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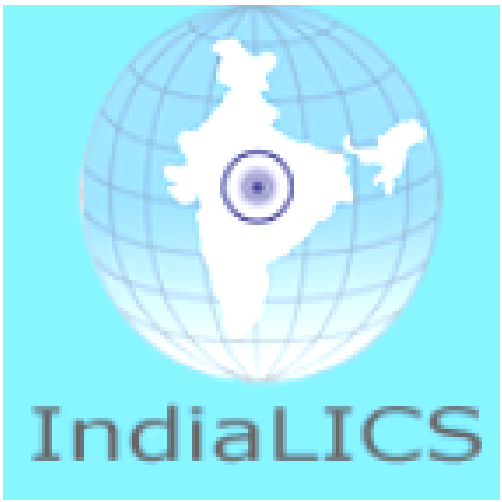

Export Spillovers from Foreign Direct Investment in India: A Firm Level Analysis

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Sanghita Mondal*

Abstract

FDI and its effects on host country firms have drawn considerable attention during the last few decades due to the surge of FDI in developing countries. In view of that, the present study focuses on the channels of export spillovers from FDI activities in the host country market, namely India, using the firm level data from manufacturing sector for the period 1994-2010. For the econometric analysis, the study considers manufacturing firms from all 2 digit industries. Moreover, the manufacturing firms are also categorised according to the technology intensity following OECD definition. We have divided the FDI spillover channels into competition (domestic market activity), information (export activity), skill (a proxy to measure spillover from higher foreign skills) and imitation (R&D and technology import) spillovers. We also consider that in house R&D activity, technology import influence the export performance of the host country firms. Our findings show that most of the spillover channels are not influencing export decision or export activity of the Indian firms. Information spillovers from foreign export activities in fact have shown negative impact on domestic firms from all technology categories. Among other factors, in house R&D activity is found to be an important factor to influence export decision and in enhancing export intensity.

Keywords: MNE, FDI spillovers, Manufacturing firms, export performance, Technology

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1. Introduction

In the recent decades, FDI and its impact on the developing countries have become a constant source of controversy. In literature, technology spillovers from foreign firms to the domestic firms has been the main focus since Caves (1974) studied technology spillover on Australian and Canadian manufacturing firms. There have been a large volume of studies concentrated on the indirect effects of multinational enterprises (MNEs) on the productivity of the host country firms[1]. However, a relatively less studies have focused on the effect of the FDI spillovers on the export performance of the domestic firms. Being another important factor of growth and development for the developing countries, export has always gained an attention of the policy makers. India is no exception from other developing countries. Since Independence, constant export promotion policies show the importance of the export activity in the domestic market. However, due to lack of domestic investment, R&D activity, technology and human skill, Indian products were always less attractive in the international market though being a labour abundant country Indian export of labour intensive products were not negligible. However, competition from other labour abundant countries like China has reduced the competitive advantage of the Indian products in the international market. Thus, India has moved its attention towards building its advantage on relatively capital and technology intensive products along with labour intensive products. Here comes the importance of MNEs in providing technology, links in the international market among many other direct and indirect benefits. According to Dunning (1993), FDI promotes specialisation and improves resource allocation playing an important role in international comparative advantage in trade. While, export from the foreign firms increases the export capacity of the country, indirect benefits in terms of spillover effects not only build the export capacity of the domestic firms it also improves the export activity by providing necessary technology and information about the foreign consumers. Therefore, it is expected to have positive spillover effects of foreign presence in the domestic market.

In the present study, we focus on the channels of FDI spillover which might have effects on the export performance of the domestic firms in Indian manufacturing sector. Not only the export activity, but also the decision to export is affected by the foreign presence and its different activities in the domestic market. Thus, we separate channels of FDI Spillovers to investigate the effects on export performance of the domestic manufacturing firms. We use Heckman selection method to estimate the two stage effects of export performance of domestic firms: in the first step the firms decides whether to export and in the second step the self selected firms decide how much to export. Our study covers more than 6000 Indian manufacturing firms over 17 years (1994-2010).

Present paper is organised in four sections. The next section provides a brief review of the previous theoretical and empirical research on export spillovers and FDI, followed by the brief discussion on the FDI and trade activity of India since liberalisation. Fourth section is dedicated to the methodological issues. Econometric results are explained in the fifth section and section six concludes the paper.

2. Export Spillovers from FDI: Theoretical aspects and Empirical evidence

In the context of recent liberalisation and globalisation, the role of FDI on the export performance of the domestic firms has become an important consideration. A cross-country study by UNCTAD (1999) on 52 countries has shown that there is a strong relationship between FDI and manufacturing exports, especially in the developing countries. The theoretical understanding says that the vertical FDI is complementary to the export

performance than the horizontal FDI (Zhang and Markusen 1999; Kutan and Vuksic 2007; Abor, et al. 2008). The direct and indirect influence of the FDI on host country's export has been explained by the theoretical models like, flying geese model (Kasahara 2004), Vernon's international product cycle model (Vernon 1966; Njong 2008) and new trade theory (Krugman 1983; Markusen and Venables 1998). Although these theories and models have explanations relating FDI and exports from the host country, none of these models clearly state about the channels that influence export performance. Recent studies clearly divide these channels into direct and indirect effects. Indirect effects are commonly mentioned as the *spillover effects* (as shown in the previous discussion) and for the present study we mainly focus on this effect.

Kutan and Vuksic (2007) have mentioned that there are broadly two types of spillover effects from FDI[2]: (1) Supply enhancing effects of domestic firms (capacity effect) and (2) FDI specific effects. While the supply increasing effects arise due to the increase in production capacity of domestic firms, the later one takes place through channels of competitive advantages from foreign investment, such as, knowledge, technology and information etc. There are three different channels for the externalities mentioned above. These channels are diffusion of technology and skills, information and competition. Foreign investment not only influences the international mobility of the capital, technology, management or information, it also facilitates international division of labour (Sun, 2001). Relocation of global recourses alters the productive capability of the countries and thus comparative advantages. Diffusion of advanced technology, R&D activity and management skills improve factor productivity, inducing the export competitiveness (Wang et al. 2007; Anwar and Nguyen 2011; Franco and Sasidharan 2010). Competition from the foreign firms in the domestic market, leads an improvement in the productivity of the domestic firms and consequently higher export activity (Greenaway et al. 2004; Franco 2013). These effects are generally considered as induced effects of FDI on export performance through the improvement of productive capacity. On the contrary, export activity of the foreign firms improves export performance of the domestic firms through positive information spillover given that the export volume of the domestic firms remains unchanged (Kaparty and Kneller 2011). MNCs convey information about the international market due to their connection with the international distributors and networks, their knowledge about the taste and demand of the consumers, servicing facilities and higher marketing capabilities. This is known as the "learning by seeing" or information spillover (Aitken et al. 1997; Sun 2001; Franco and Sasidharan 2010).

Several studies have attempted to investigate the *spillover effects* from foreign investment on domestic export performance. Among many other studies, Greenaway et al. (2004), Barrios et al. (2003), Kneller and Pisu (2007) and Ruane and Sutherland (2005) are significant as these studies have separated FDI spillover channels depending on their host country activities. Greenaway et al. (2004) confirms positive spillover effects through different channels, namely, demonstration, information and competition from foreign firms' R&D, export and domestic market activity respectively. The study highly supports the hypothesis of positive FDI spillovers on UK firms' export decision though domestic firms' export intensity does not show any positive information spillover from foreign export activity. Similar to this, Ruane and Sutherland (2005) found negative information externalities on the export performance of the domestic firms which they argued as MNCs use their domestic country as the export platform. Contradicting this result, Kneller and Pisu (2007) found that horizontal spillover channels of FDI have no impact on the export performance of the domestic firms in The UK though backward linkages have positive impact on export performance of the domestic firms. Moreover, this study shows that export

oriented MNCs generate higher positive effects than the domestic market oriented MNCs in the horizontal spillovers.

