Spillovers from FDI and Decision to Export by the Domestic Firms: The case of select Indian industries

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Abstracts: Objectives of this paper are to empirically examine the roles of three channels of FDI liked spillovers in enabling domestic firms (DFs) to take decision to export (DTE). The findings suggest that competition has a positive effect on DTE but there is no evidence of technological and export related information externalities affecting DTE of DFs. When heterogeneity in inefficiencies of DFs is introduced in the estimation equations, the study reveals that the export spillovers created through the information externalities benefits the efficient DFs. Although export spillovers created through competition effects benefits all DFs in taking DTE, it benefits more the efficient DFs. The implication of this result for the Government is that it should actively promoting FDI in the industries selected for this study for transforming non-exporting DFs into exporting DFs.

Keywords: FDI, Export spillovers, Domestic firms, Indian industries

1. Introduction

Given the importance of exports in an economy, researchers and policy makers have always been interested in finding answers to the question why some firms export and others do not in an industry. In this context, a growing field of economic literature examines the effect of spillovers arising from the operations of FDI firms (FFs) on the decision to export (DTE) of domestic firms (DFs).[2] Objectives of this paper are to empirically examine the roles of spillovers from FFs in enabling domestic firms (DFs) to export. We define FFs as a group of firms in which each firm has at least 10 per cent of equity from a foreign promoter and rest of the firms in an industry are designated as DFs. The study uses an unbalanced panel of firm-level data covering a period of 9 financial years, FY2003/04 to FY2011/12, for conducting empirical analysis. The sample firms are drawn from 7 divisions of *National Industrial Classification: All Economic Activities-2008* (NIC): manufacture of

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[2] Refer to Greenaway and Kneller (2008) for a survey.

basic metals (NIC-24), fabricated metal products (NIC-25), computer, electronic and optical products (NIC-26), electrical equipment (NIC-27), machinery and equipment, n.e.c. (28), automobiles (2-3-4 wheelers) (NIC-29A) and automobile ancillaries (NIC-29B).[3]

Reasons for examining this issue in the Indian context and for these industries are the following: First of all, despite Government of India (GoI) following over two decades of liberal FDI and trade policies, a large proportion of manufacturing firms have not made a dent into the export market, particularly in the industries selected for this study. Secondly, only a few researchers have examined the relationship between FDI spillovers and exporting beahaviour of firms including DTE and export intensity (XI) in the Indian context (Keshari 2011: chapter 7, Franco and Sasidharan 2010).

Methodologically, our study is in line with earlier studies on the subject. Yet, it is noteworthy in the following respects: i) it focuses only on DTE (not on XI) of DFs; ii) it employs variables related to three aspects of FDI spillovers, namely technological spillovers from FFs (TSF), export related spillovers from FFs (ESF) and competition effects from FFs (CEF) for explaining DTE; iii) it uses a number of control variables among explanatory variables and panel data technique for controlling the effect of observed and unobserved heterogeneity in characteristics of DFs on DTE[4]; iv) it also tries to tackle endogeneity issue by using one year lagged value of each spillover and firm-level control variables; v) the study also investigates whether heterogeneity in inefficiency among DFs in an industry affects FDI linked export spillovers.

Rest of the paper is organized as follows. Section-2 discusses the analytical framework. Section-3 reviews recent empirical literature on FDI linked export spillovers to DFs. Section-4 explains the probit model of the determinants of DTE, discusses FDI spillovers and other explanatory variables

[3] Division 29 of NIC has been divided into two parts and firms manufacturing only automobiles and their parts have been included in the sample.

[4] For instance, FFs may be attracted to a specific industry due to unobserved characteristics like high productivity that may be correlated with DFs' DTE.

used in the model and hypothesizes the relationships between the DTE and individual explanatory variables. Section-5 describes the data sources and characteristics of the sample and industry. Section-6 discusses the results obtained from the application of econometric method adopted for the empirical analysis. Section-7 presents the conclusions of the study.

2. Analytical framework

DFs intending to export from a developing country with large domestic market face barriers to entry mainly due to less familiarity with foreign market and unsuitable product quality, lack of cost competitiveness and export orientation, operational inefficiency, inadequate distribution channel and expertise in dealing with the conditions prevailing in the international market. DFs may overcome these barriers by: i) acquiring market intelligence (viz. information about the business practices, customers' specific requirements and preferences, competitors, economic policy and legal environment) regarding the prospective destination of their exports; ii) upgrading technology of production for achieving cost competitiveness and quality; iii) establishing distribution channels and outlets for pre- and after-sales services; iv) providing export orientation to human resources through training and other means; v) adopting techno-managerial processes (viz. just-in-time, total quality management and total production management) for improving the operational efficiency in procurement, distribution, marketing and customer service. Thus, DFs have to incur substantial costs to match with existing exporting firms if they wish to venture into the international market. Since most of these costs are in the nature of *sunk costs*, they cannot be recovered if a firm fails to export.

If DFs by some means offset or reduce the incidence of these costs, they may be able to export successfully. One of the important ways to reduce the incidence of the sunk costs is to take advantage of spillovers or externalities arising from the presence of FFs in the industry. FFs possess certain firm-specific advantages (FSAs) which offer them competitive advantage over DFs located in a developing

economy. These FSAs may include superior technology, management practices, market intelligence; access to the global distribution channel of multinational enterprises (MNEs) and their foreign contacts; expertise in dealing with foreign customers, country-specific norms and standards. Some of these FSAs having non-exclusive characteristics (viz. technology, management practices including techno-managerial processes and market intelligence) may spillover to DFs on account of FFs' presence and linkages with the former. For example, some of the skilled workers with expertise in exports employed in FFs may move over to DFs or help DFs for a fee and thereby pass on the essential knowledge, skills or trade secrets to DFs. Besides, DFs, as the suppliers of some goods and services to FFs, may gradually learn to export from FFs. These spillovers may improve the DFs' productivity, quality of product and customer service, market intelligence and expertise regarding conforming to the regulations and norms of the foreign governments.

