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FDI and Firm Level Export Competitiveness in the Indian Machinery Industry

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Abstract

The paper examines the effect of FDI on firm-level export competitiveness by comparing the export behaviour of foreign controlled and domestic firms in Indian machinery industry. It defines the firm-level export competitiveness involving two aspects of export behaviour: i) the export itself or a firm's decision to export and ii) the exporting firm's decision on the portion of output to export (export intensity). Findings of the study reveals that the foreign controlled firms have greater likelihood of exporting, even after controlling for the large number of additional factors influencing export activity. However, the export intensity of exporting firms is not affected by FDI but affected favourably by a host of other firm-specific factors such as arms length import of disembodied technology, import of raw material and capital goods, use of labour intensive technology, larger size and years of experience.

Keywords: FDI, Export Competitiveness, Indian Machinery Industry

Introduction

A firm's engagement in export activity enlarges its market base and thereby provides benefits of economies of scale and scope, and enables it to earn foreign exchange that supports its own import bill besides contributing to the foreign exchange reserves of the country.[1] Further, the export activity exposes a firm to the more competitive international market (compared to the domestic market) and helps it in acquiring better market intelligence and contacts, managerial and marketing skills (i.e. learning by exporting), efficiency and thereby an overall competitive advantage. Furthermore, the export enables a firm's participation in the global value chain (GVC), which helps the firm in upgrading its innovatory and technological capability, adopting higher value adding activities and application of its competence acquired in a particular function to move into a new segment (Humphrey and Schmitz 2000).

Despite the various advantages of engagements in exports, a firm cannot easily acquire export competitiveness, i.e., enter into the exports market due to the existence of several barriers to entry (viz. sunk and transaction cost barriers[2]) and an exporting firm cannot increase its export-sales ratio (export intensity) significantly due to intense competition in the international market. As a firm's entry

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[1] Earlier literature on exports emphasized mainly on foreign exchange earning role of exporting firms in the developing countries normally having shortage of foreign exchange.

[2] Sunk costs of exporting includes a variety of costs such as those related to market intelligence and research, setting up of new distribution channel, developing marketing network and contacts, acquiring skills for dealing in international market, modifying the existing products as per the requirement of overseas buyers, after-sales servicing, etc. These costs are called sunk costs because these are in the nature of a fixed cost and cannot be recovered once incurred whether a firm undertakes export or not.

into export market proves its ability to overcome barriers to entry, the firm's engagement in export activity itself is indicative of its competitive advantage over non-exporters. Besides, among the firms, which have entered into the international market, if a firm is able to achieve higher export intensity than others in the industry, it may be considered as having competitive advantage over others. Thus, the study defines firm-level export competitiveness by incorporating both these aspects of export behaviour.

There is a large amount of literature suggesting that the foreign multinational enterprises (MNEs), the major vehicle of inward foreign direct investment (henceforth FDI), have made significant contribution to a select group of host developing economies (China, Malaysia, Singapore, Chile, Hungary, Poland, Czech Republic) in building export capabilities in their manufacturing sector, including the medium and high technology industries (UNCTAD 2002). In Singapore, South Korea, Taiwan and China, MNEs have also provided the requisite expertise to set up advanced manufacturing and design and development centres which have allowed them to export a wide range of medium and high technology capital goods (EXIM Bank 2008). Ever since the initiation of economic reforms in the year 1991, the Indian Government has been making its FDI policy regime increasingly attractive, notably, allowing FDI with majority foreign equity holding in the manufacturing sector including Indian machinery industry (IMI). Of late, the Indian government has been permitting 100 per cent foreign equity participation in most of industries of manufacturing sector under automatic route (GoI 2008). India has become one of the few most attractive destinations in the world for FDI in the recent years (Global Business Policy Council 2008). By its very nature, FDI constitutes critical 'resources and capabilities' including financial capital, technology, marketing and managerial skills, international networks and contacts needed for achieving competitive advantage (Dunning 2000). These resources may enable a firm in enhancing its productivity and overcoming the barriers to entry into exports as well as in improving the export intensity of exporting firms. However, the empirical studies in India have primarily focused on a firm's export intensity aspect (refer to Section-4 of this paper).

A firm's engagement in export activity is indicative of its competitive advantage over non-exporting firms in an industry. Besides, an exporting firm achieves competitive advantage if it is able to attain higher export intensity than others in the industry

In an inward looking high/medium technology industry like Indian Machinery Industry (IMI) in which a large number of firms do not export due to several barriers to exports, one of the major challenge to policy makers and stakeholders of industry lies in converting the non-exporter firms into exporters. Keeping this in view, the present study focuses on the examination of the role of FDI in imparting both aspects of export competitiveness at firm-level in IMI. For this purpose, the study divides firms in IMI into two groups: i) firms with FDI participation as foreign controlled firms (FCFs), each one holding at least 26 per cent of equity from a foreign promoter, ii) firms without FDI as domestic firms (DFs), each firm holding less than 26 per cent of equity from a foreign promoter. Thereafter, it compares the export behaviour of FCFs and DFs in a multiple regression framework with a view to find out whether the former group has export competitiveness over the latter. In case the study finds FCFs to be better than that of DFs in terms of export competitiveness, the role of FDI in IMI could be considered as export promoting.

There exists considerable heterogeneity across industries in the manufacturing sector on account of their differing product profiles, levels of product differentiation, industry specific policies, tax and tariff rates, levels of backward and forward integration, capital intensity, levels of technological capabilities, nature and extent of FDI, export orientations, etc. As the heterogeneous nature of industries variously affects prospects of exports and FDI therein, the study selects a single industry IMI to reduce heterogeneity across industries in the manufacturing sector. Besides, the selection of single industry also reduces endogeneity problem. For example, if FCFs are concentrated in more export oriented industries in a group of industries, the analysis will show FCFs'export behaviour to be better than DFs.

As far as appropriate model and methodology for comparing the export behaviour of FCFs and DFs is concerned, the recent empirical studies seem to suggest the application of a sample selection model of firm-level export behaviour, which could take care of both aspects of export behaviour of a firm simultaneously in a single framework, to be more appropriate (refer to Section-4 of this paper). Hence, the paper estimates a sample selection regression model of export behaviour with the help of a pooled dataset for the seven years period between 2000/01 to 2006/07.[3] By incorporating several explanatory variables in this model, the study also tries to control intra-industry heterogeneity and endogeneity arising out of firm-specific factors and sub-industry level factors possibly influencing firm-level export behaviour.