Export spillover studies are relatively less explored in India. Earlier studies by Kumar and Siddharthan (1994) could not find any significant difference in export performance between foreign affiliates and domestic firms in restrictive policy regime. However, a number of studies for post liberalization period suggest that foreign firms have shown significantly higher export performance as compared to domestic firms (Aggarwal 2002; Kumar and Pradhan 2003). Using Tobit model, Aggarwal (2002) found that MNEs' export performance is better than domestic firms during late 1990s. However, she did not find any evidence of positive relationship between foreign equity share and export performance in high technology domestic firms. She argued that India could not attract efficiency seeking outward oriented FDI in the high tech sector. Banga (2003) found a significant impact of FDI on the export intensity of non-traditional export industries in India. Prasanna (2010) has contradicted the previous results showing that in between 1991-92 to 2006-07, India's export performance of high tech products have been highly influenced by the presence of FDI.

In the recent studies, Joseph and Reddy (2009) and Franco and Sasidhran (2010) have formally investigated FDI spillover on export performance of Indian manufacturing firms. Joseph and Reddy (2009) have shown that, horizontal and vertical spillovers in terms of export intensity of the foreign firms in industries did not have any spillover effect on domestic firms' export performance. This indicates that economic liberalization did not attract much of export oriented FDI to India. Contrary to the foreign firms' export activity, foreign firms' domestic activity (sales in the domestic market) found to be a significant factor in raising export activity of domestic firms in the same industry groups except for the 1997-2000 when industry characteristics are controlled for using industry dummy. This result indicates that the competition from the foreign firms force domestic firms to look for the markets abroad. There was no evidence of vertical spillovers on export performance of domestic firms. Franco and Sasidharan (2010) considered various channels for export spillover from foreign presence. Not only the export activity of the foreign firms, according to them, R&D activity and human skills present in the foreign firms influence the export decision and export intensity of the domestic firms. While, Indian firms' decision to export is highly influenced by the R&D activity and skill of the foreign firms, there was no evidence of information spillover. However, the result becomes different when firms' internal R&D activity interacts with all these spillover variables. The result shows that with internal R&D activity, the domestic firms can absorb the positive effects of FDI presence. Domestic firms' export intensity is found to be influenced by the export activity of the foreign firms than any other foreign activities (skill and R&D). The result shows that when a domestic firm is already exporting, then information or demonstration spillover is more important for further export activity of the domestic firms. The result remains same as export decision when indigenous firms' R&D activity is taken into consideration. Export spillover and R&D spillover is found to be more effective in the presence of domestic R&D activity. The result reinforces the fact that domestic R&D activity is highly relevant to capture any benefit from foreign presence in any form.

From the above literature review, we specifically focus on two different sets of hypotheses. In the first set, we investigate the spillover effects of FDI on export performance of the domestic firms. We consider four different channels for export spillovers: competition, information, skill and demonstration (imitation) spillovers. We hypothesize that foreign firms' economic activities would have positive spillover impacts on the export performance

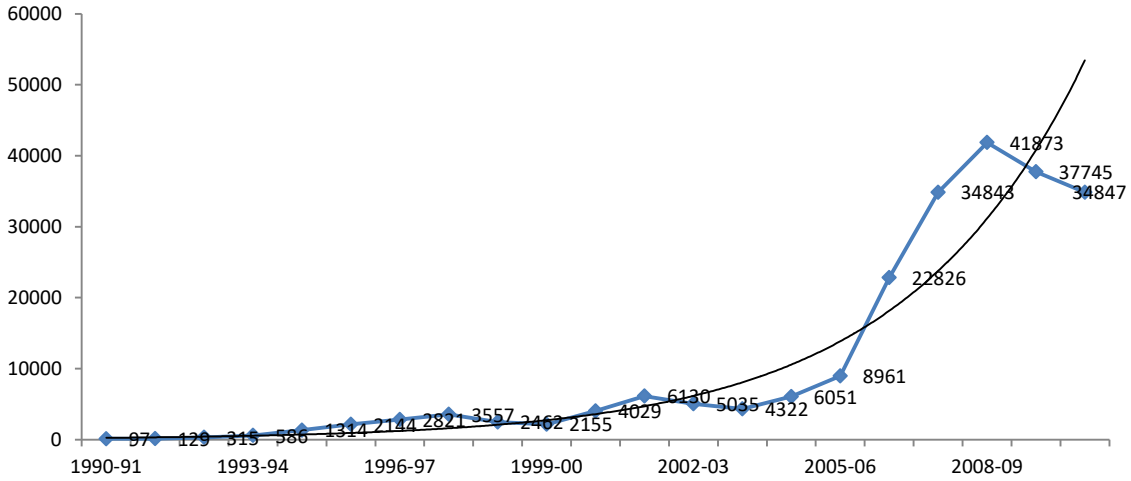
of the domestic firms. In the second set, we look into the diversity of the FDI spillover effects on the domestic firms across technology category sectors.

3. FDI and Export activity in India

a) FDI trends after liberalisation

Since liberalization, the policy changes have brought a major alteration in terms of inflow of actual FDI through various channels. The total FDI inflow has gone up to 34 billion in 2010 from merely 2 million in 1991-92. As we see from the graph below (Figure 1), even after liberalization, FDI inflow was not that high till 2002[3]. However, economic slowdown has shown an impact on the FDI inflow in India as we see that FDI inflow has decreased after 2007-08. From the average FDI inflow in different periods, it is evident that India has experienced a drastic increase in inward FDI since 2005-06. The policy change to allow FDI up to 100% foreign equity under the automatic route in townships, housing, built-up infrastructure and construction-development projects can be observed from the FDI inflow.

Figure 1. FDI Inflow since 1990-91 ($ Million)

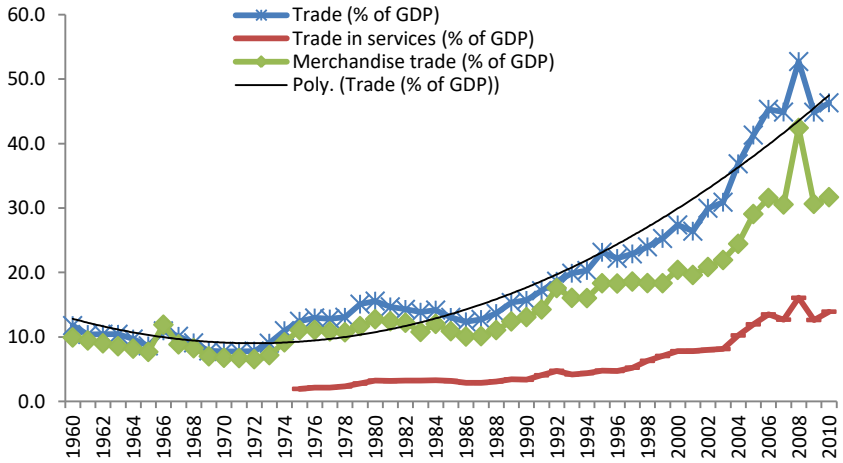


Source: Handbook of Statistics on Indian Economy, Reserve Bank of India

b) Trade performance since liberalisation

Since 1991, India has transformed from relatively closed economy to one of largest open economy in Asia (OECD, 2009). We can see from figure 2 that Indian economy is more open than earlier regime as the measure of openness (trade share in GDP) has reached 46 percentages in 2010. This is significantly large to the earlier regime of inward orientation. For instance, during 1960-90, the openness share was only around 11 to 15 percentage of GDP. On an average, openness has increased to 22 percent during 1990-2000 and around 40 percent during 2001-10. This suggests the growing importance of trade in India's GDP.