Following Greenaway et al. (2004), we divide FDI spillovers into three categories: i) export related information spillovers from FFs (ISF), ii) technological spillovers from FFs (TSF) and iii) competition effects generated by FFs (CEFs) in the industry. Based on the above discussions, we expect that both ISFs and TSFs may have favourable impact on the DTE. However, the effects of CEFs cannot be ascertained (Aitken et al. 1997). It may act favourably if competition from FFs puts pressure on DFs to utilise their resources in most efficient manner, innovate products and processes and thereby target more competitive overseas market for selling their products. The CEFs may be stronger in industries with higher barriers to entry and seller concentration than other industries (Greenaway et al. 2004 and Poddar 2004). CEFs may also diminish exports from DFs, if FFs exert such a competitive pressure that they could force DFs to reduce their production and thereby push their average cost curve up (Aitken and Harrison 1999).

Notwithstanding the theoretical arguments advanced above, there are reasons to believe that the positive impact of FDI spillovers on DTE may differ across DFs due to heterogeneity in FFs as well as DFs. Farole and Winkler (2015) has developed a conceptual framework which identifies and summarises the heterogeneity creating factors based on the previous literature and call them as mediating factors affecting potential of FDI spillovers. At the level of FFs, heterogeneity may arise due to various motives of FDI, difference in the degree of foreign ownership, country of origin and efficiency levels of FFs, etc. At the level of DFs, heterogeneity may arise on account of differences in the levels of absorptive capacity which in turn depends on significant differences in technology and skill intensities, efficiency, firm size and age, etc. Our study mainly takes care of heterogeneity in the characteristics DFs. Yet, the capital intensive inward oriented industries chosen for this study would also imply that heterogeneity among FFs would be much less.

3. *Empirical literature*

Empirical studies examine the effect of FDI linked spillovers either on DTE or XI or on both aspects of export behaviour. In this section, we discuss the findings of select important studies on the subject pertaining to both the developed as well as developing countries. In the context of United Kingdom, Greenaway et al. (2004) and Kneller and Pisu (2007) find strong positive effect of spillovers of FDI on both the DTE as well as XI. Karpaty and Kneller (2011) find that the spillovers from FDI have positive effect, primarily on the XI of existing Swedish exporters. Phillips and Ahmedi-Esfahani (2010) for Australian food manufacturing industry find that the presence of FFs has negative effect on the DTE of DFs. Barrios et al. (2003) however finds no effect of FDI spillovers on export behaviour in the case of Spain.

Using a probit model, Aitken et al. (1997) for the first time examine whether a firm's DTE is influenced by FFs in the Mexican manufacturing plants for the years 1986 and 1990. They find that the

informational externalities (measured by FFs' share of exports in total exports of an industry) and the CEFs created by FFs (measured by FFs' share in the total production of an industry) are mainly responsible for DFs' DTE in an industry and province of Mexico.

Using a cross section data on Uruguayan firms, Kokko et al. (2001) examine the evidence of FDI spillovers on the DTE by DFs. The estimation results of a probit model suggest that the probability of exporting has increased with the presence of export oriented FFs. While examining the importance of foreign networks (represented by foreign ownership, regional presence of FDI and imports) on the DTE of Indonesian manufacturing firms, Sjöholm (2003) finds no evidence of spillovers from the regional presence of FDI on the DFs' DTE. He estimated a cross-section probit model which controlled various firms and industry specific characteristics and endogeneity problem.

Based on a panel of a large sample of firms for the period 1998–2001, Buck et al. (2007) suggest that FFs positively affect the exports of Chinese DFs through various spillover channels involving labour mobility, spatial agglomeration, technological imitation and the diffusion of exporting experience. By estimating a Heckman sample selection model with the help of pooled four-year (2000 to 2003) firm-level data, Sun (2009) finds the evidence of export spillovers from the FDI in the cultural, educational and sporting product manufacturing industry in China.

By estimating a Heckman selection model of export behaviour, Keshari (2011, chapter 7) finds no evidence of two alternate channels of FDI spillovers (TSF and ESF) and CEF affecting DTE as well as XI in the Indian non-electrical machinery industry. The study uses a pooled data set for the period of FY2001-07. By estimating a Heckman selection model of export behaviour, Franco and Sasidharan (2010) explore the effect of operations of FFs on the DTE as well as XI of DFs in the Indian manufacturing sector with the help of pooled dataset for the period 1994-2006. The authors conclude from the study that: a) MNEs investing in Indian manufacturing sector are primarily domestic market

oriented; b) there is a feeble evidence of crowding out effect on exports of DFs as FFs are taking away skill force from the DFs by offering higher wages; c) imitation effect is important for a DFs' entry into the export market.

In a recent study on the exporting decision of Chilean manufacturing plant, Duran and Ryan (2014) find that: a) DTE is adversely affected by the export share of FFs but the same is favourably affected by the export share of DFs; b) FFs share in employment positively affects the DTE, implying externalities arising from the human capital benefits DFs' export.

In an empirical analysis based on Heckman's two-step estimator in selection models, Anwar and Nguyen (2011) finds that the presence of FFs in Vietnam, through horizontal and vertical (forward) linkages, significantly affects the export behaviour of DFs. However, the backward linkages with foreign affiliates negatively affect both the DTE as well as XI of DFs. By estimating a Heckman selection model, Nguyen and Sun (2012) finds an evidence of significant spillovers from FDI (measured by the output share of FFs in an industry) on DFs' export in Vietnamese manufacturing sector. Besides, they also report that spillovers are heterogeneous and depend on firm characteristics.

The studies reviewed in this section report mixed results. The reasons for the mixed results could be the followings. First, the studies use different measures for capturing FDI linked export spillovers. Some studies have used FFs'share of sales or investment as the measure of FDI spillover but this is ideally the measure of CEF. Secondly, FFs have been defined by following different cut off (viz 10, 25 or 51 percent) of foreign equity participation in a firm. Even with the similar cut off of foreign equity, FFs may differ in terms of their motives of entering into a country's industry, international competitiveness, global production and sourcing strategies, length of their presence in an industry and country, etc. Thirdly, institutional and policy frameworks (e.g intellectual property regime, labour market regulations and ease of exporting from a country) generally vary across economies (Farole and

Winkler 2015). Fourthly, FDI linked export spillovers may be affected by the heterogeneity in the characteristics (viz. size, age, financial health, cost efficiency, technological intensity, etc.) of DFs. For instance, DFs with higher level of efficiency and technology intensity may be able to absorb spillovers generated by FFs in a better way. Finally, use of cross-section or panel data models and corresponding econometric methods may also result in contradictory results. For instance, panel data models are best suited for spillover studies but researchers sometimes estimate cross-section or pooled (cross section and time series) data models.