The layout of the rest of this paper is as follows: Section-2 explains the definition, characteristics, status of IMI and reasons for its selection. Section-3 discusses analytical framework linking FDI with firm-level export behaviour in an industry. Section-4 reviews the empirical literature on

[3] Estimation procedures and software for sample selection panel data models are not yet developed.

the export behaviour of FCFs and DFs and explains the methodological issues involved in empirical examination of firm level export behaviour. Section-5 explains the model, variables and hypotheses relating export behaviour to its various determinants and method of estimation. Section-6 presents the analysis of sample characteristics by mainly applying statistical tools. Section-7 presents and discusses the results obtained from the econometric estimation. Section-8 presents the conclusions of the paper.

Indian Machinery Industry-The Focus of Study

In this study, IMI comprises three groups of industries categorized at three digit level of *National Industrial Classification: All Economic Activities-2008 (NIC-2008)*. These groups are manufacture of electric motors, generators, transformers and electricity distribution and control apparatus (group 271), manufacture of general-purpose machinery (group 281) and manufacture of special purpose machinery (group 282). The major reasons for the selection and status of IMI are the following:

a) Being a machinery producing industry, IMI is considered an important source of innovations and higher value addition. Firms in this industry generally have potential for earning higher profit margins and for better growth prospects as compared to the firms based in the mature low-technology industries, in which intense competition has shrunk margins and lowered growth prospects. Being a technology and skill intensive industry, it could also generate significant intra-industry and inter-industry knowledge spillovers and beneficial linkages.

b) IMI is relatively under-studied, especially in terms of micro level impact of FDI on its export behaviour. Besides, there exists no firm-level study to the best of my knowledge that employs a sample of panel data for the recent period and uses simultaneous examination of the both aspects of comparative export behaviour of DFs and FCFs in the IMI.

c) IMI has high potential to receive much larger amount of FDI as it has received lower level of FDI compared to the other medium/high-tech industries (viz. transport equipment) in the post-reform period.[4] Besides, the share of exports constituted only about 10 per cent in the aggregate market size of IMI, while the share of imports reached to 40 per cent in the year 2006/07.[5] Typically, a large number of firms in the IMI remain oriented towards the domestic market. Thus, it is worth examining whether the higher participation of FDI could improve the export engagement of these firms.

d) Traditionally, USA, Germany and Japan have been the largest suppliers of machineries. Of late, Asian countries such as China, South Korea and Taiwan are also emerging as the important players in the production and export of machineries. Consumption of machineries has also increased substantially in the developing Asian countries due to their thrust on the value-added manufacturing. The shifting base of machinery and equipment production from the developed to developing countries is also providing major opportunities of production and exports from technologically advanced countries of the developing economies like China, India, South Korea, etc. The countries like China and South Korea respectively share 7 per cent and 4 per cent in the world's total production of machineries. However, India's share in world's total production machineries is still insignificant 1.4 per cent, indicating ample scope for expansion in its market share. (EXIM Bank, 2008).

One of the major challenges to policy makers and stakeholders of industry lies in converting the non-exporter firms into exporters.

f) To achieve international competitiveness in a medium and high technology industry like IMI, particularly in its higher segment, a firm requires to: i) have product design and engineering (precision measuring, material engineering and process control) capabilities, ii) maintain high quality standards including good finish of the product and iii) incur high capital expenditure for setting up business and sunk and transaction cost associated with exporting and servicing its overseas client (Lall 2000b, EXIM Bank 2008, CII 2007). Thus, FDI through MNEs could contribute in this industry in a better way by offering latest technology, management and marketing expertise, international business contacts and market intelligence; all of which may eventually lead to better efficiency and higher exports.

MNEs and Export Behaviour- Analytical Framework

Several scholars [e.g. Roberts and Tybout (1997), Clerides *et al.* (1998), Melitz (2003) and Bernard and Jensen (2004)] have modeled the decision to export by rational, profit-maximizing firm facing sunk costs barriers to entry. This literature highlights that: a) all firms do not export in an industry mainly due to the sunk cost barriers to entry

[4] Data on cumulative inflow of FDI in India during August 1991 to July 2007 show that: i) the share of manufacturing sector constituted about 56 per cent of cumulative inflow of FDI of about Rs. 2150 million (or USD 50.4 billion) in the country; ii) within the manufacturing sector electrical and electronic equipments (including computer software) received the highest amount with the share of about 30 per cent, followed by transport equipment industry with the share of 14 per cent, chemicals and fertilizers industry with the share of 9 per cent and machineries with the share of only 6 per cent (GoI, 2008).

[5] Calculated from the data given in Industry Market Size and Shares, April 2008, CMIE

associated with the export market; b) the expected profit of more productive (or efficient), less financially constrained and larger firms will be high enough to cover sunk cost and such firms would be able to survive in the highly competitive international market; c) more productive, larger and financially sound firms self select into the export market (Greenaway *et al.* 2007).

Since MNEs are generally more productive, larger and financially sound, we may extend this literature by distinguishing two groups of firms, FCFs and DFs, in an industry. We argue here that FCFs' relative advantage over DFs in the following areas leads to better export behaviour for the former group. First of all, FCFs may achieve higher efficiency/productivity than DFs on account of: i) the former's superior technological capabilities, which partly emanates from their access to superior technology (viz. product as well as process technologies) from their MNEs networks and partly from adapting (i.e. using and mastering) and combining the technology to the locational advantages of a host nation; ii) the sharing of the techno-managerial expertise available within the MNEs network that may enable the implementation of learning process and better skill formation in FCFs based in an industry (Dunning 2000). Secondly, FCFs, being part of MNE system, have access to superior marketing expertise, market intelligence and information, business contacts and brand equity for setting up export base in a new country as well as have easy access to internal finance, marketing and distribution channel of MNE system (UNCTAD 2002, Blomström and Kokko1998).

Firms in machinery industry generally have potential for earning higher profit margins and for better growth prospects as compared to the firms based in the mature low-technology industries

On the contrary, DFs with their limited presence in international market, lower level of technological and marketing expertise and lower financial capability may find it difficult to cover sunk, transaction and coordination costs involved in integration to overseas customers and market for high technology goods. Even after entering into export market, DFs may not be able to export as much as their counterpart FCFs at least for the lack of opportunities for intra-firm trade. In sum, the FCFs' productivity advantage with its effect on cost reduction in combination with marketing skills, advantages and access are expected to result in better export behaviour for this group as compared to the group of DFs. We now turn over to the discussions on the empirical literature on export behaviour of FCFs against DFs.

