-2.61	-7.79	68.2	3.89	-14.18	-7.32	5.78
2006	-46.19	-61.66	-56.56	-15.28	-3.05	-6.21	52.9	3.72	-17.74	-7.15	24.9
2010	-46.67	-87.3	-47.66	5.91	-3.84	-8.94	40.23	1.48	-28.13	-9.32	28.25
2011	-37.08	-98.87	-67.29	18.11	-3.89	-9.97	43.24	0.92	-30.29	-10.21	54.95
2012	-42.47	-101.99	-57.69	0.31	-4.91	-10.55	41.1	0.21	-31.16	-10.62	77.63

Source: Calculated from the data collected from UN Comtrade data

The scores reveal that there are 13 products out of 33 manufacturing products are enjoying comparative advantage during the period under consideration. They are Organic Chemicals (51); Dyes, Coloring Materials (53); Medical, Pharma Products (54); Leather & Leather Goods (61); Rubber Manufactures (62); Textile, Yarn, Fabric (65); Non Metal, Mineral Manufactures(66); Iron and Steel (67); Metal Manufactures (69); Other Transport Equipment (79); Clothing and Accessories (84); Footwear (85); Miscellaneous Manufactured Goods (89).

We have fitted a trend equation ($y = \alpha + \beta t$) to check the significance of the comparative advantages of the products. The results are shown in the following table 5:

Table 5
Trend and Significance of the Manufacturing Industries having Comparative Advantage

SITC	*Products*	$\hat{\beta}$	*t-stat*[#]
51	Organic Chemicals	1.43	7.05**
53	Dyes, Coloring Materials	-0.30	-2.32*
54	Medical, Pharma Products	1.20	6.62**
65	Textile, Yarn, Fabric	-1.58	-3.78**
66	Non Metal, Mineral Manufactures	1.60	1.20
67	Iron and Steel	1.42	2.41**
69	Metal Manufactures	-0.49	-2.76**
84	Clothing and Accessories	-2.50	-6.57**
85	Footwear	-0.34	-8.30**
89	Miscellaneous Manufactured Goods	4.96	4.52**

Source: own calculation from the data
Significant at (*) 10 per cent level and (**) 5 per cent level of significance.

It is evident that almost 39 per cent of the products who are enjoying comparative advantage in the international markets are showing significant negative trend. These products are Textile, Yarn, Fabric (65); Metal Manufactures (69); Clothing and Accessories (84) and Footwear (85). Products like Leather & Leather Goods (61); Rubber Manufactures (62) and Other Transport Equipment (79) are evidencing insignificant trend over last 15 years. As evident from table-1, most of these sectors are receiving FDI although not significantly. For example, in 2000-2005, leather and leather goods was receiving 0.088 percent (rank 27) of foreign equity capital to total FDI which had decreased to 0.022 per cent (rank 32) during in 2006-2010 and has marginally increased to rank 29 in 2011-14 with 0.085 per cent of foreign equity. Rank wise textile sector is receiving more FDI and holding ranks between 8 to 14. This sector is enjoying throughout comparative advantage during the period under consideration. It is surprising to notice although the FDI inflow in rubber manufacturing (62) is positive and significant (table-2); its comparative advantage is falling over time and hence the trend is insignificant. In fact during 2009 to 2011 we found that the industry had lost its international competitiveness. From 2012, we have found it has stared gaining its position. Almost same picture we find in case of metal manufactures (69). It also shows a significant negative trend of it comparative advantage position in the international market which is mainly because of its competitive disadvantage position during 2009-11. But if we look into the FDI inflow in the metallurgical industry, it's showing a significant positive growth (table 2). It receives 3.2 per cent of foreign equity capital during 2006-10 and metal manufacturing, being a subsector of metallurgical industry seems able to regain its international competitiveness in the later period due to this foreign equity capital inflow.

Turing into the other sectors, who are showing significant positive trend of their competitiveness, it is found that almost all of them are receiving FDI. Worth mentioning Iron & Steel, organic chemicals, medical pharma products who are among the top ten receivers of FDI and are enjoying significant positive trend of comparative advantage since 1998.