4. Model and Variables

4.1 *Econometric model of decision to export*

To achieve our objectives, we use a model which assumes that a DF *i* decides to export in each year *t* if incremental expected profits associated with exporting is positive (i.e. profits made by exporting is expected to be in excess of those on the domestic market sales). Denoting DTE_{it} as a dummy variable equal to 1 if a DF *i* exports in year t and 0 otherwise, we symbolically write the model as follows:

$$DTE_{it} = 1 \text{ if } \pi_{it} [C_{it} (Y_{it}, Z_{it}), E_t] > 0; \; DTE_{it} = 0 \text{ if } \pi_{it} [\,.\,] < 0$$

where π is profit which is function of cost of export sales (C_{it}) and time and industry specific factors (E). C in turn is a function of FDI spillovers (Y), firm-specific characteristics (Z).

Using a reduced form approximation for the determinants of firm profits from export activity and writing out all the variables, we arrive at the following random effect panel data probit model:

$$\begin{aligned} \Pr (DTE_{it} = 1 | \mathbf{X}) = {} & \beta_1 FDIS_{it-1} + \beta_2 INEFF_{it-1} + \beta_3 FINS_{it-1} + \beta_4 SZ_{it-1} + \beta_5 AGE_{it-1} + \beta_6 CAPI_{it-1} + \\ & \beta_7 IMIG_{it-1} + \beta_8 PDA_{it-1} + \gamma_1 IND1_i + \ldots + \gamma_6 IND6_i + \Omega_1 FYD05_t + \ldots + \Omega_7 \\ & FYD11_t + \varepsilon_{it} \qquad (1) \end{aligned}$$

$$\Pr(DTE_{it}=1|\mathbf{X}) = \beta_1 FDIS_{it-1} + \beta_2 FDIS_{it-1}* INEFF_{it-1} + \beta_3 FINS_{it-1} + \beta_4 SZ_{it-1} + \beta_5 AGE_{it-1} + \beta_6 CAPI_{it-1} + \beta_7 IMIG_{it-1} + \beta_8 PDA_{it-1} + \gamma_1 IND1_i + \ldots + \gamma_6 IND6_i + \Omega_1 FYD05_t + \ldots + \Omega_7 FYD11_t + \varepsilon_{it} \quad (2)$$

$$\varepsilon_{it} = \alpha_i + u_{it} \quad (3)$$

$\Pr(DTE_{it} = 1|\mathbf{X})$ denotes conditional probability that a firm will take DTE, given a vector of explanatory variables ($\mathbf{X}$). $\mathbf{X}$ includes observable time varying and time invariant vector of explanatory variables affecting DTE. To settle causality issues, we use one year lagged values of FDIS and firm-specific control variables. β_S, γs, and Ωs are coefficients associated with explanatory variables. α_i denotes firm-specific unobservable effects and u_{it} is a random error term. It is also assumed that $u_{it} \sim IN(0, \sigma^2_u)$. To marginalize the likelihood, it is assumed that, conditional on the $\mathbf{X}$, α_is are IN $(0, \sigma^2_\alpha)$ and independent of u_{it}s and X_{it}s. This implies that the correlation between two successive error terms for the same firm is a constant and given by,

$$\text{Corr}(\boldsymbol{\varepsilon}_{it}, \boldsymbol{\varepsilon}_{it-1}) = \rho = \sigma^2_\alpha / (1+ \sigma^2_u) \quad (4)$$

DTE_{it}, as a dummy variable, equals to 1 if a DF *i* exports at least 2 percent of its net sales in a firm year.

Greenaway et al. (2007) suggests that the sunk costs of entry into export market can be included in the DTE model in two ways. First, as sunk costs are unobservable, we could augment DTE equation with variable (s) measuring a firm's capacity to finance them. Second method is to add a time lagged DTE into the explanatory variable. We follow the first method and thereby do not include lag DTE as the proxy for capturing sunk cost of exporting. The reason is that, as pointed by Bernard and Jensen (2004), lagged dependent variable would be correlated with the error term and thereby produce biased estimate since the unobserved heterogeneity is potentially permanent or serially correlated. Besides, we find first method more appealing.

4.2 ***Explanatory Variables***

We divide explanatory variables into the following 4 categories, FDI spillover variables (ISF, TSF, CEF), firm-specific variables (FINS, INEFF, SZ, AGE, CAPI, IMIG, PDA), industry level dummy variables (IND) and year-specific dummy variables (FYD). The measurement and hypothetical relationship of each category of explanatory variables with DTE are explained in the following paragraphs.

FDI spillovers (FDIS)

In view of the discussions in Sections-2, we expect DTE to be positively related to ISF and TSF. However, the impact of CEF on DTE cannot be predicted on *a priori* basis. ISF is captured by FFs' share of export in an industry. TSF is approximated by the FFs' share of technological related expenditure in an industry. Technological expenditure is represented by the sum of a firm's expenses on R&D, training activities and royalty and technical fee payments for import of disembodied technologies. CEF is captured by FFs share of net sales in an industry. For the purpose of calculating shares of FFs in an industry, we classify sample firms into 12 groups of industries, namely Basic iron & steel (NIC241), Basic precious & non-ferrous metal (NIC242), Casting of metals (NIC243), Fabricated metals (NIC250), Computer, electronics & optical products (260), Misc. electrical equipment (NIC270), Electric motors, generators, turbines, distribution and control equipment (NIC271), Wiring and wiring devices (NIC273), General purpose machinery (NIC281), Special purpose machinery (NIC282), Automobiles: Two, three and 4-whelers (NIC290), Auto ancillaries and parts (NIC300). Shares of FFs in total technological expenditure, exports and net sales of each of these industries for each sample year are computed and presented in Appendix Table-4, Table-5 and Table-6.