Empirical Literature and Methodological Issues

In terms of use of various models and corresponding econometric methods, the recent empirical studies examining the impact of foreign ownership on the firm level export behaviour can be categorized mainly into three groups. The first category of studies defines export behaviour by export intensity (export to sales ratio) of a firm. These studies employ and estimate Tobit model since the values of export intensity may vary between zeros to one. A large number of studies in developing countries, notably the Indian studies, have employed Tobit models of export behaviour. The studies pertaining to the countries other than India report FCFs to be more export intensive than DFs [e.g. Rasiah (2004) for electronics exporting firms in Malaysia, Philippines and Thailand; Rasiah and Gachino (2005) for textiles and garments, food and beverages and metal engineering firms in Kenya; Chudnovsky and Lopez (2004) for MERCOSUR countries; Rasiah and Malakolunthu (2009) for electronics firms in Malaysia]. Indian studies, however, have come out with the mixed results. Aggarwal's (2002) firm-level study pertaining to the late 1990s provides weak support for the hypothesis that FCFs perform better than DFs. In the case of Indian information technology, Siddharthan and Nollen (2004) report that the export intensity of FCFs (compared to DFs) is greater when they have higher level of foreign equity stake since the transfers of tacit knowledge and other complementary advantages associated with FDI may take place at higher level of contol. Employing a cross-section spline regression method, Chhibber and Majumdar (2005) conclude that when property rights devolve unequivocally to foreign owners (i.e. with majority ownership of equity), the firms display higher export orientation. Bhaduri and Ray's (2004) firm-level study provides *weak evidence* on FCFs to be more successful in exporting than DFs in the Indian pharmaceutical industry and *no significant evidence* in the case of electrical/electronic industry.

The second group of studies examines the effect of foreign ownership independently on the export propensity of manufacturing firms by employing probit/logit models and/or on export intensity by estimating a linear regression model by ordinary least square method. In the case of Indian manufacturing sector during pre reform period, Hasan and Raturi (2003) find that the export propensity is significantly higher in the case of FCFs (compared to DFs) in low-tech scientific industry and high-tech non-scientific industry; but report no difference in the export intensity of FCFs and DFs. In a study of clothing manufacturing firms in China and Sri Lanka, Wignaraja (2008) estimated a probit model for exploring the determinants of propensity to export. The econometric results indicate that foreign ownership, index of acquisition of technological capability and learning from buyers are positively and significantly related with probability of exporting. Fung *et al.* (2008) find that the FCFs have higher propensity as well as intensity to export in comparison to DFs in the Chinese manufacturing sector. Sjöholm and Takii (2008) in the Indonesian manufacturing sector concludes that the plants with foreign ownership are substantially more likely to

export than domestically owned plants even after controlling for various other plant characteristics. Using OLS method, Rasiah and Kumar (2008) report FCFs to be better than DFs in terms of export intensity in automotive parts industry. Employing a structural equation modeling (SEM) based partial least square (PLS) methodology, Ray and Venaik (2008) concludes that the FCFs contribute less in terms of export intensities than DFs in the selected Indian industries.

The third category employs sample selection models due to Heckman (1979) and Lee and Maddala (1985). These models consider export activity comprises two types of decisions on the part of a firm- a decision to export or not and what portion of output to export. Accordingly the model estimates two simultaneous equations. One for decision to export (probit model) and another for export intensity of exporting firms (linear regression). The sample selection model also addresses the limitations of Tobit model in the following manner: a) it employs two different set of explanatory variables to determine the probability of exporting and export intensity; b) it allows for greater theoretical development because observations are said to be censored by some other variable" (Correa *et al.* 2007, p. 14). While examining the firm-level determinants of export behaviour in the Indian basic chemical industry with the help of a sample of pooled data for a period 2001 to 2007, Bhat and Narayanan (2009) have concluded that export behaviour of the firms can be modeled in a more appropriate manner by using a sample selection model [or a two-part probit plus truncation or Crag (1971) model] rather than by the Tobit model.

In the case of developing country, Athukorala *et al.* (1995) for the first time estimated a sample selection model for determining the contribution of MNEs in influencing both the aspects of export behaviour. This study reports that the MNE affiliation in the case of Sri Lankan firms had no significant influence on export intensity but it impacts favourably the decision to export while controlling for other factors influencing export behaviour such as firm-size, capital intensity, etc. While identifying supply-side constraints to export performance in Ecuador, a working paper by Correa et al (2007) also examines the effect of foreign ownership on export propensity and intensity by estimating a Heckman selection model. The results of the study confirm that the foreign ownership acts as a significant positive determinant of export propensity as well as export intensity along with other firm specific variables (e.g. size, import of input, in house R & D) while controlling for industry specific effects.

The study uses most appropriate sample selection model which takes care of both aspects of export behaviour, export propensity as well as export intensity, simultaneously in a single framework.

In sum, irrespective of the models and estimation method of export behaviour used, the recent studies in developing countries other than India overwhelmingly indicate FCFs to be more export oriented than DFs in the manufacturing sectors of the respective developing countries.

Empirical Model, Variables and Hypotheses

The recent empirical studies on determinants of export behaviour have emphasized the use of sample selection models [e.g. Greenaway *et al.* (2004), Correa *et al.* (2007), Kneller and Pissu (2007), Bhat and Narayanan (2009)]. We therefore use sample selection model developed by Heckman (1979).

The Empirical Model and Estimation Procedure

The empirical specifications of Heckman selection model of export competitiveness involving two aspects of export behaviour are represented by the following two simultaneous equations: export propensity equation (1) and export intensity equation (2).

$$\Pr(DX_{it}) = b_0 + b_1FCD_{it} + b_2RDI_{it} + b_3MTI_{it} + b_4AMI_{it} + b_5CAPI_{it} + b_6SZ_{it} + b_7AGE_{it} + b_8MI_{it} + b_9FINC_{it} + b_{10}IMC_{it} + b_{11}SID1_{it} +,..., b_{17}SID7_{it} + b_{18}YD02 +,...,+ b_{23}YD07 + u_{it} \quad (1)$$

$$XI_{it} = b_0 + b_1FCD_{it} + b_2RDI_{it} + b_3MTI_{it} + b_4AMI_{it} + b_5CAPI_{it} + b_6SZ_{it} + b_7AGE_{it} + b_8MI_{it} + b_9IMC_{it} + b_{10}SID1_{it} +,\ldots, b_{16}SID7_{it} + b_{17}YD02 +,\ldots,+ b_{22}YD07 + v_{it} \quad (2)$$

where, i = 1, 2, …, 177 and t = 1, 2, …….7; $v_{it} \sim N(0,1)$, $u_{it} \sim N(0, \sigma_u 2)$, corr $(v_{it}, u_{it}) = \rho$ and $(v_{it}, u_{it}) \sim N(0, 0, 1, \sigma_u 2, \rho)$.