This analysis reveals a fact that in case of Indian manufacturing only 39 per cent products are enjoying comparative advantage in the international market and most of them are getting FDI. Hence FDI in manufacturing is coming in a skewed manner. Efforts are required to be made to enhance the competitiveness of the other manufacturing industries in the sector so that it can attract more FDI in due course of time.

Now in order to understand what could be the possible macro and micro economic factors that may affect the export performance of Indian manufacturing sector, we have performed an econometric analysis considering the time series data from 1998 to 2012 on selected macro and micro economic variables. This has been elaborated in our next section.

FACTORS DETERMINING EXPORT PERFORMANCE OF INDIAN MANUFACTURING SECTOR

Theoretical Background

The existing literature has so far talked about two kinds of approaches to compute the attributes of export performance (Marandu, 2008). First, in which we make two groups, one of exporters & the other of non-exporters. Using this approach the authors have found the major characteristics which differentiates these groups. The second method to compute the export performance used various indicators which might impact the performance. In this paper we are following the second approach.

In our model, we have considered the macro-economic variable viz. lagged GDP, total exports volume in the manufacturing sector, exchange rate and financial health that determine the export performance of the sector. Variables at micro level like the firm size along with their capital intensities and productivities also play a major role in determining the performance of a sector at international level.

FDI is a long term commitment which serves a mutually benefited purpose for the two parties involved in it. Typically there are many host country factors involved in the process of investing. The literature on FDI's effect on export performance has mixed results. Some studies show that the FDI is a substitute for trade & hence they share a negative relationship (Horst, 1972). Some other studies have proved that they share a positive relationship & hence are positively correlated. In case of India, although FDI plays a very important role to enhance

the international competitiveness of the manufacturing industries, but the significant inflow is still restricted to some selected sector.

GDP is the total output produced by a nation & can be used as proxy for the size of the domestic economy & it is attributed as one of the key variable for the foreign investors' decision to invest.

The third variable we have considered in the model is the exchange rate. The inflow of FDI can be determined by the depreciation of exchange rate. It temporarily stimulates the nation's exports & the foreign investment which in turn, leads to a trade surplus & appreciation of domestic currency which again neutralizes part of its original depreciation.

To capture the financial health of the country we have considered the variable of foreign exchange reserves.

For these macro-economic variables we have collected the data from RBI Bulletin, SIA Newsletter Annual Report, IndiaStat & FDI Factsheets for the years 1998 to 2012. GDP and Manufacturing export data have been deflated by using appropriate deflators.

Lastly, we have considered micro level variables like the firm size, capital intensity and firm productivity. The proxy used for firm size is given as the average number of labourers employed, whereas, the capital intensity is measured by the capital-labour ratio of an industry. We have taken partial labour productivity as an indicator of firm productivity. These variables have been calculated by using the data at 3 digit level of manufacturing sector from Annual Survey of Industries. Appropriate deflators have been used to deflate the concerned variables before calculating productivity and intensity.

All these concerned factors are supposed to have a push effect on exports & thus the consideration.

Model Specification

Considering the principal determinants of the export performance the equation is specified as:

$$Manu\_ex_t = f\,(For\_Ex\_res_t, ex\_rate_t, GDP_{t-1}, FDI_t, cap\_int_t, FP_t, FS_t) \qquad (7)$$

Where, $Manu\_ex_t$: Total Manufacturing Exports at period t

$For\_Ex\_res_t$: total foreign exchange reserve at period t

ex_rate_t : Exchange Rate at period t

GDP_{t-1}: Size of the economy (one year lag GDP)

FDI_t : Foreign Direct Investment at period t

cap_int_t: capital Intensity of the manufacturing firms at period t

FP_t: Firm Productivity at period t

FS_t: Firm size at period t

Assuming non-linear nature of the relationships, we propose the following log-linear specification of the model as:

$$ln\_manu\_ex_t = a_0 + a_1\, ln\_For\_Ex\_res_t + a_2 ln\_ex\_rate_t + a_3\, ln\_GDP_{t-1} + a_4\, ln\_FDI_t + a_5 ln\_cap\_int_t + a_6 ln\_FP_t + a_7 ln\_FS_t + u_t \quad (8)$$

Further, Log transformation can reduce the problem of heteroscedasticity because it compresses the scale in which the variables are measured, thereby reducing a tenfold difference between two values to a twofold difference (Gujarati 1995).