Based on the discussions in the Section-2, we also expect that FDI linked export spillovers would vary across the DFs' inefficiency (or efficiency) levels. Therefore, we construct three interaction variables corresponding to each aspect of FDIS: ISF*INEFF, TSF*INEFF and CEF*INEFF. These

variables are included in the second equation of DTE. In equation 2, net effect of FDI spillovers on DTE would be given by $\beta_1 + \beta_2 \, INEFF_{it-1}$. The net effect of FDI spillovers on DTE will be smaller (or larger) than β_1 if the coefficient of interaction term (β_2) is negative (or positive). We predict that cost inefficient DFs would not benefit from FDI linked export spillovers.

Firm-specific characteristics

Financial soundness (FINS)

Undertaking export activity would involve extra costs for entering in the foreign markets. A large part of these extra costs are in the nature of sunk costs which often have to be paid up front. This requires availability of long-term fund with the firm. Moreover, as compared to domestic orders, firms take extra time to execute exports order and to collect payments after shipping. This necessitates access to fund-based working capital (pre-shipment and post-shipment credit) as well. Besides, export activity is prone to higher risk due to exchange rate fluctuations and selling to unfamiliar customers in the international market. To manage these risks, an exporter also requires non-fund based assistance in the form of forward contract and foreign letters of credit.

In view of these, a potential exporter should have adequate internal fund as well as the capacity to obtain fund-based as well as non-fund based credits from the banks and financial institutions. A firm's networth, being shareholders funds, acts as the most reliable source of finance. Besides, based on the strength of its networth a firm could also raise long-term and short term funds as well as non-fund based credit from the banking system. Indian banking industry considers a manufacturing firm to be non-support worthy if its financial leverage, a ratio of total outside liability to tangible networth, exceeds 3. Thus the financial soundness can be considered as one of the important characteristics relevant for taking DTE.

In recent years, some scholars [Muuls (2015) and Manova (2013)] have introduced indicators of financial strength into the influential model of heterogeneous firms and trade by Melitz (2003). In a recent survey of 32 empirical studies covering 14 countries using firm-level data, Wagner (2014) concludes that financially sound firms self-select into exporting but exporting does not improve financial condition of the firms. We measure financial soundness (FINS) of a firm by the ratio of networth to total liability of a firm. We expect DTE to be positively related to FINS.

Inefficiency (INEFF)

New-new theory of trade, as modeled by Melitz (2003) and summarized in WTO (2008, Section II-C, 3) predicts that more productive (compared to a benchmark) firms with their cost advantage are able to overcome sunk costs barriers and thereby self-select into export market. A large body of empirical literature accumulated over the years also supports this prediction in majority of the cases In this regard we may refer to the Wagner's (2007) literature survey and later research on the developing countries [viz. Sjoholm and Takii (2008) for Indonesia, Cole et al. (2010) for Thailand, Berman and Hericourt (2010) for 9 developing and emerging economies, Srinivasan and Archana (2011) for labour intensive Indian industries].

Following a study by Fung et al. (2008), which suggest that firms in emerging economies may enhance their exportability by saving on the cost of overhead, raw material and other intermediate inputs and increasing the productivity of workers in relation to their wages, we use a variable capturing cost inefficiency of firm rather than productivity. Cost inefficiency (INEFF) is approximated by the difference between the ratios of a domestic firm's cost of production to net sales to the industry's average cost of production to net sales. If INEFF is positive it would suggest that the firm is inefficient. On the other hand, negative value of INEFF would imply that the firm is efficient in the industry. Thus, DTE is expected to be negatively related to INEFF.

Firm's size (SZ)

SZ is measured by natural logarithmic value of net sales of a firm in a year. Since every unit of additional sales may not add significantly to the firm's resources, logarithmic value of net sales is taken to reduce degree of variability in size across firms. Besides, such a measure of size also helps in avoiding the problem of heteroskedasticity in the estimation of a regression equation. Hirsch and Adler (1974) points out that the larger firms are better equipped to bear the costs and risks involved in exporting, therefore, they would be more inclined to export than the smaller ones. Recent empirical studies on export spillovers find favourable effect of firm's size on DTE [Franco and Sasidharan (2010), Anwar and Nguyen (2011), Karpaty and Kneller (2011), Duran and Ryan (2014)]. Thus, DTE is expected to be positively related to SZ.

Firm's age (AGE)

AGE is measured by natural logarithm of firm's age (i.e. the difference between its year of presence in the sample and its year of incorporation). As every year of operation may not add significantly to the experience, we use natural logarithm of firm's age to reduce the variability. The longer period of operation in an industry may result in accumulation of information, knowledge and expertise required for sustaining competitive advantage. As a firm needs to learn additionally about overseas market before venturing into export, learning by doing or experience could be an important factor in taking DTE too. Thus, the effect of AGE on DTE is likely to be positive. Nevertheless, aging may also lead to rigidity in outlook due to path dependence nature of learning and plant vintage. Hence, the management of older firm may not be inclined to take DTE. A few recent studies using firm's age as a control variable in FDI spillovers studies report no impact of AGE on DTE [Franco and Sasidharan (2010), Nguyen and Sun (2012)]. We consider a firm's age to reflect its accumulated learning and experience and thereby expect AGE to favourably affect DTE.

Capital intensity (CAPI)

CAPI is measured as the ratio of a firm's gross fixed assets (GFA) to net sales. GFA includes original cost of land, mines, building, plant and machinery, equipment, furniture and fixtures, etc. acquired by a firm over the years. As GFA includes property, plant and equipment including information communication and technology (ICT) equipment, CAPI may reflect firm-specific knowledge embodied in plant, machinery and equipment. For this reason high level of CAPI in a firm would lead to higher productivity/technical efficiency (Keshari 2013), better product performance (viz. precision, finish and quality) and higher operational efficiency. Thus, we may expect a positive relationship between DTE and CAPI. Most of the recent studies, however, report negative relationship [Nguyen and Sun (2012)] or no relationship [Franco and Sasidharan (2010), Anwar and Nguyen (2011)]. Since the industries selected for the study are capital intensive in nature, capital deepening may provide competitive advantage to firms based in these industries. We thus expect the relationship between DTE and CAPI to be positive.