In this model, export behaviour of a firm is represented by two endogenous variables, namely the decision to export (XD) and export intensity (XI). XI is defined by the ratio of exports (i.e. revenue earned through exports of goods including deemed exports) to net sales of a firm in a particular year. XD is captured by a dummy variable assuming value 1 for exporting firm and 0 for non-exporting firms in a year.[6] For the model to be identified, Heckman procedure requires the use of at least one uncommon variable between the first and second equations. The model uses 22 common explanatory variables between the two equations and one uncommon variable FINC which is included only in the export propensity equation. The explanatory variables of the model used in this study are divided into two categories, namely the key variable and control variables. The key explanatory variable is foreign control dummy variable (FCD). The control variables are further grouped into three sub-

[6] We define a firm as exporting, if its mean export intensity equals at least one per cent during the various years of its presence in the entire period of study.

categories: firm-specific variables (RDI, MTI, AMI, CAPI, SZ, AGE, MI, FINC), sub-industry related variables and year-specific dummy variables. The measurement of each of the explanatory variable is explained in Appendix.

As proposed by Heckman (1979), sample selection model can be estimated either by a two-step method or maximum likelihood method. The two-step methodology involves estimation of first the Probit selection equation; thereafter the estimation of outcome equation by Ordinary Least Square (OLS) over the sub-sample given the selection variable. The maximum likelihood estimation involves an estimation of a complicated likelihood function for the selection model for which Heckman won the Nobel Prize. Although the two-step method is easy and intuitive, it is less efficient in relation to the maximum likelihood method. The paper prefers to estimate the above sample selection model of export behaviour by maximum likelihood technique. For this purpose, it employs popular software STATA, which incorporates a sample selection mechanism given by the export decision equation and takes care of the truncated nature of the sub-sample of firms used in the export intensity equation. As the relationships between dependent and explanatory variables may suffer from the heteroskedasticity, heteroskedasticity corrected standard error are obtained with the help of robust option available in the STATA.

Given the risky nature of export activity, sunk costs involved in exports can be more efficiently financed by networth, the firm's internal and more stable long term source, than by external debt

Explanatory Variables and Hypotheses

Based on the discussions in the previous sections, the paper tests its major hypothesis that *FCFs shall have greater propensity and intensity to export than DFs* in IMI. This is done with the help of the dichotomous dummy variable FCD which assumes the value 1 for FCFs and 0 for DFs. The positive sign of FCD in the estimated equations would indicate better export behaviour of FCFs in comparison to DFs. The expected relationship between XD (or XI) and the control explanatory variables are discussed in the following paragraphs.

Some scholars (e.g. Greenaway *et al.* 2007) consider financial capacity of a firm to be important for overcoming the sunk costs barriers to export. Given the risky nature of export activity, sunk costs involved in exports can be more efficiently financed by networth, the firm's internal and more stable long term source, than by external debt. Besides, the level of networth also provides a firm capacity to raise (long term as well as short term) debt from the market.[7] The study thus employs a ratio of tangible networth to total assets as the measure of financial capacity (FINC) to overcome sunk costs barriers to exports in a firm. We predict that the higher the FINC the greater is the likelihood that a firm will be able to export by financing sunk costs. As the availability of long and stable internal source of finance is mainly important for overcoming sunk costs of entry in the export market, FINC is not employed in equation 2 explaining export intensity. As required in a simultaneous equation model, FINC also acts as the identifier between the export propensity and export intensity equations.

Porter (1985, 1990) suggests that a firm can also create competitive advantage through differentiating strategy aimed at differentiating the firm from its competitors through sales, marketing and innovative activities. We expect non-existent relationship between advertising and marketing intensity (AMI) and firm level export behaviour since IMI is a producer goods industry with domestic market orientation, exporting mainly the standardized products.

Since the developing countries like India are labour abundant economies, they have a comparative advantage in labour intensive products and disadvantage in capital-intensive products as per conventional Heckscher-Ohlin theory of factor proportions. Thus, the firms operating with higher capital intensity (CAPI) will have disadvantage of higher capital cost in exporting. Hence, the firms with higher CAPI will have less likelihood of exporting. Beside, having entered into the export market, more capital-intensive firms with capital cost disadvantage arising from higher use of capital may not be able to export more as the ratio of their sales than the firms with lower CAPI. Hence, we hypothesize a negative relationship between both the aspects of export competitiveness and CAPI.

Since the larger firms are better equipped than the smaller ones to bear the costs and risks involved in exporting and also to take advantage of economies of manufacturing, marketing and finance, it is expected that the larger firms would exhibit export competitiveness (Hirsch and Adler 1974). We hypothesize a positive relationship between both the dimensions of export competitiveness and firm size (SZ).

Two alternative interpretations of the age of a firm are possible. First, a firm's age may act as a proxy measure for the maturity and/or accumulated experience gained through learning by doing or learning by operating in the market. Second, a firm's age may capture vintage of its plant and rigidity in outlook. Thus, the effect of age on export behaviour is expected to be favourable in the first case,

[7] Indian banks generally use ratio of total debt to networth (TDN) with some benchmark (e.g. max 3.5:1 for TDN) as a key criteria for considering a firm for the credit support (Mukherjee 2008, Chapter 6).

while unfavourable in the second case. Considering firm's age as the proxy for accumulated experience and maturity, we expect a firm's age (AGE) to have favourable impact on both the aspects of export behaviour of the firms in the IMI.

Besides labour and capital, intermediate goods including machinery and equipments, spare parts and components and raw materials are the important inputs in production process. Import of these inputs therefore can significantly help a firm in improving its export behaviour for the following reasons: First of all, imported intermediate goods may be cheaper compared to the similar products available in the domestic market. Therefore, the use of imported inputs may lead to the reduction in cost of production. Secondly, imported machinery, components and spare parts may act as an additional source of productivity enhancing and material saving modern (embodied) technology to a firm. Thirdly, some intermediate goods required for manufacturing final goods of international quality may not be available in the country**.** Thus, the import of these intermediate goods may fulfill the more exacting quality, finish and precision requirements of the final products to be exported to the international market. Fourthly, overseas suppliers of intermediate goods may facilitate inflow of information about the new overseas markets and promote foreign networks of buyers in the mutual interest (Sjöholm 2003 and Sjöholm and Takii 2008). Finally, imports may also put pressure on a firm to increase its export so as to finance its foreign exchange requirements of imports without taking exchange risk. We hypothesize that a firm's intensity to import intermediate goods (MI) would be positively related to its XD as well as XI.