A stationarity check of the variables using appropriate tests has been done individually so that no hindrance occurs while running & interpreting the model'.

Empirical Analysis

For the purpose of study, aggregate annual time series data at current prices is used. All the data are taken in Rupee Lakhs for maintaining normality. Aggregate data is considered to be an important tool in establishing long term econometric relations between variables. The GDP values are adjusted for inflation using the deflator, i.e. GDP has been divided by WPI. WPI has been converted into the base year of 2004-05. Similar steps have been performed for the manufacturing exports.

Unit Root Test for Stationarity

Before proceeding for the estimation of the model, it is appropriate to check the stationarity of the concerned variables. In this regard, we have employed three unit root test to cross validate.

a. Augmented Dickey-Fuller (ADF) test
b. Augmented Dickey-Fuller – Generalised Least square (DF-GLS) test and
c. KPSS (Kwiatkowski, Phillips, Schmidt, and Shin) test

The ADF test is conducted by adding the lagged values of the variable concerned as follows:

$$\Delta x_t = \alpha_1 + \alpha_2 t + \alpha_3 x_{t-1} + \Sigma_{i=1}^{k} \alpha_i \Delta x_{t-i} + \varepsilon_t \quad (9)$$

Where, is the pure noise term and k is the maximum lag length of the lagged dependent variable which is determined empirically. The ADF test adjusts the DF

test to take care of possible serial correlation in the error terms of adding the lagged difference terms of the regressand.

Elliott, Rothenberg and Stock (ERS) proposed an efficient test, modifying the Dickey-Fuller test statistic using a generalized least squares (GLS) rationale. The DF-GLS test procedure is as follows:

Let z_t = *(1; t)*. For the time series x_t; regress [x_1, *(1-* αL*)* x_2, *(1-* αL*)* x_T] on [z_1, *(1-* αL*)* z_2,…., *(1-* αL*)* z_T] yielding $\tilde{\beta}_{GLS}$ where $\alpha = 1 + \bar{c}/T$; $u_0 = 0$; and $\bar{c}$ = –13.5 for the detrended statistic.

Detrended $\tilde{x} = x_t = z_t' \tilde{\beta}_{GLS}$ is then employed in the (augmented) Dickey-Fuller regression, with no intercept nor time trend. The t-statistic on $\tilde{x}_{t-1}$ is the DF-GLS statistic.

In case of ADF and DF-GLS, the null hypothesis of nonstationarity is tested i.e. $H_0 : x \sim I(1)$.

The Kwiatkowski, Phillips, Schmidt and Shin test (KPSS, 1992) has the opposite (and perhaps more intuitive) null: that the series being tested is stationarity, $H_0 : x \sim$ I (0).

The test statistics is:

$$KPSS = \frac{1}{T^2} \frac{\Sigma_{t=1}^{T} S_t^2}{\hat{\sigma}_{\infty}^2}$$

Where, $S_t = \Sigma_{s=1}^{t} \hat{\varepsilon}_s$ is the partial sum; $\hat{\sigma}_{\infty}^2$ is the HAC estimator of the variance of $\hat{\varepsilon}_t$.

Cointegration Test

For this purpose we have used Engle-Granger two step estimation for cointegration under which after checking the unit roots of the variables, we run cointegrating regression. Then ADF test have been performed for the residual ($\hat{u}_t$). The null hypothesis of EG test is no cointegration.

There will be evidence for a cointegrating relationship if:

(a) The unit-root hypothesis is not rejected for the individual variables, and

(b) the unit-root hypothesis is rejected for the residuals ($\hat{u}_t$) from the cointegrating regression.

If we look into the following graphs (Figure 1) of the level variables, we find that all of them are having a constant term. Hence it is justified to perform the unit root tests with intercept and trend.