Intensity to import intermediate goods (IMIG)

IMIG is measured as the ratio of a firm's combined expenses on imports of raw material, components, spare parts and capital goods to net sales in a FY. Import of intermediate goods, including machinery and equipments, spare parts and components and raw materials, may improve the international competitive advantage of a firm for the following reasons: a) it may act as an additional source of productivity enhancing and material saving modern (embodied) technology to a firm; b) it may fulfill more exacting quality, finish and precision requirements of the final products to be exported to the international market; d) overseas suppliers may provide information about the new markets/buyers and promote linkages with foreign buyers in the mutual interest. Nguyen and Sun (2012) find DTE to be positively related to IMIG. We expect higher IMIG to improve the

competitiveness of a firm as well as offer export enabling foreign contacts and networks. Thus, IMIG is expected to be positively related to DTE.

Product differentiation advantage (PDA)

PDA may provide a firm capability to overcome sunk cost barrier to export since the major part of sunk cost is related to the marketing activities. A firm creates PDA by creating brands through advertisement and marketing efforts and building wider selling, distribution and servicing networks. Thus, PDA is measured by the ratio of a firm's expenditure on advertising, marketing, selling and distribution to sales turnover. Some empirical studies do report product quality and differentiation created through advertising and marketing or by other means to be important determinant of DTE [Keshari (2016), Srinivasan and Archana (2011), Bhavani and Tendulkar (2001), Bhat and Narayanan (2009) for India; Fung et al. (2008) for China, Cole et al. for Thailand (2010)]. Thus, we expect DTE to be positively related to PDA.

Industry level factors

Industry level factors may also influence DTE by DFs. We therefore need to control these factors to study the effects of spillover variables on DTE of DFs. The industry-specific characteristics may include degree of inward or outward orientation, level of market (seller) concentration, capital intensity and technology intensity, etc. To capture industry-specific influences, we categorize the sample firms into 7 industry groups corresponding to NIC-24, NIC-25, NIC-26, NIC-27, NIC28, NIC-29A and NIC-29B. A minimum 51 per cent of a firm's sales made up from an industry in a particular financial year are used as the norm for this classification. To control the effect of each industry, we use 6 additive dummy variables, IND1 for NIC-25, IND2 for NIC-26, IND3 for NIC-27, IND4 for NIC-28, IND5 for NIC-29A and IND6 for NIC-29B (each one with reference to NIC-24).

Time specific factors

Time related factors and events are captured by year-on year changes affecting DTE. The time related factors and events may include business cycles, supply and demand conditions and prices affecting exportability of a firm. We try to control these factors by including FY-specific dummy variables in the regression equation explaining DTE. For this purpose, we employ 7 year-specific dummy variables FYD05, ..., FYD11 corresponding to FY2004/5,…,FY2010/11. FY 2003/4 is taken as the reference year.

5. Data, Sample and Industry

For construction of variables for the study, major portion of the data and information is sourced from the PROWESS - an electronic database on information about the financial statements and various other aspects of Indian firms- designed by the Centre for Monitoring the Indian Economy (CMIE). Data sourced from the PROWESS was supplemented and sometimes cross checked by obtaining relevant information from additional sources and publications, namely *Bombay Stock Exchange Directory*, *Annual Reports* of some companies, *Capital Line Ole* (another electronic database) or conducting internet searches in the case of some doubts on the data. To create a sample of firms, we draw firm-level data from the seven divisions of NIC, 2008. After cleaning up the data, we include in the sample only those firms which has positive networth[5] and for which data on each of the relevant variables were available for at least 2 years of the 9 FYs of the study. These exclusions left us with a usable sample of unbalanced panel of 1445 firms with 9483 observations over the sample period FY2003/4-FY2011/12.

Appendix Table-1 presents the distribution of number of DFs and FFs over the FY 2003/4 to FY2011/12. Appendix Table- 2 & 3 gives average export intensities of all sample firms and DFs

[5] Firms with only positive networth were included in the sample for removing outlier effect. Besides, Indian companies sometimes manipulate the data for registering in the Board for Industrial Finance and Reconstruction (BIFR) for obtaining financial concessions from banks and financial institutions. The most important criterion for the registration in BIFR is that the peak networth should have been eroded in the last three years of operations of a firm.

respectively. Appendix Table- 4, 5, 6 respectively summarizes data on TSF, ESF and CEF over the industries and FY2003/4-FY2010/11. Appendix Table-7, summarizes the descriptive statistics for the sample of DFs which includes mean, standard deviation, minimum and maximum of each firm-specific explanatory variable used in the model. Appendix Table-8 presents correlation matrix pertaining to FDI spillover and firm-specific explanatory variables. The table shows that the CEF and ISF are highly correlated with correlation coefficient of more than 82 per cent. Therefore, CEF and ISF cannot be used together in the model.

6. Estimation Results

We estimate the models described in section 4.1 by using the maximum likelihood technique with the help of popular software STATA. The estimation results pertaining to equation 1 are presented in Table-1. The reported Wald test for overall significance of the estimated model indicates that taken together the coefficients of the regressors are significant. The estimation results with respect to spillover variables show that the coefficients of TSF and ISF are insignificant while the coefficient pertaining to CEF is significant and positive. Thus, we conclude that there exists no export spillover from the technological activity or information externality of FFs. These results suggest that FFs are able to protect their firm-specific assets effectively whether it is information about foreign market or their technological activity. However, significant and positive coefficient of CEF suggests that the entry and operations of FFs in domestic market have competition induced efficiency enhancing effects on DFs which in turn enables non-exporting DFs to participate in the export activity.