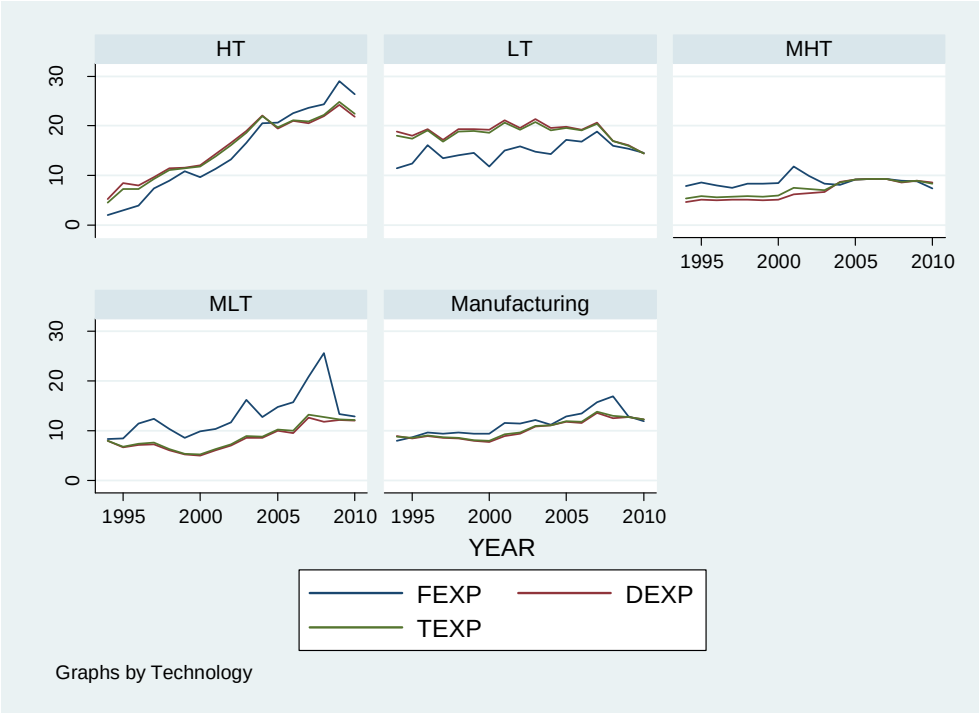
Figure 2. India's trade Share in GDP (%)



Source: Author calculation based on World Development Indicators (WDI) World Bank

However, if we compare the export activity of the foreign and the domestic firms in India along technology intensity sectors (as, defined in OECD) we do not find any difference in export performance of domestic and foreign firms (Figure 3). Moreover, in sectors except MLT and HT recently, domestic firms' export activity is higher than the foreign firms. This signifies that the increase in the export activity of India has been due to the improved export capacity of the incumbent firms in India rather than entry of more export oriented firms.

Figure 3. Export Intensity of the firms in technology category and manufacturing sector



Note: Calculated using the firm level data collected from PROWESS database. FEXP represents the export intensity of the foreign firms, DEXP represents the export intensity of the domestic firms, and TEXP represents export of export intensity of the all firms in the technology category and manufacturing sector.

4. Data Source, Selection of Variables and Empirical Methodology

4.1 Data Source and Description of Data

The empirical (descriptive as well) study is carried out using data collected from PROWESS database provided by the Centre for Monitoring Indian Economy (CMIE). The database covers firms from manufacturing, banking, financial services and other service sectors in India. It provides quarterly time series data for all financial activities since 1989-90 onwards. Our study focuses on the manufacturing sector.

We collected information about 9000 manufacturing firms at 5 digit level listed for the period 1994-2010. Although, the database reports data since 1989-90 onwards, we confine our study for the time period 1994-2010 due to availability of observation for most of the firms. We selected firms based on the data availability of sales, wages and salaries, gross fixed assets and raw material. Firms with less than five years of sales were dropped from the sample. Similarly, firms with no data on wages and salaries, gross fixed assets and raw materials were also dropped from the sample. Almost 3000 firms were dropped in the process from the sample due to unavailability of data. For the present study, firms with greater than 10%[4] foreign equity share for at least 3 years are classified as the foreign firms.

The varying presence of the foreign firms in the industries reveals that the foreign firms are mainly concentrated in the relatively technology intensive and capital intensive sectors. There are two industries (NIC16 and NIC31) where the foreign firms are not present at all. In other industries, foreign firms vary from merely 1.5% in the fabricated metal products to 23% in the printing and reproduction of recorded media sector. The data also shows that nearly 32% of the domestic firms have never exported over the study period 1994 to 2010. On the contrary, only 6.2% of the foreign firms are non-exporter over the 17 years.

After cleaning of data, our unbalanced panel for empirical study includes 6233 firms observed over the study period 1994-2010. We also have divided the whole dataset according to the technology intensity of the industries into HT, MHT, MLT and LT sectors. To categories the firms across the technology sectors, we have used the OECD definition of technology intensity.

4.2 Selection of variables

The choice of the variables depends on the previous literature on determinants of export performance[5]. We separately discuss the firm specific variables and sector specific variables including different spillover variables measuring different economic activities of MNEs in the host country.

Spillover Variables (SP)

Competition Spillover (*CompSill*): Share of Foreign firms in total industrial domestic sales is used as a proxy for the *competition spillover*. Generally employment share of the foreign firms in total sectoral employment is used in order to capture concentration of foreign firms in domestic market (see, Ruane and Sutherland 2007); due to unavailability of employment data we use the alternative approach.

Information Spillover *(ExpSpill):* To capture the *information spillover* we use foreign firms' export share in total industrial export. Gains from the established network, and marketing knowledge of the foreign firms reduce the cost of attaining information, leaving productivity unchanged (Franco and Sasidharan 2010). Thus, we hypothesise that domestic firms' export performance would be positively associated with the foreign firms export activity.

Imitation Spillover: We use two separate measures for *Imitation spillover*. The first measure includes the research and development activity by the foreign firms while in the second measure we include the import of technology by the foreign firms. Thus we take share of foreign firms' R&D expenses in total industrial R&D expenses *(RDSpill)* as one measure and share of royalty payment by the foreign firms' in sectoral royalty payment *(TechSpill)* as another. We expect positive signs for both of these spillover variables.

Wage Spillover *(WageSpill):* For the skill spillover variable we follow the measure undertaken by Franco and Sasidharan (2010). It is measured as the share of foreign firms' expenditure on wages and salaries to total wages and salaries expenditure of the industry. This variable takes into consideration the level of skill embodied in the human capital working in foreign firms. Following the previous studies, we hypothesise that skill spillover would improve the export performance of the domestic firms.

Sector Specific Variables

We have included two other sectoral variables in the model to verify the importance of the sectoral export *(Sei)* and domestic activity *(Ssect)* on export performance of the local firms. The first variable controls the factors that affect overall export performance of the industry (Greenaway et al., 2004). We expect a positive sign for the variable due to the fact that firms located in an export oriented industry, would have positive impact on the export performance through information assimilation from other domestic firms. Another variable *(Ssect)* accounts for the possible general spillover effects not associated with the export activities (Greenaway 2004; Franco and Sasidharan 2010). It also captures the fact that firms in the larger domestic market, would have lower export activity and thus we expect a negative association between export activity of the domestic firms and Ssect variable.