Figure 1: Trends of the level variables

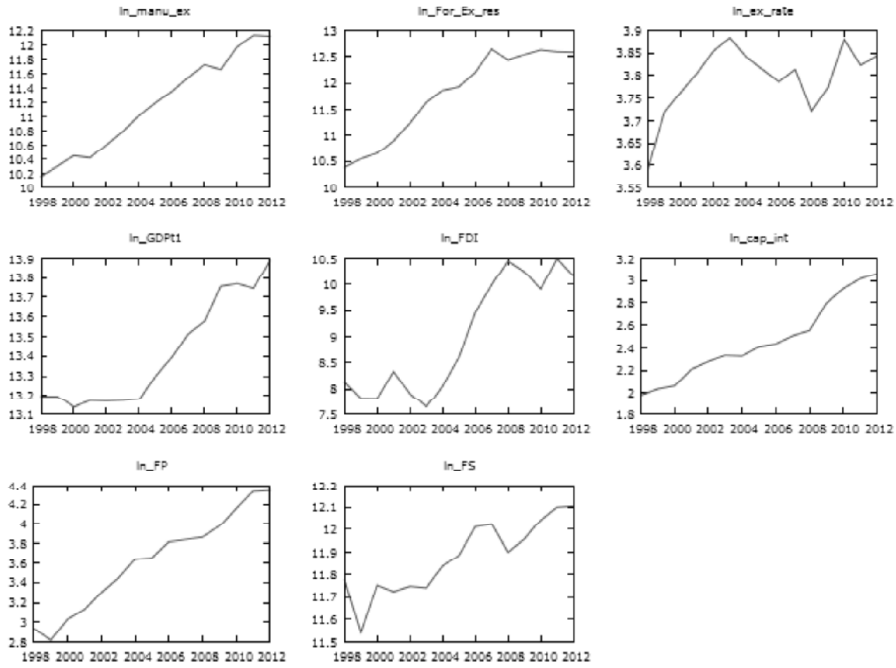

Table 6
Results of Unit Root Tests for Level & First-difference Variables

Tests	*ln_manu_ex*	*ln_For_Ex_res*	*ln_ex_rate*	*ln_GDP$_{t-1}$*	*ln_FDI*	*ln_cap_int*	*ln_FP*	*ln_FS*
ADF	-2.39	-0.31	-3.23*	-1.95	-1.86	-1.36	-1.93	-2.42
DF-GLS	-2.97*	-0.86	-2.98	-1.92	-2.04	-1.56	-2.25	-2.79
KPSS	0.18	0.16	0.21	0.17	0.18	0.17	0.17	0.21
	Δln_manu_ex	*Δln_For_Ex_res*	*Δln_ex_rate*	*Δln_GDP$_{t-1}$*	*Δln_FDI*	*Δln_cap_int*	*Δln_FP*	*Δln_FS*
ADF	-3.29*	-3.62**	-3.68**	-3.23*	-2.57	-3.20*	-5.44**	-4.92**
DF-GLS	-4.40**	-3.87**	-3.20*	-3.56**	-2.91*	-3.43**	-5.51**	-6.55**
KPSS	0.14**	0.14**	0.14**	0.13**	0.12**	0.10*	0.13**	0.11**

	Critical Values		
Tests	*10 percent*	*5 percent*	*1 percent*
ADF	-3.20	-3.53	-4.23
DF-GLS	-2.89	-3.19	-3.77
KPSS	0.13	0.15	0.20

Note: # Significant at (*) 10 per cent level and (**) 5 per cent level of significance.
The lag lengths are selected by minimising the SIC and AIC criterion.
In KPSS, lag denotes the bandwidth selected on the basis of the Newey-West method using Bartlett Kernel.

The tests reveal that the level variables are I(1) and the first differences are stationary i.e. I(0). Thus, model (8) can be estimated by using the first differences of the concerned variables[4] as:

$$\Delta ln\_manu\_ex_t = b_0 + b_1 \Delta ln\_For\_Ex\_res_t + b_2 \Delta ln\_ex\_rate_t + b_3 \Delta ln\_GDP_{t-1} + b_4 \Delta ln\_FDI_t + b_5 \Delta ln\_cap\_int_t + b_6 \Delta ln\_FP_t + b_7 \Delta ln\_FS_t + u_t \quad (10)$$

Further, after running the OLS regression, we test the unit root of the residual $(\hat{u}_t)$ through ADF test with constant reveals the test statistics is -2.32 (p-value 0.17).This signifies no cointegrating variables are there in the model as we are rejecting the unit root hypothesis.