Table-1: Determinants of Decision to Export, FY 2003/4-2010/11

Exp. Var	Coef.	Z	Coef.	Z	Coef.	Z
ISF	0.06	0.17				
TSF			-11.02	-0.79		
CEF					1.49	2.66*
FINS	0.70	2.32*	0.69	2.29*	0.67	2.22*
INEFF	-1.66	-2.93*	-1.65	-2.91*	-1.71	-3.04*

SZ	0.57	8.79*	0.57	8.78*	0.57	8.96*
AGE	0.54	3.55*	0.54	3.56*	0.53	3.55*
CAPI	0.35	3.32*	0.35	3.32*	0.34	3.24*
IMIG	0.72	3.36*	0.72	3.34*	0.72	3.35*
PDA	8.38	5.41*	8.36	5.40*	8.13	5.29*
IND1	1.27	3.10*	1.27	3.13*	1.44	3.60*
IND2	2.53	4.38*	2.74	4.45*	1.98	3.35*
IND3	0.90	2.03**	0.94	2.13*	0.49	1.08
IND4	1.82	4.17*	1.90	4.36*	1.25	2.67*
IND5	0.10	0.10	0.36	0.36	-0.43	-0.44
IND6	1.24	2.87*	1.33	3.04*	0.84	1.90
FY05	0.02	0.13	0.02	0.15	-0.03	-0.22
FY06	-0.06	-0.46	-0.06	-0.49	-0.12	-0.93
FY07	0.12	0.79	0.12	0.90	0.01	0.07
FY08	-0.12	-0.79	-0.11	-0.79	-0.25	-1.70
FY09	0.01	0.09	0.04	0.28	-0.07	-0.49
FY10	-0.38	-2.26*	-0.35	-2.14*	-0.51	-3.03*
FY11	-0.52	-2.66*	-0.49	-2.65*	-0.72	-3.59*
Constant	-6.35	11.78*	-6.32	-11.99*	-6.64	-12.39*
Observations	5905	5905	5905	5905	5905	5905
Groups	1123	1123	1123	1123	1123	1123
Loglikelihood	-2090.9		-2090.6		-2087.4	
Wald Chi sqr (21)	268.8*		269.2*		277.5*	
Rho	0.91		0.91		0.91	
Chi bar sqr (1)	2956.4*		2968.1*		2926.8*	

The coefficients of firm-specific variables, FINS, SZ, AGE, CAPI, IMIG and PDA turn out to positive and significant. This indicates that DFs with greater financial strength, larger in size, higher capital and import intensity and more years of experience in business have greater likelihood to export. Coefficients of INEFF and PDA turn out to be negative and positive respectively. These results imply that DFs having competitive advantage in terms of cost efficiency as well as product differentiation would also have greater probability to export. Thus, the results of this study show that heterogeneity in firm-specific characteristics has important influence on DTE of DFs.

We now turn to testing the hypothesis that FDI linked export spillovers- through their 3 channels- varies across DFs with different levels of cost inefficiencies (efficiencies). For this purpose,

we estimate the equation-2 involving interaction variables and present the results of testing this hypothesis in Table-2.

Table-2: Determinants of Decision to Export, FY 2003/4-2010/11

Exp. Var	Coef.	Z	Coef.	Z	Coef	Z
ISF	0.15	0.39	-	-	-	-
TSF	-	-	-14.27	-1.01	-	-
CEF	-	-	-	-	1.61	2.82*
ISF*INEFF	-2.65	-2.66*	-	-	-	-
TSF*INEFF	-	-	-102.16	-1.50	-	-
CEF*INEFF	-	-	-	-	-3.01	-2.46*
FINS	0.71	2.36**	0.79	2.61*	0.70	2.32**
SZ	0.57	8.78*	0.58	8.81*	0.58	8.92*
AGE	0.54	3.55*	0.55	3.56*	0.54	3.58*
CAPI	0.37	3.44*	0.38	3.55*	0.36	3.40*
IMIG	0.72	3.35*	0.71	3.27*	0.72	3.34*
PDA	8.57	5.55*	9.05	5.88*	8.35	5.42*
IND1	1.33	3.21*	1.43	3.46*	1.54	3.82*
IND2	2.56	4.41*	2.98	4.82*	2.05	3.43*
IND3	0.93	2.09**	1.06	2.35**	0.57	1.23
IND4	1.85	4.22*	2.11	4.78*	1.31	2.78*
IND5	0.12	0.12	0.53	0.52	-0.36	-0.37
IND6	1.28	2.93*	1.51	3.37*	0.92	2.05**
FY05	0.04	0.34	0.00	0.04	-0.02	-0.19
FY06	-0.04	-0.30	-0.06	-0.49	-0.11	-0.87
FY07	0.14	0.96	0.11	0.86	0.02	0.14
FY08	-0.10	-0.64	-0.10	-0.76	-0.23	-1.58
FY09	0.04	0.27	0.06	0.44	-0.05	-0.37
FY10	-0.36	-2.14**	-0.33	-2.00**	-0.49	-2.93*
FY11	-0.50	-2.56*	-0.48	-2.59*	-0.71	-3.53*
Constant	-6.50	-12.21*	-6.65	12.82*	-6.86	12.98*
Observations	5905	5905	5905		5905	
Groups	1123	1123	1123		1123	
Log likelihood	-2091.7		-2093.7		-2088.9	
Wald Chi sqr (21)	266.7		259.9		272.9	
Rho	0.91		0.92		0.91	
Chi bar sqr (1)	2971.3*		3005.6*		2942.6*	

To find evidence on heterogeneity in FDI linked export spillovers, we compute marginal impact of three channels of foreign presence as follows:

$\frac{\partial DTE}{\partial ISF}$ = 0.15 – 2.65 INEFF; $\frac{\partial DTE}{\partial TSF}$ = -14.27 – 102.16 INEFF; $\frac{\partial DTE}{\partial CEF}$ = -1.61-3.01INEFF

The marginal impact equations show that heterogeneity in cost inefficiency of DFs does impact FDI linked export spillovers. Table-2 shows that the coefficients of ISF*INEFF is negative and significant. When ISF is used without interaction with INEFF, it is not found important in providing export spillovers to DFs. Combining both the finding, we can probably say that only cost efficient DFs are able to take advantage of export related information externalities and thereby decide to export. Coefficient of CEF is positive and significant while the coefficient of CEF*INEFF is negative and significant which shows that competition effects generated by FFs is helping efficient DFs in taking DTE. However, the coefficient of TSF as well as interaction variable TSF*INEFF turns out to be insignificant. This shows that the technological spillovers from FDI have no role to play in DTE of DFs, irrespective of their efficiency levels. The coefficients of firm-specific variables have same signs as in the Table-1.