Firm Specific Variables

The importance of capital and skill is always described in the trade related models. In our empirical model also we use both of these variables. Capital-labour ratio *(K)* represents the technological accumulation in the production process while wage intensity *(WAGE)* represents the skill accrued in the production. Higher skill improves the productivity and quality of the product in turn increasing the export competitiveness in the international market (Roberts and Tybout 1997). This increases the possibility of the non exporters to enter the export market as well as improves the activity of exporters. Though India does not export or produce much technology and skill intensive products and relatively capital scares than other developed countries, we expect negative or insignificant effects from these two variables. However, the shift of the export concentration from LT sector to other sectors indicate that India constantly growing in the skill intensive products. Thus, we add these variables to investigate whether capital and labour skill has positively influenced the export activity of the domestic firms. Another very important firm specific variable which is generally ignored is the import of raw material and intermediate inputs (RAW) by the firms. Pant (1995) in his book argued about the import induced export activity of Indian firms. Generally, materials which are scares and relatively of better quality are imported, thus, we

can expect that the quality of the product would improve to compete in the international market. Therefore, a positive effect is expected from the import of raw and intermediate inputs.

To compete as well as to achieve comparative advantage in the international market, firms need to innovate and diversify its production of technologically advanced and quality products. Moreover, R&D activity increases productivity of the firms which increases the likelihood of entering the export market. Therefore, internal R&D activity of the firms is a very important factor to capture the innovative capacity of the firms and we expect that R&D activity would positively influence the export performance of the domestic firms. However, it is a known fact that developing country like India spends a very small portion of its income on R&D activity and total technological activity. Therefore, we may not get the expected effect of R&D activity. Along with R&D activity, firms also import technology to attain advanced technology. India relied on imported technology since before 1991 and it continued to grow even after liberalisation. Productivity growth due to advanced technology improves the competitiveness in the international market and enhances export performance of the domestic firms. Therefore, we add the variable *(TECH)* to capture the impact of technology import on export performance.

Among other variables, we have added age *(AGE)* and size *(SIZE)* as control variables. The square of these variables are also added in the model to capture the non-linearity of these variables. There has been a long debate on the relationship between the size and export activity of the firms. Size can be seen as the indicator of efficiency of the firm (Willmore 1992) or economies of scale achieved by the firm (Pant 1995). Thus after a certain threshold level, the firm gain the efficiency to cover the sunk cost and export more. However, the positive influence may hold till the coordination costs are less than profitability of the firm (Franco and Sasidharan 2010). Similarly, older firms are better knowledgeable and more efficient to compete in the international market. Thus, we expect to have positive impact of age on export activity. Power (1998) though found an inverted U-shaped relationship between age and export activity. Our model tries to capture that by including the square term of the variable.

4.3 Empirical Model

Export performance is associated with two activities of the firm: (i) firm's decision to export or not and (ii) if the firm exports, the amount it is willing to export. This occurs due to the sunk cost associated with exporting activity of the firms. Thus, we have adopted Heckman selection model (Heckman, 1979) to capture these two decision problems of the firms. This eliminates the problem of selectivity bias if otherwise we consider only the exporting firms. Due to this problem of self selection, OLS estimation would provide biased estimates of outcome variables. In the first step, the firms self select themselves to the exporting and the second step explores the outcome of these selected firms. The selection equation can be represented as:

$$\begin{aligned} DEXP_{ijt} = \alpha + \beta_1 K_{ijt} + \beta_2 WAGE_{ijt} + \beta_3 RD_{ijt} + \beta_4 SIZE_{ijt} + \beta_5 SIZE_{ijt}^2 + \beta_6 AGE_{ijt} \\ + \beta_7 AGE_{ijt}^2 + \beta_8 SP_{jt-1} + \beta_9 DEXP_{ijt-1} + \beta_{10} PROFIT_{ijt} + \beta_{11} Sei_{jt} \\ + \beta_{12} Ssect_{jt} + \beta_{13} TECH_{ijt} + \beta_{14} RAWIMP_{ijt} + v_i ---(1) \end{aligned}$$

And, the outcome equation of the model is

$$EXPINT_{ijt} = \alpha + \beta_1 K_{ijt} + \beta_2 WAGE_{ijt} + \beta_3 RD_{ijt} + \beta_4 SIZE_{ijt} + \beta_5 SIZE_{ijt}^2 + \beta_6 AGE_{ijt} + \beta_7 AGE_{ijt}^2 + \beta_8 SP_{jt-1} + \beta_9 Sei_{jt} + \beta_{10} Ssect_{jt} + \beta_{11} TECH_{ijt} + \beta_{12} RAWIMP_{ijt} + u_i ----- (2)$$

Subscript i refers to firm, j to sectors and t to time. As we are following the MLE model[6], we assume that $v_i \sim N(0,1)$, $u_i \sim N(0, \sigma^2)$. The dependent variable ($DEXP_{ijt}$) of the first equation is a binary variable which takes the value 1 if the firm reports positive exports and 0 otherwise. In the next equation (equation 2) the dependent variable is measured as export intensity ($EXPINT_{ijt}$). The distribution of the error terms of the equations is assumed to be bivariate normal with correlation $\rho \neq 0$. This is for the reason that estimating only export intensity would lead to a sample selection bias, since we analyse the export behaviour of all firms not only export-oriented firms. If $\rho = 0$ then the OLS estimates would provide consistent and unbiased estimates of the outcome variable[7].

As we see from the above two equations, both equations include same regressors except for two variables in the selection equation in order to identify the complete model as required by the selection models. One of the two is the lagged export status ($DEXP_{ijt-1}$) to take into account the fact that the decision to export depends on the previous export status of the firms. This means that if a firm exports at time t it would export at time t+1 as well. The second regressor is profitability ($PROFIT_{ijt}$) of the firm which is the proxy of the capacity of the firm to meet the start up cost associated with the exporting activity (Franco and Sasidharan 2010). Moreover, lagged values of the spillover variables have been added considering the fact that time lag is needed for MNEs' spillover to influence export performance of the domestic firms. It would deal with the endogeneity problem as well. We measured all variables on annual basis (t). We also include industry and time dummies to account for possible industry and time invariant effects.

5. Heckman Estimation Results of FDI and Export Spillovers

5.1 Manufacturing sector (1994-2010)

Export Decision

Firm Specific Variables

Starting with the firm level variables, we find that profit (PAT) and previous export status of the firms (D_EXP) are very important deciding factors for future export decision of the domestic firms. Both of these variables show significant positive coefficients which follow the previous studies on India (Franco and Sasidharan, 2010) as well as the theory that profitable firms can overcome the sunk cost associated with exporting.

For a non-exporting domestic firm, internal R&D activity is found to be an important factor for the exporting decision while import of technology shows negative effect. Imported technology needs human capital and time to get adapted with the process of production. Thus, it increases cost of production and reduces the competitiveness in the international market. This finding contradicts the previous studies on India (Joseph and Reddy, 2009; Franco and Sasidharan, 2010). Both of these studies show that import of technology promotes export. Interestingly, Buck et al. (2007) did not find any impact of internal R&D in promoting export in Chinese manufacturing firms.