Table 7
Model Summary

Model	R^2	*Adjusted* R^2	*Durbin Watson*
1	0.87	0.72	2.19

Predictors: (constant), $\Delta ln\_For\_Ex\_res_t$, $\Delta ln\_ex\_rate_t$, Δln_GDP_{t-1}, Δln_FDI_t, $\Delta ln\_cap\_int_t$, Δln_FP_t, Δln_FS_t

Dependent Variable: $\Delta ln\_manu\_ex_t$

In the above model (equation 3), adj. R^2 is 0.72 which tells us that approximately 72 per cent of the variation in the manufacturing exports is explained by the all the explanatory variables that signify the goodness of the fit of the model (table 7).

Further, the estimated coefficients are enumerated in the following table -8.

Table 8
Estimated Coefficients

Variables	*Coefficients*	*t-stat*#
Constant	0.287	11.96**
$\Delta ln\_For\_Ex\_res_t$	–0.520	4.86**
$\Delta ln\_ex\_rate_t$	–1.823	6.14**
Δln_GDP_{t-1}	0.542	2.96*
Δln_FDI_t	–0.046	1.77
$\Delta ln\_cap\_int_t$	–0.910	4.87**
Δln_FP_t	0.715	4.80**
Δln_FS_t	–0.577	4.54**

Significant at (*) 10 per cent level and (**) 5 per cent level of significance.
Dependent Variable: $\Delta ln\_manu\_ex_t$ (1998-2012)

According to the above model, the only insignificant variable is the FDI inflows. Considering the trends of FDI inflows in the Indian manufacturing sector, it can be observed that the foreign investments have been considerably high in the electrical & electronics flowed by chemicals, automobile, engineering & food processing units.

The FDI trends reveal that when compared to 1990s the direction for FDI has switched to the service sector (financial & non-financial) followed by telecom sector, IT, hotels & tourism. The FDI inflows in the pharmaceutical, automobile industry, metallurgical industry & electrical equipment's were recorded the highest while the major export commodities were engineering goods, gems & jewellery, chemicals & textiles in 2012. Hence the major exporting commodities are not receiving significant amount of FDI. Thus this justifies the above regression model, where the FDI is insignificant & shows no effect on the export performance of the manufacturing sector.

In this context, it is worth mentioning about the studies performed by Siddharthan & Nolan (2000), Sharma (2000) & Pailwar (2001) have re-examined the impact of FDI on the export performance in the post- liberalisation period. They found that the FDI inflows have not influenced the exports in the manufacturing sector. Alfano (2003) in her paper has shown the benefits of FDI & how it varies from sector to sector. Her final findings are that the FDI has negative impact on the primary sector & almost no influence on the manufacturing sector. Various economists & academicians feel that it's too early for a developing country like India to expect huge amounts of FDI inflows in the manufacturing sector. In the current era of globalisation where the competition is so tough, having liberal industrial policies will not alone fetch FDIs.

Among the other variables, firm productivity and size of the economy (lagged GDP) are having significant positive impact on the manufacturing sector's export performance. The elasticity change of manufacturing export with respect to firm productivity is 0.7 and with respect to size is 0.5. That means the change of growth rate of manufacturing export increases less than proportionately with the change of growth rates of lagged GDP and firm productivity. Thus, firms with higher productivity rate will have an incentive to export more because they would be capable in achieving economies of scale. Hence this proves to be a major determinant of export performance.

The rest variables, e.g. capital intensity, foreign exchange reserve, exchange rate and firm size have significant negative impact on manufacturing export. That is, the change of growth rate of manufacturing export decreases less than proportionately with the positive change of growth rates of these variables. The possible reason could be the fact that India is labor abundant nation & the Indian manufacturing industry is the traditional labor intensive sector with low capital intensity. Another reason could be the lack of technology development in the domestic manufacturing industries to enhance the export performance. The foreign technology suppliers charge appropriating rents from the domestic manufacturers to provide them with new technology & the domestic producers are unable to pay those rents. Also Indian manufacturing industries still operate on the intermediary levels of technology India's R&D expenditure is 0.9 per cent of GDP which is very low compared to the other nations.