7. Conclusions

In sum, our study offers evidence on FDI linked export spillovers, mainly through competition effects. It also shows that efficient domestic firms benefit more from competition effect than the less efficient ones. In the case of export related informational externalities generated by FDI, the study indicates that only efficient domestic firms could benefit but not all. Besides, the study also reports strong evidence on firm-specific characteristics such as efficiency, firm size, age, financial soundness, intensity to import of intermediate goods, capital intensity and product differentiation advantage to be the important determinants of decision to export by domestic firms.

Appendix

Table-1: Distribution of number of DFs and FFs, FY2003/4-FY2010/11

Type of Firm	2004	2005	2006	2007	2008	2009	2010	2011	2012	Total Obs.
DFs	689	801	865	905	908	862	530	358	350	6268
FFs	350	360	376	377	376	371	357	328	320	3215
Grand Total	**1039**	**1161**	**1241**	**1282**	**1284**	**1233**	**887**	**686**	**670**	**9483**

Table-2: Industry wise and year-wise distribution of export intensities of all firms (per cent)

Industry	2004	2005	2006	2007	2008	2009	2010	2011	Average
241	6.63	6.56	6.63	6.88	7.38	7.63	7.74	8.26	7.13
242	7.82	7.18	9.10	10.70	11.64	12.61	9.66	9.98	10.00
243	15.43	17.65	16.69	15.36	16.62	17.76	16.84	22.40	17.11
250	12.09	12.10	11.91	12.48	13.16	15.03	12.08	13.47	12.80
260	21.71	20.69	21.97	22.52	20.64	21.01	19.09	24.60	21.43
270	10.14	10.01	6.56	6.17	7.19	12.54	11.40	10.08	9.05
271	11.91	10.43	12.83	13.38	13.48	14.24	9.30	13.43	12.45
273	5.92	5.88	5.44	5.86	6.79	10.21	7.09	6.87	6.68
281	15.61	14.31	16.47	16.63	17.84	20.45	17.12	14.83	16.77
282	12.89	15.71	14.06	12.94	11.58	12.96	10.37	9.45	12.73
290	4.17	4.57	4.82	4.22	5.55	9.53	6.93	7.50	5.91
300	8.94	10.30	10.21	11.04	11.49	12.88	10.19	11.33	10.80
Average	**11.13**	**11.48**	**11.38**	**11.56**	**11.85**	**13.20**	**11.18**	**12.56**	**11.78**

Table-3: Industry wise and year-wise distribution of export intensities of DFs (per cent)

Industry	2004	2005	2006	2007	2008	2009	2010	2011	Average
241	5.53	5.22	5.20	5.55	6.27	6.54	6.34	6.71	5.85
242	6.79	6.07	7.97	9.70	10.00	11.30	8.40	8.48	8.77
243	13.61	15.11	14.12	13.67	14.77	16.08	13.76	17.98	14.79
250	11.79	11.51	11.56	12.05	12.41	14.28	12.42	13.97	12.43
260	21.31	19.94	23.95	22.38	18.97	18.37	10.79	14.12	19.73
270	15.17	12.49	8.41	8.26	8.54	12.75	23.21	15.48	11.67
271	12.94	9.17	12.58	12.18	12.44	12.05	8.94	20.74	12.10
273	3.94	7.05	8.87	8.01	7.24	15.22	9.37	9.34	8.26
281	16.32	13.53	15.31	16.17	17.21	21.07	17.79	6.70	16.47
282	9.63	16.00	12.02	9.86	8.57	9.89	6.99	3.36	10.37
290	2.26	2.06	3.08	1.72	4.49	6.75	5.56	7.27	4.44
300	8.68	10.09	9.48	10.73	10.94	12.33	9.83	10.55	10.33
Average	**9.95**	**10.26**	**10.12**	**10.23**	**10.45**	**11.63**	**9.80**	**11.05**	**10.43**

Table-4: Distribution of TSF, FY2003/4-FY2010/11

Industry	2004	2005	2006	2007	2008	2009	2010	2011	Average
241	0.16	0.20	0.15	0.22	0.15	0.14	0.15	0.12	0.15
242	0.14	0.09	0.12	0.13	0.06	0.28	0.11	0.06	0.12
243	0.12	0.03	0.61	0.48	0.11	0.43	0.52	0.04	0.36
250	0.26	0.07	0.09	0.05	0.20	0.64	0.48	0.24	0.35
260	0.60	0.78	0.58	0.54	0.78	0.78	0.89	0.86	0.78
270	0.56	0.70	0.61	0.64	0.68	0.79	0.86	0.84	0.74
271	0.64	0.35	0.35	0.38	0.32	0.28	0.26	0.27	0.30
273	0.51	0.43	0.48	0.86	0.85	0.96	0.95	1.00	0.86
281	0.76	0.76	0.87	0.77	0.87	0.87	0.78	0.91	0.84
282	0.72	0.68	0.70	0.76	0.78	0.73	0.82	0.98	0.80
290	0.97	0.93	0.93	0.88	0.83	0.88	0.85	0.81	0.85
300	0.53	0.56	0.55	0.53	0.53	0.52	0.53	0.74	0.57
Average	0.60	0.64	0.60	0.55	0.58	0.60	0.58	0.61	0.59