Through reduction in cost, improvements in the quality and foreign contacts, imports of intermediate goods and technology may improve the export behaviour of firms significantly

One of the ways in which technological capabilities can be acquired is through in-house R&D efforts. In line with the technological capability approach (Lall 2000a) in-house R&D may enhance the international competitiveness of firms in IMI in two ways: i) R&D may raise the efficiency in use of inputs of production and thereby reduce cost; ii) it may improve the quality and finish of the products produced by the firms. However, if R&D is not conducted with a view to gain export competitiveness, it may not have any significant impact on XD or XI. Thus, we cannot predict the direction of relationship between XD (or XI) and R&D intensity (RDI) on *a priori* basis.

IMI has been heavily relying on the import of disembodied technology via foreign technological collaboration agreements after the initiation of economic reforms in 1991. Purchase of foreign technology through the foreign technological collaborations agreements improves the competitiveness a firm by reducing its cost of production and/or improving the quality of its products. We can thus expect a positive relationship between export intensity and a measure of import of foreign technology. However, the technological collaboration agreements between Indian and foreign firms may contain a number of export inhibiting clauses restricting exports from FCFs as has been observed by some studies in the past (e.g. RBI 1985). Thus, the effect of intensity to import of foreign technology (MTI) on export behaviour cannot be predicted on an a priori ground.

The characteristics of IMI may vary across its major sub-industries in terms of market structure, demand and supply conditions, price per unit of output, capital, skill and technology requirements, etc. These sub-industry level factors may also influence the firm level export behaviour. Analysis of data on sub-industry wise export intensity presented in Table-4 indeed show substantial variations in mean export intensity across various sub-industry groups of the IMI. To isolate the unique influences of foreign ownership related key variables on the firm-level export behaviour we try to control the possible effect of sub-industry specific factors on the export behaviour in two ways. First, we construct firm specific index of market concentration (IMC) corresponding to eight sub-industries (S0, SI1,…,SI7) in which a firm may operate. Domestic market concentration allows the dominant firm to have monopoly power in the domestic market and thereby de-motivates such firms to undertake exports or export more as a portion of sales for two main reasons (Glejser *et al.* 1980): a) the dominant firms can exploit the negatively sloped domestic demand curve, as exporting would involve increasing the demand elasticity and becoming price-takers by weakening the oligopolistic interdependence and facility of collusion. This is especially true in the absence of impediments to trade that could isolate domestic firms from foreign competition and when dumping is prohibited by international trading rules; b) Domestic market concentration facilitates major firms to reap economies of scale in the domestic market itself if the market size of the product is limited. In such a situation, the remaining firms may not be able to reach the critical size required for exports. Thus, we posit a negative relationship between IMC and export propensity as well as IMC and export intensity. Secondly, we also use seven dummy variables corresponding to 7 sub-industries (SI1,..,SI7) to control sub-industry wise variation in export intensity.

Export behaviour of firms may fluctuate due to year-to-year changes in external factors such as changes in industrial, trade and FDI policy, supply and demand conditions, price, etc. leading to the improvements (or deteriorations) in export performance of IMI. To account for such developments over the period of study, we employ six year-specific additive dummy variables (i.e. YD02, YD03, YD04, YD05, YD06 and YD07). We do not use any

dummy variable for the year 2000/01 to avoid dummy variable trap. In view of the fact that export performance of IMI has been improving in the latter years of our study, we expect the coefficients of dummy variables related to the latter years to be positive.

Sample, Data and Period

Empirical analysis in this study utilizes the unbalanced pooled data on a sample of 177 firms, with 936 observations spread over 7 years period (2000/01 to 2006/07), drawn from the IMI. We obtained basic data on a number of financial and non-financial parameters for each year of the study for designing various indicators for carrying out the empirical exercise. The major portion of this data and information was sourced from the PROWESS database - 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 even by personally contacting the company's representatives in the case of some doubt on data. We also acquired data from CMIE's *Industry Market Size and Share* chiefly for constructing a variable on the index of market concentration. We extracted a list of all firms belonging to the IMI available in PROWESS database. We included all those firms in the sample for which data on each of the relevant variables were available for at least 2 years of the 7 financial years of the study. Further, we deleted sick companies, i.e., the companies with negative networth in a financial year, mainly with a view to remove outlier effect from the analysis. These exclusions left us with a usable sample of unbalanced panel of 177 firms with 936 observations. The size of overall sample (as well as the size of each sub-sample of DFs and FAs) varies from year to year during the period 2000/01 to 2006/07 of the study. Despite the sample size being smaller than that of the PROWESS database, share of sample firms in respect of some aspects of corporate financial indicators (say sales turnover or net worth) of the IMI during the period of the study ranges from 66 per cent to 90 per cent depending on the individual aspects of financial indicators. In particular, sample firms in aggregate over 2000/01 to 2006/07 covered 68 per cent of sales turnover, 90 per cent of gross profit, 85 per cent of net worth, 74 per cent of gross fixed assets, 69 per cent of total assets, 66 per cent of foreign exchange earnings and 74 per cent of foreign exchange outgo of all the firms belonging to the IMI as classified in the PROWESS database. Considering the fact that PROWESS covers almost entire corporate sector, our sample with such shares on the individual aspects of financial indicators can be considered as the good representative of the corporate sector of IMI.

Export behaviour is negatively influenced by domestic market concentration. In other words, increased domestic competition may lead to better export behaviour

The period of study is characterized by the following events: First, the Indian companies have adopted better accounting standards since 2000/01, which has made the presentations and descriptions of financial statements more detailed, transparent, accurate and uniform across the firms. As our study uses firm-level data originally sourced from the annual reports of the companies, these developments add additional feature to our study over the studies that have used data pertaining to the period prior to the year 2000. Second, India has become one of the most attractive destinations for FDI during the period of the study.

Before estimating the models and discussing the results, we briefly explain the characteristics of the sample by analyzing the data with the help of simple statistical tools. The descriptive statistics of the variables used in the model for the sample are presented in Table-1. This tables show mean, standard deviations (overall, between and within) and minimum and maximum values for each of the variable used in the estimation of the model. The results on the standard deviation reveal the between and within variations in the mean values of SZ, AGE, CAPI, AMI, MTI, RDI, FINC, XI, XD, MI, IMC but do not show any within variation in the mean values of FCD and sub-industry level dummy variables.

Table 2 presents the mean export intensity of the sample firms for the each year of the study. It suggests that the mean export intensity has been increasing until it reached to its peak at 20 per cent in 2004/05 but declined to 19 percent in 2006/07.

Table 3 describes the sub-industry level export intensity of sample firms. We observe from the table that there are wide variations in export intensities across sub-industries of IMI. These results suggest that that the sub-industry level factors and year-specific factors may influence export behaviour.