Coefficient of *Δln_ex_rate* is -1.82 which means that 1per cent positive change in exchange rate growth rate, i.e. 1per cent change in depreciation rate in the Indian Rupee vis-à-vis USD leads to 1.8 per cent increase in the change in growth rate of manufacturing exports. When the Indian rupee depreciates then, the goods are now available at a cheaper cost which attracts other countries & thus exports of India increases.

Coefficient of *Δln_For_Ex_res* is – 0.52, which means that 1 per cent increase in the rate of growth of foreign exchange reserves will result in approximately 0.5 percent decrease in the rate of growth of manufacturing exports i.e. growth of manufacturing export increases at a decreasing rate of 0.5 per cent. The increase in the forex reserves means that the Central Bank is printing more of domestic money & has gone to the currency foreign exchange market to buy more of other currencies. This is done to protect the domestic country from their currency appreciation & hence to promote exports.

CONCLUDING REMARKS

Our analysis reveals that India is enjoying international competitiveness in few manufacturing sectors (39 per cent). If we see the ranks of the products then we can find the following are the top 10 commodities in 2002 and 2012 (table 9).

Table 9
Top 10 commodities of 2002 & 2012

Rank	*Industry*	*NRCA Scores in 2002*	*Industry*	*NRCA Scores in 2012*
1	Non Metal, Mineral Manufacture (66)	125.9	Non Metal, Mineral Manufacture (66)	117.2
2	Textile, Yarn, Fabric (65)	73.8	Miscellaneous Manufactured Goods (89)	77.6
3	Clothing and Accessories (84)	68.2	Textile, Yarn, Fabric(65)	61.2
4	Medical, Pharma Products (54)	19.6	Clothing and Accessories (84)	41.1
5	Iron and Steel (67)	9.4	Medical, Pharma Products (54)	34.8
6	Organic Chemicals (51)	8.8	Organic Chemicals (51)	28.3
7	Leather, Leather Goods (61)	8.2	Iron and Steel (67)	16.9
8	Rubber Manufactures(62)	7.4	Dyes, Colouring Materials (53)	4.4
9	Miscellaneous Manufactured Goods (89)	5.8	Leather, Leather Goods (61)	4.3
10	Metal Manufactures (69)	4.6	Metal Manufactures (69)	4.0

Source: own calculation from UN Comtrade database

All of these industries are receiving foreign equity capital which could be the major reason of their international competitiveness. But these sectors are only 30-35 percent of the total manufacturing sectors who are receiving only 33 percent of

total FDI received by India. Hence, effective implementation of the foreign policy and industrial policy is the need of the hour.

Our regression results exhibit insignificant impact of FDI on the growth of overall manufacturing sector export and that can be well justified seeing the nature of the FDI inflow in the manufacturing sector. The other macro variables viz. foreign exchange, exchange rate and lagged GDP are having significant impact on the manufacturing export growth. It is found that the rate of growth of manufacturing export is increasing at an increasing rate with the size of the economy whereas with a decreasing rate with foreign exchange reserve and exchange rate.

The impact of microeconomic variables reveals that the rate of growth of manufacturing export is increasing at an increasing rate with firm productivity and with a decreasing rate with capital intensity and size of the firm.

Notes

1. Symbolically, the index can be written as: BRCAij = (Eij/Ej)/ (Ei/E). It compares country i's market share in commodity j's export market (Eij/Ej) to its market share in the world export market (Ei/E). BRCAij >1(or <1) signifies country i's comparative advantage (disadvantage) in commodity j and equal to 1 indicates that country i has "neutral" comparative advantage in commodity j (Balassa 1965).
2. Misc. articles- carving and moulding, artificial flowers, foliage or fruit, candle matches, umbrella, walking stick, gems and jewelries, orthopedic appliances, bath wear and toilet articles.
3. We have multiplied the scores by 105.
4. Regressing on first difference doesn't involve the long run aspect of the decision making as it ignores the information about the long run. Thus in our present analysis, we have tried to infer the short run impact of the determinants of manufacturing export.

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