Table-5: Distribution of ISF, FY2003/4-FY2010/11

FY	2004	2005	2006	2007	2008	2009	2010	2011	Average
241	0.20	0.51	0.42	0.54	0.46	0.48	0.47	0.53	0.47
242	0.49	0.61	0.69	0.62	0.69	0.64	0.67	0.68	0.65
243	0.26	0.34	0.59	0.62	0.69	0.55	0.73	0.64	0.61
250	0.11	0.12	0.14	0.49	0.55	0.18	0.20	0.23	0.27
260	0.74	0.71	0.77	0.72	0.68	0.68	0.74	0.78	0.77
270	0.43	0.38	0.42	0.36	0.39	0.54	0.41	0.51	0.44
271	0.62	0.64	0.76	0.81	0.85	0.73	0.66	0.70	0.74
273	0.68	0.70	0.61	0.72	0.81	0.68	0.78	0.80	0.77
281	0.57	0.67	0.77	0.69	0.65	0.66	0.73	0.75	0.71
282	0.80	0.66	0.62	0.71	0.69	0.66	0.80	0.82	0.73
290	0.74	0.76	0.69	0.67	0.59	0.71	0.75	0.64	0.69
300	0.65	0.64	0.67	0.65	0.67	0.63	0.65	0.78	0.67
Average	0.47	0.57	0.59	0.63	0.62	0.59	0.64	0.65	0.61

Table-6: Distribution of CEF, FY2003/4-FY2010/11

FY	2004	2005	2006	2007	2008	2009	2010	2011	Average
241	0.12	0.22	0.20	0.26	0.28	0.25	0.31	0.34	0.26
242	0.48	0.57	0.56	0.54	0.56	0.57	0.59	0.61	0.57
243	0.14	0.24	0.41	0.54	0.55	0.50	0.62	0.46	0.48
250	0.14	0.12	0.19	0.27	0.31	0.20	0.19	0.30	0.24
260	0.72	0.72	0.72	0.66	0.65	0.60	0.72	0.75	0.68
270	0.71	0.69	0.64	0.64	0.68	0.71	0.76	0.78	0.71
271	0.45	0.48	0.49	0.51	0.53	0.50	0.46	0.49	0.49
273	0.67	0.62	0.64	0.63	0.66	0.68	0.68	0.73	0.71
281	0.74	0.72	0.75	0.74	0.75	0.78	0.80	0.85	0.78
282	0.73	0.68	0.63	0.66	0.65	0.65	0.71	0.75	0.71
290	0.75	0.74	0.74	0.70	0.67	0.69	0.67	0.64	0.69
300	0.59	0.59	0.57	0.56	0.56	0.56	0.58	0.72	0.59
Average	0.45	0.47	0.48	0.50	0.50	0.48	0.52	0.55	0.50

Table-7: Descriptive Statistics of variables

Variable	SD	Mean	Std. Dev.	Min	Max
DTE	overall	0.4410	0.4965	0.0000	1.0000
	between		0.4422	0.0000	1.0000
	within		0.2274	-0.4340	1.3160
FS	overall	0.4078	0.2066	0.0028	2.1783
	between		0.1908	0.0202	1.6728
	within		0.0914	-0.2611	1.1726
ISF	overall	0.5362	0.1829	0.1100	0.8482
	between		0.1579	0.1150	0.8068
	within		0.0958	0.2466	0.8599
TSF	overall	0.0050	0.0055	0.0001	0.0452
	between		0.0053	0.0004	0.0364
	within		0.0024	-0.0142	0.0272
CEF	overall	0.4348	0.2009	0.1121	0.8500
	between		0.1936	0.1226	0.7947
	within		0.0588	0.1511	0.6388
FINS	overall	0.4078	0.2066	0.0028	2.1783
	between		0.1908	0.0202	1.6728
	within		0.0914	-0.2611	1.1726
INEFF	overall	0.0519	0.1288	-0.5616	0.5505
	between		0.1199	-0.5580	0.3792
	within		0.0490	-0.2365	0.4747

ISF*INEFF	overall	0.0244	0.0713	-0.3645	0.3563
	between		0.0656	-0.3108	0.2446
	within		0.0296	-0.1322	0.3050
TSF*INEFF	overall	0.0001	0.0009	-0.0124	0.0113
	between		0.0008	-0.0059	0.0077
	within		0.0005	-0.0064	0.0086
CEF*INEFF	overall	0.0157	0.0580	-0.3085	0.3515
	between		0.0538	-0.2734	0.2613
	within		0.0232	-0.1301	0.2922
SZ	overall	4.3377	1.5696	0.6981	10.8397
	between		1.4812	0.8109	10.5525
	within		0.4704	0.7388	6.7920
AGE	overall	2.9383	0.6975	0.0000	4.7005
	between		0.7239	0.3466	4.6679
	within		0.1485	0.6281	3.6663
CAPI	overall	0.4568	0.5895	0.0061	9.3618
	between		0.6179	0.0112	7.6602
	within		0.2880	-3.6542	7.3243
IMIG	overall	0.0963	0.1904	0.0000	6.7974
	between		0.1547	0.0000	1.9022
	within		0.1218	-1.5730	4.9916
PDA	overall	0.0367	0.0454	0.0000	0.4540
	between		0.0421	0.0000	0.3671
	within		0.0189	-0.1384	0.3308

Table-8: Correlation Matrix

	ISF	TSF	CEF	FINS	INEFF	ISF* INEFF	TSF* INEFF	CEF* INEFF	SZ	AGE	CAPI	IMIG	PDA
ISF	1.00												
TSF	0.41	1.00											
CEF	0.82	0.51	1.00										
FINS	0.10	0.11	0.13	1.00									
INEFF	-0.14	-0.23	-0.26	-0.27	1.00								
ISF* INEFF	-0.06	-0.21	-0.18	-0.27	0.95	1.00							
TSF* INEFF	-0.07	-0.16	-0.10	-0.21	0.64	0.71	1.00						
CEF* INEFF	-0.04	-0.17	-0.08	-0.27	0.89	0.96	0.75	1.00					
SZ	0.01	-0.05	-0.08	-0.03	0.04	0.04	0.08	0.03	1.00				
AGE	0.05	-0.03	0.06	0.00	-0.08	-0.06	-0.04	-0.05	0.12	1.00			
CAPI	0.03	0.11	0.04	0.17	-0.24	-0.22	-0.12	-0.19	-0.20	-0.09	1.00		
IMIG	0.10	0.10	0.11	0.03	-0.01	0.00	0.01	0.02	0.11	-0.10	0.15	1.00	
PDA	0.09	0.15	0.20	0.01	-0.33	-0.29	-0.15	-0.25	-0.05	0.11	0.05	0.04	1.00

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