Table 4 gives summary statistics of various firm-level characteristics of the exporters and non-exporters belonging to the full sample. The table also offers Welch's t-statistics with their significance levels for testing the hypothesis that there exists no difference in the mean values of each of the firm characteristics between exporters and non-exporters. [8] As can be seen from the table, the value of t-statistics is

[8] The null hypothesis Ho: mean value of a variable for exporters – mean value of a variable for non-exporters = diff = 0 is tested against alternative hypothesis (Ha: diff ! = 0).

positive and significant in respect of SZ, AGE, FINC, MI and MTI. These results indicate that the exporters as compared to non-exporters have higher financial capacity (FINC), intensity of import of intermediate goods (MI) and intensity of import for foreign disembodied technology (MTI). Besides, the exporters are also bigger in size (SZ) and older than non-exporters. The value of t-statistics related to CAPI reveals that the exporters are less capital intensive than the non-exporters.

To measure the strength of correlation between the two variables and detect any multicolinearity problem in the sample, we computed the matrix of correlation coefficients (Table-5) and variance inflation factor (Table-6). Matrices of correlation coefficients of variables and information on variance inflation factor reveal no serious multicolinearity problem either in terms of the rule of thumb for the pair-wise correlation coefficients between two regressors (> 0.80) or the rule of thumb for the variance inflation factor (>10) for the individual regressors.

Econometric Results

The results of the maximum likelihood estimates of the simultaneous equations (1) and (2) of the Model are presented in Table-7. The reported Wald test for overall significance of the model indicates that taken together the coefficients of the regressors is significant. Wald test of independent equations suggest that the estimated correlation between the error terms of export decision and export intensity equations is significantly different from zero for the model. Thus, the export propensity and export intensity are related and the choice of Heckman selection model is appropriate.

Learning by doing and longer experiences do help in improving the export behaviour of firms in the IMI. As expected, CAPI carries a significantly negative sign in both the equations. This signifies that the firms using labour-intensive techniques of production are more successful on export front

Table-7 also shows that FCD, the key variable of interest, bears positive and statistically significant coefficient in the export propensity equation but statistically insignificant coefficient in the export intensity equation. This suggests that the FCFs (as compared to DFs) as a group has greater propensity to export. In other word, direct MNE affiliation helps in converting non-exporters into exporters by overcoming transaction cost, sunk cost and other barriers to export, even after controlling for a number of observable firm-specific, industry-specific and year-wise factors explaining export behaviour. However, FCFs are unable to exploit the advantages of financial support, technology, management, marketing and MNE network with the locational advantages of India in achieving higher export intensity than DFs in IMI.

Out of the firm-specific control variables, AMI carries statistically insignificant coefficients in the export propensity as well as export intensity equations. This result suggests that the product differentiation advantage created through advertising and marketing are not important factors in determining export behaviour of firms in the IMI. The coefficient of R&D intensity is significant but unexpectedly carries a negative sign in export propensity equation. The coefficient of RDI is insignificant in the export intensity equation. These results indicate that the firms direct their R&D towards improving sales in the domestic market rather than exporting products from the IMI. This is probably happening because firms in IMI mostly sell in large domestic market. The coefficients of MTI are significant and positive in both the equations, implying that the technological upgradation through import of disembodied technology has been enabling firms not only in entering in the export market but also in improving their export intensity after the entry. It seems that the import of disembodied technology is helping Indian firms in bridging the technological gap and in designing cost effective and quality products needed for the international market.

Although the coefficient of SZ turns out to be statistically insignificant in export propensity equation, there exists an evidence of strong positive relationship between firm size and export intensity in equation (2). These results suggest that the advantages associated with larger size do not equip firms in IMI for entering into export. However, after the firms start exporting, advantages of large size come into play, enabling the exporting firms to export more as a ratio of their sales. The variable AGE carries significantly positive coefficients in both the equations of the model, suggesting learning by doing and longer experiences do help in improving the export behaviour of firms in the IMI. As expected, CAPI carries a significantly negative sign in both the equations. This signifies that the firms using labour-intensive techniques of production are more successful on export front. Thus, the use of labour intensive technique in labour abundant country like India helps firms in acquiring cost competitiveness in the international market.

The coefficient of MI is insignificant in export propensity equation but the same is significant with positive sign in the export intensity equation. These results suggest that higher import intensity does not help in overcoming barriers to export but the same leads to higher export intensity in the case of exporting firms. As predicted, the coefficient of FINC is positive and statistically significant, implying financial capacity does enable firms to overcome sunk cost barriers to export in the IMI.

The variable IMC carries expected negative and significant coefficients in both the equations of export behaviour. This supports the contention that the dominant

firms enjoying domestic market power tend to sell in the domestic market. Besides, as dominant firms lack motivation to sell in the international market, the sub-industries with higher market concentration display lower export intensity. Among the seven sub-industry specific dummy variables, the coefficients of 5 variables (SID1, SID2, SID5, SID6 and SID7) are significant and positive in export propensity equation. These results suggest that the firms based in pumps, compressors and valves (SID1), bearings (SID2), machine tools (SID5), industrial machinery for food, beverages and textiles (SID6) and other industrial machinery (SID7) have greater propensity to export than those belonging to the prime movers (SI0). In the export intensity equation, the dummy variables associated with each sub-industry carry a significantly positive coefficient, indicating that firms in each of these sub-industries are more export intensive than those belonging to the prime movers (SI0).

Among the year-specific dummy variables, only the coefficient of YD05 is significant (at 10%) with positive sign. This indicates that the firms in IMI had better probability of exporting in 2004/05 than that in 2000/01. In the export intensity equation, however, the coefficients of YD03, YD04, YD05 and YD07 are significant and positive. These results indicate that the firms on an average are more export intensive in each of these years compared to the reference year 2000/01

Non-exporting firms in Indian machinery industry may acquire FDI constituting a package of tangible and intangible resources for entering into export market. Exporting firms may improve their export intensity by deploying imported disembodied technology, raw material and capital goods and labour intensive technology of production.

Conclusions

The objective of this paper was to empirically investigate the effect of FDI on firm-level export competitiveness in the context of Indian machinery industry. The export competitiveness is captured by two types of a firm's activity/decision: i) the export itself or a firm's decision to export and ii) the decision on the portion of output to be exported (export intensity), once the decision is taken to export. To capture the effect of FDI on export competitiveness at firm level, the paper sought to compare the export behaviour of two ownership groups of foreign controlled and domestic firms inhabiting Indian machinery industry. Based on the review of recent empirical studies conducted in the Section-4 and methodologies used in such studies, the paper estimated an appropriate sample selection multiple regression model of export competitiveness involving both the decisions/activities in a simultaneous equation framework with the help of a pooled dataset of 177 firms for the seven years period between 2000/01 to 2006/07.