Table 2. Heckman Selection (MLE) model for Indian manufacturing firms

variables	Model 1		Model 2		Model 3		Model 4		Model 5	
	Export Decision	Export Intensity	Export Decision	Export Intensity	Export Decision	Export Intensity	Export Decision	Export Intensity	Export Decision	Export Intensity
PROFIT	0.0015 (2.01)**		0.0015 (2.00)**		0.0015 (2.01)**		0.0015 (1.99)**		0.0015 (1.95)**	
DEXP	2.6291 (169.99)**		2.6286 (169.71)**		2.6285 (169.92)**		2.6290 (169.9)***		2.6290 (169.69)**	
K/L	-0.00001 (6.45)***	0.00000 (2.58)***	-0.00001 (-6.45)***	0.00000 (-2.56)**	-0.00001 (-6.42)***	0.00000 (-2.49)**	-0.00001 (-6.45)***	0.00000 (-2.56)**	-0.00001 (-6.43)***	0.00000 (-2.53)**
RD	0.5603 (2.52)**	-0.0871 (-2.22)**	0.5612 (2.53)**	-0.0880 (-2.24)**	0.5635 (2.54)**	-0.0869 (-2.21)**	0.5563 (2.50)**	-0.0884 (-2.25)**	0.5529 (2.48)**	-0.0867 (-2.22)**
TECH	-0.8587 (-4.52)***	-1.4129 (5.68)***	-0.8566 (-4.52)***	-1.3491 (-5.40)***	-0.8673 (-4.57)***	-1.4096 (-5.66)***	-0.8581 (-4.52)***	-1.4143 (-5.68)***	-0.8458 (-4.45)***	-1.4237 (-5.74)***
RAW	0.1254 (6.21)***	0.6266 (44.9)***	0.1252 (6.20)***	0.6262 (44.69)***	0.1264 (6.26)***	0.6270 (44.84)***	0.1253 (6.21)***	0.6289 (44.96)***	0.1237 (6.12)***	0.6136 (3.69)***
WAGE	-0.3177 (-11.11)***	0.0884 (8.18)***	-0.3178 (-11.10)***	0.0909 (8.37)***	-0.3183 (-11.12)***	0.0891 (8.23)***	-0.3180 (-11.11)***	0.0882 (8.15)***	-0.3160 (-11.05)***	0.0876 (8.14)***
SEI	1.3574 (2.95)***	1.4120 (12.36)***	1.3981 (3.00)***	1.5516 (13.48)***	1.5083 (3.26)***	1.5962 (13.96)***	1.2856 (2.75)***	1.4416 (12.36)***	1.4034 (3.01)***	1.5777 (13.80)***
SSECT	0.1940 (1.23)	-1.6423 (-7.58)***	0.1288 (1.15)	-1.9770 (-9.07)***	0.2208 (1.26)	-1.9176 (-8.89)***	0.1880 (1.22)	-1.9349 (-8.98)***	0.1863 (1.10)	-2.1532 (-9.65)***
AGE	0.0046 (2.49)**	-0.0015 (-3.19)***	0.0046 (2.49)**	-0.0014 (-2.97)***	0.0046 (2.50)**	-0.0014 (-2.95)***	0.0045 (2.48)**	-0.0015 (-3.15)***	0.0047 (2.55)**	-0.0014 (-2.96)***
SQAGE	-0.00002 (-1.09)	-0.00001 (-1.18)	-0.00002 (-1.09)	-0.00001 (-1.34)	-0.00002 (-1.08)	-0.00001 (-1.37)	-0.00002 (-1.08)	-0.00001 (-1.17)	-0.00003 (-1.07)	-0.00001 (-1.37)
SIZE	-0.0049 (-6.42)***	0.0112 (16.81)***	-0.0049 (-6.41)***	0.0110 (16.58)***	-0.0049 (-6.42)***	0.0111 (16.67)***	-0.0049 (-6.42)***	0.0111 (16.68)***	-0.0049 (-6.42)***	0.0111 (16.85)***
SQSIZE	0.00000 (9.62)***	-0.00001 (-7.83)***	0.00000 (9.61)***	-0.00001 (-7.67)***	0.00000 (9.63)***	-0.00001 (-7.71)***	0.00000 (9.62)***	-0.00001 (-7.73)***	0.00000 (9.59)***	-0.00001 (-7.85)***
CompSpill	-0.1042 (-1.44)	-0.5716 (-11.47)***								
RDSPill			0.0391 (1.49)	-0.0013 (-1.07)						
ExpSpill					-0.4012 (-2.29)**	-0.1705 (-3.81)***				
WageSpill							-0.2745 (-1.58)	-0.3421 (-4.34)***		
TechSpill									-0.0082 (-1.17)	-0.0383 (-2.97)***
Constant	-0.1158 (-13.20)***	0.5229 (29.37)***	-1.1728 (-14.47)***	0.5493 (31.02)***	-1.1740 (-14.50)***	0.5489 (31.03)***	-1.1548 (-13.81)***	0.5704 (31.05)***	-1.1582 (-13.60)***	0.5625 (30.87)***
Loglikelihood	-25634.47		-25642.94		-25690.21		-25690.53		-25452.42	
Rho	-0.1158045		-0.1137094		-0.1136412		-0.1136677		-0.1135843	
Wald Chisq (47)	8663.71		8386.23		8513.2		8518.99		8188.6	
LR test	157.06***		154.57***		154.57***		154.44***		155.21	
Observation	64538		64538		64538		64538		64538	

*** ,**,* stands for significance at 1%,5% and 10% level. Error corrected z ratios are in the parenthesis.

Contrary to our expectations, we find negative effect of capital labour ratio (*K*) on the decision to export. This result is not very surprising for a developing country like India where adequate skill is also scares to couple with available technology and capital. Negative significant coefficient of the skill variable (*WAGE*) shows that India still has not reached that threshold level of competitive advantage in capital and skill intensive products to enter the international market. Recent studies by Bhat and Narayanan (2009), and, Joseph and Reddy (2009) also found capital intensity to be insignificant. Import of inputs (*RAW*) has significant positive impact on export promotion in Indian manufacturing firms. The claim during the export promotion policies to open the import of raw and intermediate materials has actually been successful in enhancing export performance in India.

The result shows that old but small sized Indian firms are successful in entering export market. Siddharthan (1986) argued that generally small firms are concentrated into labour intensive products in which India has comparative advantage. Moreover, large firms with oligopolistic power in the domestic market enjoy the profit rather than taking the risk associated with exporting activities (Kumar and Siddharthan, 1994; Pant, 1995). The result confirms the non-linearity of the size (*SIZE* and *SQSIZE*) variable. The square term for age (*SQAGE*) variables is found to be insignificant. The significant positive sign of the *AGE* variable confirms that firms which are operating in the market for some time are able to gather the knowledge of international market and thus due to the demonstration effects, it is easier for the older firms to enter the export market.

Sectoral Variables

Among the sector specific variables, export orientation of the sector *(Sei)* has shown that firms inside a more export oriented sector have higher probability to become exporters which contradicts the previous study by Franco and Sasidharan (2010). We can term this as positive spillover from domestic firms' export activity. On the other hand, domestic market concentration of the sectors (*Ssect*) does not have any impact on the decision to export of the firms.

Spillover Variables

Now we move to our main focus of the study, the spillover variables. Except the information spillover (*ExpSpill*) variable, all other variables are insignificant. The significant negative coefficient of the *ExpSpill* variable suggests that Indian market is basically used as an export platform and thus the information does not filter to the domestic firms. Moreover, the export competitiveness is higher for the foreign firms than domestic counterpart. Therefore, the sectors where foreign firms are strong exporters, domestic firms are not been able to enter the export market. India's close competitor of FDI investment, China however found positive impact from foreign export activity (Buck et al. 2007). It seems that the motives of FDI investment are different for these two countries. The coefficients of skill spillover (*WageSpill*) and technology Spillover (*TechSpill*), Competition Spillover (*CompSpill*) are negative and insignificant.

Export Intensity

Firm Specific Variables

In the case of export intensity, capital-labour ratio (*K*) follows the results of export decision. The result confirms that India does not have competitive advantage in technology intensive products. In contradiction to the export decision, skill intensity (*WAGE*) is found to

be important factor for the export activity of the exporting firms. Most of the domestic export activity is concentrated in the LT and MLT sectors which use semi skilled labour and less of capital. Knowledge acquired from the exporting activity improves the production skill of the labour enhancing the export activity of the manufacturing firms. Along with these variables, import of raw and intermediate input is also found to be an important indicator of export augmentation.

Although R&D activity (*RD*) has positive impact on export decision, in the case of export intensity this variable shows just the opposite result. The main contributors (LT and MLT sectors) to the exporting activity in India do not share much of the R&D activity and moreover expenditure incurred on R&D activity is so small that this result is not quite surprising. Alongside, the lack of coordination between the production process and R&D activity increases the cost of production reducing effective productivity gain. Similarly, import of technology (*TECH*) has significantly negative impact on export activity.

In line with the study by Joseph and Reddy (2009), our result shows that large sized firms (*SIZE*) are more export intensive. Large firms can acquire latest technology for relevant production comparatively easily than others. This indicates that the economies of scale achieved by the firms have significant influence on export performance (Kumar and Pradhan 2003). The non-linearity is fairly visible for both of these variables suggesting that after a certain size the coordination cost becomes higher than the profit earned reducing their export activity (Franco and Sasidharan 2010). On the other hand, the result indicates that young firms are more prone to be successful in export activity.

Sector Specific Variables

Among the sectoral variables, exporting activity of the industry (Sei) is still found to be an export enhancing factor for the domestic exporting firms. However, domestic market size of the sector (Ssect) shows significant negative impact on the export intensity of the domestic firms. Firms within large domestic market sector counter with huge competition from other firms in the sector. To keep up with the competition and market share, firms generally are not able to concentrate in exporting which in turn reduces the international activity of the domestic firms.

Spillover Variables

Spillover variables have significant impacts on export intensity of domestic firms. Contradicting Greenaway et al. (2004) and Ruane and Sutherland (2005), we find negative competition spillover effects on export activity of the domestic firms. Indian firms are relatively smaller and technologically backward than the FDI firms. Competition from foreign firms forces the domestic firms to improve the production process. With little human capital and absorptive capacity, an effort to improve production process employing new technology only increases the production cost. Therefore, firms lose their domestic market share as well as cost competitiveness in the world market reducing export intensity of local firms.

The study does not find any imitation spillover among manufacturing firms. Both of the imitation spillover variables (*RDSpill* and *TechSpill*) are negative and insignificant. It is a the fact that foreign firms do not undertake much of R&D activity in the domestic market. Only 14% of total R&D stock in manufacturing industry is possessed by the foreign firms. To remain competitive and to reduce the spillover effects, foreign firms prefer to undertake the R&D activity at the head quarters. Therefore, the effect does not seem unexpected. Buck et

al. (2007) pointed out correctly that Chinese firms have delocalised the foreign R&D activity more than Indian firms to accumulate higher spillover potentials. *TechSpill* variable is found to be significantly negative. The result confirms that quality of the domestic absorptive capacity is not high enough to capture the benefit of foreign technology import.

The coefficient of the skill variable (*WageSpill*) is also negative and significant. Atkin and Harrison (1999) argued that foreign firms not only capture the best available skilled labour from the domestic market but it also increases the wage bill of the domestic firms (Saggi 2002). Therefore, increasing cost and reduced availability of the skilled labour hinders the export competitiveness in the world market.

Significant negative coefficient of the *ExpSpill* variable indicates that not only foreign firms have used India as export platform but also have reduced share of domestic export in international market. Export platform foreign firms generally do not share the information with the domestic firms (Ruane and Sutherland, 2005). Along with this, foreign firms, being more R&D intensive, technologically advanced and skill oriented can produce and innovate diversified products faster than domestic competitors. This decreases the demand for the domestic products reducing the export activity of domestic firms.

This result also indicates that domestic firms are more benefitted from the export activity of the domestic firms within the industry than the foreign firms. Domestic firms generally produce similar exporting products and use similar technology, therefore, it is easier for the domestic firms to get information from their local source than the source coming from outside.

5.2 Technology intensity Sectors (1994-2010)

In this section, we provide a comparative analysis of technology intensive categories to get a comprehensive account of export performance of the domestic firms. The spillover variables are provided in the table 3.

Export Decision

Spillover Variables

In contrast to our earlier findings, *CompSpill* variable is found have significantly positive impact on the export decision of the firms in MHT sector. In our earlier discussion, we have found that FDI is largely concentrated in MHT sector. Therefore, domestic firms are accustomed with the foreign production process and technological competency, which facilitate production of goods of international quality. Thus, with competitive pressure from foreign firms, domestic firms decide to enter the export market. However, the *CompSpill* variable is negative but insignificant for other technology category sectors which are in line with our earlier results. In the MHT sector, the *RDSpill* variable is also positive and significant which implies that the spillover effect from foreign R&D activity has been beneficial for domestic firms in MHT sector. For MLT, LT and HT sectors, *RDSpill* variable is also positive but insignificant. The significant negative coefficient of the *ExpSpill* variable indicates that Indian HT sector is merely an export platform for the foreign investors who want to serve other countries. Aggarwal (2002) also found that equity participation adversely affects export activity of the HT sector. For rest of the technology intensive sectors, the *ExpSpill* is negative but insignificant. We do not find any evidence of skill spillover (*SkillSpill*) or imitation spillover through foreign technology import (*TechSpill*) on export decision of the domestic firms in any of the sectors.

Table 3. FDI and Export Spillovers across Technology Intensive sectors (1994-2010): Results from Heckman Selection model (MLE)

Technology Category	Variables	Model 1		Model 2		Model 3		Model 4		Model 5	
		Export Decision	Export Intensity	Export Decision	Export Intensity	Export Decision	Export Intensity	Export Decision	Export Intensity	Export Decision	Export Intensity
HT	CompSpill	-0.0566 (-1.08)	-0.0478 (-1.38)								
	RDSPill			0.8765 (1.06)	0.0958 (0.92)						
	ExpSpill					-1.3874 (-1.77)*	0.0661 (0.87)				
	WageSpill							-1.2550 (-1.06)	-0.5160 (-1.86)*		
	TechSpill									0.2937 (1.06)	0.0231 (0.93)
	Constant	-1.298 (-2.26)**	0.368 (4.07)***	-1.393 (-2.70)**	0.343 (4.12)***	-1.277 (-2.80)**	0.334 (3.74)***	-1.284 (2.56)**	0.454 (4.66)***	-1.476 (-2.87)***	0.350 (4.28)***
	Log likelihood	-1728.043		-1727.768		-1726.498		-1725.976		-1716.994	
	Rho	-0.20329		-0.203766		-0.2045265		-0.2058023		-0.2021173	
	Wald Chisq (29)	654.48		654.57		654.64		658.47		645.13	
	LR test	60.77***		63.81***		63.83***		63.49***		60.49***	
	Observation	6664									
MHT	CompSpill	0.6430 (2.37)**	0.0187 (0.81)								
	RDSPill			0.5598 (3.02)***	0.0246 (0.87)						
	ExpSpill					-0.4555 (-1.07)	-0.2141 (-2.45)**				
	WageSpill							-0.5543 (-1.06)	0.4333 (2.94)**		
	TechSpill									0.0010 (1.01)	-0.0632 (-2.47)**
	Constant	-1.6860 (-6.38)***	0.2001 (5.17)***	-1.2066 (-11.24)***	0.2000 (12.73)***	-1.0398 (-7.59)***	0.2385 (11.65)***	-0.9866 (-4.06)***	0.1084 (3.02)***	-1.1100 (-6.94)***	0.2498 (10.53)***
	Log likelihood	-2646.496		-2644.103		-2645.861		-2645.009		-2646.273	
	Rho	-0.245925		-0.2463482		-0.2459754		-0.2459129		-0.2464958	
	Wald Chisq (31)	933.79		934.86		940.66		943.4		940.64	
	LR test	120.05***		120.39***		120.04***		120.13***		120.66***	
	Observation	16105									
MLT	CompSpill	-0.4391 (-0.97)	-0.5855 (-2.73)***								
	RDSPill			0.0875 (0.58)	-0.0371 (-0.89)						
	ExpSpill					-0.3199 (-1.03)	-0.2568 (-3.03)***				
	WageSpill							-0.1591 (-1.23)	-0.3002 (-1.58)		
	TechSpill									0.1427 (1.04)	0.0561 (1.50)