The estimation results reveal that the foreign controlled firms have greater likelihood of exporting than domestic firms. To overcome sunk and transaction costs barriers to entry into export, the domestic non-exporting firms based in the machinery industry can thus attract FDI constituting a package of tangible (e.g. financial capital) and intangible resources (viz. internal and external networks and contacts, corporate image, technology, managerial, marketing and organizational expertise). The export intensities of foreign controlled and domestic firms are not found to differ significantly, when additional factors influencing firm-level export competitiveness are controlled. Nevertheless, export intensity is found to be affected favourably by a host of other firm-specific factors such as arms length import of disembodied technology, raw material and capital goods, labour intensive technology, size and age. Thus, it is suggested that the exporting firms, whether domestic or foreign, can improve their export intensity by deploying imported disembodied technology, raw material and capital goods and labour intensive technology..

Table-1: Descriptive Statistics of Variables for Full Sample, 2000/01-2006/07

Variable		Mean	Std.Dev.	Min	Max	Observations
FCD	overall	0.2788	0.4487	0.0000	1.0000	N = 936
	between		0.4301	0.0000	1.0000	n = 177
	within		0.0000	0.2788	0.2788	T-bar = 5.28814
SZ	overall	3.4278	1.6245	-0.1372	8.8828	N = 936
	between		1.5575	0.2772	8.5254	n = 177
	within		0.2773	2.1015	4.9944	T-bar = 5.28814
AGE	overall	3.1944	0.7298	0.0000	4.6250	N = 936
	between		0.7373	0.8959	4.6000	n = 177
	within		0.1266	2.0978	3.8896	T-bar = 5.28814
CAPI	overall	4.7216	5.0334	0.2844	50.0000	N = 936
	between		5.0590	0.3259	39.5469	n = 177
	within		1.2665	-4.5606	15.1747	T-bar = 5.28814
AMI	overall	0.0309	0.0333	0.0000	0.2506	N = 936
	between		0.0314	0.0000	0.2197	n = 177
	within		0.0127	-0.0548	0.1597	T-bar = 5.28814
MTI	overall	0.0031	0.0074	0.0000	0.0743	N = 936
	between		0.0060	0.0000	0.0372	n = 177
	within		0.0040	-0.0215	0.0547	T-bar = 5.28814
RDI	overall	0.0035	0.0060	0.0000	0.0398	N = 936
	between		0.0053	0.0000	0.0284	n = 177
	within		0.0027	-0.0093	0.0260	T-bar = 5.28814
FINC	overall	0.4426	0.2034	0.0105	0.9517	N = 936
	between		0.1996	0.0304	0.8744	n = 177
	within		0.0697	-0.0449	0.6565	T-bar = 5.28814
XI	overall	0.1247	0.1736	0.0000	0.9922	N = 936
	between		0.1523	0.0000	0.7551	n = 177
	within		0.0886	-0.3857	0.6732	T-bar = 5.28814
XD	overall	0.5684	0.4956	0.0000	1.0000	N = 936
	between		0.4262	0.0000	1.0000	n = 177
	within		0.2704	-0.2888	1.4255	T-bar = 5.28814
MI	overall	0.0930	0.1027	0.0000	0.5823	N = 936
	between		0.0918	0.0000	0.4633	n = 177
	within		0.0455	-0.1904	0.4421	T-bar = 5.28814
IMC	overall	0.4038	0.1596	0.1256	0.8955	N = 936
	between		0.1523	0.1580	0.7762	n = 177
	within		0.0568	-0.0171	0.6845	T-bar = 5.28814
SID1	overall	0.1378	0.3449	0.0000	1.0000	N = 936
	between		0.3550	0.0000	1.0000	n = 177
	within		0.0000	0.1378	0.1378	T-bar = 5.28814
SID2	overall	0.0951	0.2935	0.0000	1.0000	N = 936
	between		0.2955	0.0000	1.0000	n = 177
	within		0.0000	0.0951	0.0951	T-bar = 5.28814
SID3	overall	0.0652	0.2470	0.0000	1.0000	N = 936
	between		0.2521	0.0000	1.0000	n = 177
	within		0.0000	0.0652	0.0652	T-bar = 5.28814
SID4	overall	0.1229	0.3285	0.0000	1.0000	N = 936
	between		0.3243	0.0000	1.0000	n = 177
	within		0.0000	0.1229	0.1229	T-bar = 5.28814
SID5	overall	0.1816	0.3857	0.0000	1.0000	N = 936
	between		0.3812	0.0000	1.0000	n = 177
	within		0.0000	0.1816	0.1816	T-bar = 5.28814
SID6	overall	0.0823	0.2749	0.0000	1.0000	N = 936
	between		0.2955	0.0000	1.0000	n = 177
	within		0.0000	0.0823	0.0823	T-bar = 5.28814
SID7	overall	0.2404	0.4275	0.0000	1.0000	N = 936
	between		0.4231	0.0000	1.0000	n = 177
	within		0.0000	0.2404	0.2404	T-bar = 5.28814

Source: Calculated from the data drawn from PROWESS

Table-2: Mean Export Intensity of Sample Firms, 2000/01 to 2006/07

Year	2000/01	2001/02	2002/03	2003/04	2004/05	2005/06	2006/07
XI (%)	10.85	14.27	18.25	18.58	20.08	19.47	19.24
No. of Firms	130	141	144	132	137	127	125

Table-3: Sub-industry Wise Mean Export Intensity

Code	Sub-industry	Mean Export Intensity (%)
SI0	Prime movers (diesel engines, turbines, heat exchangers, etc.)	07
SI1	Pumps, compressors and valves and parts	19
SI2	Bearings and parts	12
SI3	Agricultural machinery (tractors and agricultural implements)	07
SI4	Earthmoving, material handling, mining and construction machinery, cranes, etc.	06
SI5	Machine tools and parts	16
SI6	Industrial machinery for food, beverages and textiles and parts	13
SI7	Other industrial machinery and parts	13
	IMI	12

Table-4: Relative Characteristics of Exporters and Non-exporters

Variable	Exporters			Non-exporters			Diff in Mean
	Obs.	Mean	SD	Obs.	Mean	SD	t-stat
SZ	486	3.68	1.529	450	3.15	1.68	5.01*
AGE	486	3.30	0.659	450	3.08	0.78	4.49*
MI	486	0.11	0.098	450	0.08	0.11	3.92*
CAPI	486	4.24	3.434	450	5.24	6.28	-2.99*
AMI	486	0.031	0.033	450	0.030	0.03	0.18
MTI	486	0.004	0.008	450	0.002	0.006	4.7*
RDI	486	0.004	0.006	450	0.003	0.006	0.69
FINC	486	0.459	0.191	450	0.42	0.21	2.55*

Note: * denotes that the t-value is significant at 1 per cent level.