	Constant	-1.521 (-5.57)***	0.326 (3.99)***	-1.656 (-8.95)***	0.179 (2.99)***	-1.558 (-7.88)***	0.228 (3.67)***	-1.599 (-6.56)***	0.243 (3.27)***	-1.721 (-8.63)***	0.136 (2.12)**
	Log likelihood	-8553.258		-8556.664		-8551.997		-8555.924		-8555.486	
	Rho	-0.0908884		-0.0911766		-0.0905595		-0.0909251		-0.0912606	
	Wald Chisq (33)	2651.9		2643.09		2654.21		2645.38		2645.01	
	LR test	33.18***		33.44***		32.92***		33.23***		33.53***	
	Observation	20114									
LT	CompSpill	-0.3689 (-1.25)	-0.4857 (-7.20)***								
	RDSPill			0.0215 (0.85)	-0.0340 (-0.87)						
	ExpSpill					-0.4255 (-1.16)	-0.2376 (-2.14)**				
	WageSpill							0.0395 (1.07)	-0.4841 (-3.22)***		
	TechSpill									-0.1046 (-1.39)	-0.0250 (-1.09)
	Constant	-1.389 (-11.64)***	0.474 (15.29)***	-1.399 (-11.47)***	0.476 (14.55)***	-1.377 (-11.19)***	0.484 (14.79)***	-1.398 (-11.18)***	0.501 (14.99)***	-1.371 (-10.99)***	0.498 (15.21)***
	Log likelihood	-9677.838		-9340.307		-9399.212		-9397.15		-9228.581	
	Rho	-0.1506315		-0.144525		-0.1446061		-0.1446288		-0.1437032	
	Wald Chisq (35)	3591.17		3099.58		3164.2		3172.48		2994.93	
	LR test	79.29***		74.11***		74.86***		74.94***		74.76***	
	Observation	21625									

Note: *,**,*** represents the 10%, 5% and 1% level of significance. The values in the parentheses are z-values.

Sectoral and Firm Specific variables

It is clearly seen that apart from domestic firms within MHT sector, the probability that the domestic non-exporter firms turning into an exporting firm increases with the export orientation of the industry (*Sei*) in all other technology intensive categories. On the other hand, decision to export is not influenced by the domestic market activity of the industry (*Sscet*) in any of the technology categories. Profit of the firms (*PROFIT*) is a deciding factor for firm level export in the MHT and LT sectors while in other two sectors this variable is insignificant. *K/L* ratio is negative and significant for all technology category sectors, except LT sector where it is insignificant due to low content of capital in the production. We find that the smaller the size (*SIZE*), higher is the probability that the firm would become exporter in every technology intensive sector except the firms within MLT sector. The size variable shows a non-linear relationship with the export decision in the LT, MHT and HT sectors. In contrast, based on age (*AGE*), it is evident that older firms in MLT sector have higher probability of starting export activity. We do not find any significant impact of *RD* (R&D intensity), *WAGE* (labour skill) and *TECH* (import of technology) variables on the export decision of domestic firms in HT sector. R&D activity (*RD*) of the firms shows positive impact on decision to export for firms in all other technology category sectors (LT, MLT and MHT). Import of technology (*TECH*) adversely affects the export decision of the firms in the MLT sector. In addition, while import of inputs (*RAWIMP*) has significantly positive impact on export decision of the firms in every technology category sectors like, LT, MLT and MHT, it is insignificant for HT sector. The results clearly show that Indian HT sector cannot utilise technology factors efficiently in the export production and hence, has not yet reached the comparative advantage in the international market.

Export Intensity

Spillover Variables

Similar to our earlier findings, the *CompSpill* variable influences the export propensity of domestic firms positively in the MHT sectors. However, for MLT and LT sectors, *CompSpill* is negative and significant. This implies that technologically weak firms in these two sectors are not able to compete with the foreign firms in the domestic market which affects their export activities negatively. There is no evidence of information spillover (*ExpSpill*) in any of the technology sectors as well. In all technology categories- MHT, MLT and LT except HT, this variable has negative and significant coefficient. Though insignificant, *RDspill* and *TechSpill* variables also have positive coefficients for the HT sector. Interesting to see that *TechSpill* variable possess a significant negative coefficient for the MHT sector, where the foreign firms own the highest stock of imported technology. On the contrary, the other imitation spillover variable, *RDSpill* shows positive coefficient for the MHT sector although insignificant. Skill spillover variable (*SkillSpill*) has different effects on export activity of different sectors. While export activity of the domestic firms in MHT sector is positively influenced by the spillover of skills from foreign firms, HT and LT sectors are adversely affected. We do not find any evidence of Skill Spillover (*SkillSpill*) or imitation spillover through foreign technology import (*TechSpill*) on the export activity of the domestic firms in the MLT sector.

Sectoral and Firm Specific Variables

Confirming our previous results on export decision, the domestic market activity of the industry (*Ssect*) has significant negative influence on the export activity of domestic firms

in all technology category sectors. Similarly, firms within bigger export sector (*Sei*) are always benefitted from the exporting firms within the industry. Import of inputs (*RAWIMP*) has significant positive impact on export intensity of domestic firms in all the technology sectors. While *K/L* ratio is insignificant in MHT and LT sectors, negative influence becomes significant for MLT and HT. Domestic firms within the LT and MHT industries are adversely affected by the import of technology (*TECH*). Another important variable R&D intensity (*RD*) of the domestic firms shows a positive influence on the export propensity of the domestic firms in HT sector although the effect is significantly negative for other sectors. This is result is not surprising as most of the R&D stock belongs to the HT sector. Skill variable (*WAGE*) has no impact on the export activity of domestic firms in HT and MHT sector. However, this variable positively influences the export activity of the domestic firms in MLT sector and negatively the domestic firms in LT sector. We find that the age (*AGE*) of the firms is not important in the HT and MHT sectors, while younger firms promote more export in LT and MLT sector. Contrary to the *AGE* variable, we find that size (*SIZE*) has a positive impact on export intensity of domestic firms in all technology sectors. However, as before the non-linearity of this variable is confirmed.

From the above analysis, it is clearly evident that domestic firms are highly heterogeneous among the technology intensive categories. The technology intensive categorisation reveals that the foreign investment spillover on export performance largely operates through competition and R&D induced channels in MHT sector. Notably, this is the largest recipient of FDI in recent period. Since 2000, there has been significant expansion of medium high technology sectors like chemicals, machinery, electrical and transport equipments. The higher FDI in these sectors in recent period has resulted in some positive effect on the domestic export performance, which can be inferred from our analysis. On the other hand, information spillover, imitation spillover through import of technology and skill spillover are largely negative or insignificant in most of the sectors. Since India does not have significant presence of HT industries, the insignificant results are not surprising.

6. Summary and Conclusion

Since the economic liberalisation policy reforms of 1991, the major thrust has been shifted towards improving the export orientation of manufacturing sector so that economy attains faster economic progress. In this regard, the liberal FDI policies aim to facilitate more foreign investment in manufacturing sector so that the overall exports improve both directly as well as indirectly. The role of TNCs in expanding exports of host developing countries derives from their access to global, regional, and especially home-country (or, third country) markets along with the additional capital, technology and managerial know-how they bring with them. TNCs, with their resources and market access complement a country's own capabilities and reduce the obstacles of the host country firms in entering the world trading system (Honglin 2005). This study is relevant in the recent days as since 2002, India has experiences a huge surge in FDI inflow. Therefore, the study is needed to see how effective the FDI has been in Indian manufacturing sector. In the present study, using econometric tools, we examined the spillover effects from FDI on the export performance of the Indian manufacturing firms during 1994-2010. The study covers 6623 firms of Indian manufacturing sector over the study period.

Compared to the previous studies, our empirical estimation focuses on different aspects of the export performance of Indian manufacturing sectors. For the empirical analysis, we have not only examined the case of aggregate manufacturing sector, but also categorised them according to the technology intensive categories (LT, MLT, MHT and HT)

to capture the heterogeneity of the domestic firms with technology sectors. Based on the theoretical literature, we incorporated five different forms of FDI induced spillover channels, i.e., information spillover, competition spillover, imitation spillover (through R&D activities and technology import of the foreign firms) and skill spillover. For the empirical estimation, we have employed the Heckman Selection (Maximum Likelihood) method, which segregates the export behaviour into two stages. In the first stage, the model examines the export decision of firms and in the second stage the export intensity of the self-selected firms is estimated. Apart from these spillover variables, we have also incorporated various sectoral and firm specific control variables, which are often considered as some of the major determinant factors of export performance at the firm level.

We carry on the empirical analysis in two different ways. In the first one, we consider the whole Indian manufacturing sector except two industries where there is no foreign presence. In the second specification, we divided the whole dataset according to the technology intensity following the OECD definition (HT, MHT, MLT and LT). The empirical analysis based on export decision and export intensity revealed that both technology and non-technology variables in various sector specific categories have differential impact on export performance. In the case of technology variables, internal R&D was found to have significant influence on the probability of firms' decision to undertake export activity. However, the internal R&D and skill intensity did not show any impact on export enhancement of the Indian exporters. In the case of technology import, it seems that Indian firms are not able to utilize imported technology due to insignificant amount of innovative capability and human capital at the firm level. Capital labour ratio of the firms have also adversely affected the decision to export and the export intensity of the firms which we can argue that India being capital scarce country, the comparative advantage lies in the export of labour intensive products. Among the non-technology variables, the profitability of the firm, previous export status and raw material inputs are the most influential factors for the export decision of the domestic firms. We find a non-linear relationship with export decision thus confirming the small size of the newly exporting firms. Contrary to the export decision model, we found higher export intensity among larger size of the firms. Sectoral variables, which control for the sectoral characteristics of the sample firms, show that firms within the highly export intensive sectors have higher probability to be exporters and moreover, exporting firms within these industries are more successful in the export market.

Looking at the spillover variables, we find that in general, Indian firms have not benefitted from the foreign activities in the domestic market. In contrast to the earlier studies on Indian manufacturing, we do not find any evidence of information spillover from the export activity of the foreign firms. This may be due the large domestic market bias for which foreign firms invest in India and the preference of foreign firms to use India as their export platform. Moreover, we found that the Indian firms are mainly focused on the export of low technology intensive products, while the foreign exports are largely concentrated in medium to high technology intensive products. Thus, due to these differences, the possibility of information spillover from foreign exports activity can be limited for the domestic firm. The study also did not show any evidence of competition spillover in Indian manufacturing firms except in the MHT sector. In other sectors, firms are generally small (LT and MLT) who produce less technology intensive products or not much developed (HT) in accordance with the international standard. Therefore, domestic firms are not capable of facing the competition from technologically advanced foreign firms. High sunk cost associated with exporting and loss of competitive advantage due to high production cost disallows the firms to enter the foreign market. Similarly, skill spillover from foreign labour and imitation spillover through the technology import by foreign firms are also found to have adverse

effects on the export decision and intensity of the domestic firms. Imitation spillover through R&D activity of the foreign firms has shown some positive impact on the export performance of the domestic firms though it is sector specific (HT sector).

We can summarise the study as follows: First, technology category wise we find that Indian firms do not possess competitive advantage in technology or capital intensive products in the world market and thus we did not find much influence of technology factors on export performance. MHT and MLT sectors are relatively important sectors in view of export promotion. Only firms in the MHT sector have benefitted foreign economic activities. LT sector on the other hand, being a technologically backward sector cannot gather much benefit from the foreign activities.

At last, we can conclude by pointing out that Indian firms must undertake suitable R&D activity and develop human skills to reap benefit from foreign activity in the domestic market. Moreover, during the inflow of FDI, firms should be cautious about the motive of the foreign firm investment. Then only, local firms would be benefitted from foreign activities.

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Notes:

1. For example, Aitken and Harrison (1999), Kokko (1994; 1996), Kathuria (2000, 2002) etc. The studies could not draw any certain conclusion regarding the FDI spillover effects on productivity of the domestic firms. In India though, most of the studies (Kathuria 2000,2002; Sasidharan and Ramanathan 2007) found negative FDI spillover effects on efficiency or productivity of the domestic firms. The recent studies by Bhattacharya et al. (2008), Behera et al. (2012) found positive spillover effects of FDI on productivity.
2. Supply enhancing effect here is not the same as direct effect mentioned above. Direct effect increases the supply volume of the industry as a whole by the direct activity of export production. On the other hand, green field export oriented FDI and green field domestic market oriented FDI can have the same effect on domestic firms in increasing supply capacity (Kutan and Vuksic 2007).
3. The blue line shows the values of the FDI inflow since 1990-91 to 2010-11. The black line is the trend line which shows how FDI has increased over the study period.
4. This is the standard definition of IMF.
5. Definitions and expected signs of the variables are presented in the tableA1 in the Appendix.
6. There are two different methods in Heckman Selection Procedure. In the Heckman two-step procedure the inverse mills ratio is included as the independent variable in the second step of the regression analysis. The inclusion of inverse mills ratio often results in multicollinearity that can profound consequences for the model estimates. Therefore, we prefer the Heckman maximum likelihood method.
7. Generally, Rho (ρ) takes negative values. Any component of the error that makes selection more likely makes y (dependent variable) less.

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Appendix

Table A1. Definition of variables and the expected signs

Variables	Symbol	Definition	**Expected Sign (Export Decision)**	**Expected Sign (Export Intensity)**
Decision to export	DEXP	DEXP=1 if the firm has exported during the year; 0 otherwise		
Export Intensity	EXPINT	Ratio of FOB value of export and sales turnover of the firm		
Capital intensity	K	Calculated with perpetual inventory method using gross fixed assets. In the model, we have used the log of K.	**+/?**	**+/?**
/Wage Intensity	WAGE	Expenditure on wages and salaries divided by sales turnover of the firm	**+/?**	**+/?**
R&D Intensity	RD	Expenditure on R&D divided by sales turnover of the firm	**+/?**	**+/?**
Technology Import Intensity	TECH	Expenditure on (capital goods import + Royalty and technical Fee payment made abroad) divided by sales turnover of the firm	**+/?**	**+/?**
Age	AGE	Difference between the year of incorporation and the year in the study	+	+
Size	SIZE	Ratio of each firm's GFA to total sales turnover	+	+
Profitability	PROFIT	Profit after Tax divided by sales turnover of the firm	+	
Size of the Sector	Ssect	Share of domestic sales in each sector to total manufacturing sales	–	–
Sectoral Exports	Sei	Share of the domestic exports in each sector on total manufacturing export	+	+
Export Spillover	ExpSpill	Share of the MNE's export in total exports of the sector	+	+
R&D Spillover	RDspill	Share of the MNE's R&D expenditure on total R&D expenditure of the Sector	+	+
Wage Spillover	WageSpill	Share of the MNES' expenditure on wages and salaries on total expenditure on wages and salaries of the sector	+	+
Technology Import Spillover	TechSpill	Share of the MNEs' expenditure on Royalty and technical fees made abroad on total expenditure on Royalty and Technical fee payment of the Sector	+	+
Competition Spillover	CompSpill	Share of the MNEs' sales in total sales of the sector	+	+