Table-5: Matrix of Correlation Coefficients

	FCD	RDI	MTI	AMI	CAPI	SZ	AGE	MI	FINC	IMC	SID1	SID2	SID3	SID4	SID5	SID6	SID7	YD02	YD03	YD04	YD05	YD06	YD07	CONST
FCD	1.00																							
RDI	0.04	1.00																						
MTI	-0.25	0.03	1.00																					
AMI	0.14	0.09	0.09	1.00																				
CAPI	0.07	0.10	0.06	0.01	1.00																			
SZ	-0.10	-0.30	-0.03	0.00	0.20	1.00																		
AGE	0.01	-0.08	0.02	0.06	0.04	-0.24	1.00																	
MI	-0.26	-0.07	-0.10	-0.12	-0.23	-0.20	0.11	1.00																
FINC	-0.10	-0.10	-0.04	0.00	-0.20	0.08	0.01	0.03	1.00															
IMC	0.04	-0.01	-0.03	-0.04	-0.04	-0.02	0.14	0.05	-0.06	1.00														
SID1	-0.01	0.00	-0.04	-0.03	0.05	0.19	0.00	0.14	-0.03	0.41	1.00													
SID2	0.00	0.06	-0.14	-0.07	-0.08	0.12	-0.07	0.18	-0.01	0.36	0.68	1.00												
SID3	0.05	-0.15	-0.02	-0.08	0.00	0.10	-0.09	0.19	-0.05	-0.09	0.47	0.44	1.00											
SID4	0.03	0.01	-0.07	-0.08	0.01	0.19	-0.11	0.11	0.05	0.10	0.64	0.61	0.54	1.00										
SID5	0.06	-0.05	-0.06	-0.10	0.04	0.37	-0.12	0.03	-0.03	0.27	0.52	0.66	0.51	0.67	1.00									
SID6	0.03	0.02	-0.09	-0.06	-0.02	0.23	-0.10	0.05	-0.02	0.20	0.62	0.59	0.46	0.60	0.67	1.00								
SID7	0.01	-0.04	-0.12	-0.07	-0.04	0.29	-0.06	0.20	0.01	0.14	0.67	0.62	0.58	0.71	0.66	0.67	1.00							
YD02	0.01	0.00	-0.01	-0.01	0.00	0.01	-0.01	0.02	-0.02	0.00	0.00	0.01	0.00	0.01	0.01	-0.01	0.01	1.00						
YD03	0.00	-0.01	0.01	0.00	-0.02	0.03	-0.02	0.03	-0.01	0.02	0.02	0.03	0.00	0.02	0.03	0.01	0.02	0.52	1.00					
YD04	0.01	-0.02	0.00	-0.03	0.02	0.03	-0.05	0.02	-0.04	0.03	0.01	0.03	0.00	0.03	0.03	0.01	0.02	0.51	0.52	1.00				
YD05	0.02	0.01	0.01	-0.04	0.02	0.01	-0.07	-0.02	-0.03	0.06	0.00	0.04	-0.02	0.02	0.03	0.02	0.00	0.51	0.52	0.51	1.00			
YD06	0.00	0.05	0.03	-0.04	0.02	-0.03	-0.08	-0.03	-0.03	0.07	0.01	0.04	-0.02	0.01	0.02	0.00	0.00	0.50	0.51	0.50	0.51	1.00		
YD07	0.00	0.09	0.05	-0.02	0.03	-0.06	-0.10	-0.05	-0.05	0.00	-0.03	0.00	-0.03	-0.01	-0.02	-0.02	-0.04	0.50	0.50	0.49	0.51	0.50	1.00	
Const.	0.11	0.16	0.01	0.13	0.01	-0.10	-0.37	-0.05	0.00	-0.42	-0.41	-0.38	-0.20	-0.32	-0.32	-0.27	-0.32	-0.15	-0.15	-0.13	-0.11	-0.10	-0.05	1.00

Table-6: Indicators of Multicolinearity

Variable	Variation Inflation Factor (VIF)	Tolerance (1/VIF)
SID7	4.01	0.25
SID5	3.81	0.26
SID1	3.26	0.31
SID2	2.68	0.37
SID4	2.59	0.39
SID6	2.22	0.45
SID3	1.98	0.51
SZ	1.84	0.54
YD03	1.79	0.56
YD05	1.79	0.56
YD02	1.77	0.56
YD07	1.76	0.57
YD06	1.75	0.57
YD04	1.75	0.57
IMC	1.66	0.60
MI	1.52	0.66
FCD	1.39	0.72
RDI	1.37	0.73
CAPI	1.29	0.78
AGE	1.21	0.83
FINC	1.2	0.83
MTI	1.19	0.84
AMI	1.16	0.87
MEAN VIF	1.93	

Table 7: Export Competitiveness of Foreign Controlled and Domestic Firms

Ind. Var	Export Propensity (Equation-1)			Export Intensity (Equation-2)		
	Coefficient	Robust SE	Z-Stat	Coefficient	Robust SE	Z-Stat
FCD	0.101	0.041	2.46**	0.271	0.202	1.34
RDI	-6.231	3.099	-2.01**	-8.772	13.227	-0.66
MTI	4.086	2.180	1.87***	32.988	16.754	1.97**
AMI	0.205	0.553	0.37	1.630	2.190	0.74
CAPI	-0.013	0.005	-2.55*	-0.019	0.011	-1.81***
SZ	0.017	0.015	1.12	0.525	0.066	7.93*
AGE	0.055	0.024	2.25**	0.214	0.081	2.64*
MI	0.246	0.194	1.27	2.624	0.824	3.18*
FINC	0.285	0.100	2.86*	-	-	-
IMC	-0.345	0.147	-2.34**	-1.767	0.458	-3.86*
SID1	0.232	0.093	2.51*	1.340	0.333	4.03*
SID2	0.176	0.098	1.79***	1.139	0.336	3.39*
SID3	0.143	0.102	1.40	0.832	0.321	2.59*
SID4	-0.013	0.091	-0.14	0.619	0.294	2.10**
SID5	0.203	0.093	2.18**	1.308	0.302	4.34*
SID6	0.281	0.090	3.11*	1.242	0.363	3.42*
SID7	0.209	0.087	2.39**	1.162	0.278	4.18*
YD02	0.069	0.066	1.06	0.150	0.205	0.73
YD03	0.072	0.063	1.13	0.614	0.211	2.91*
YD04	0.081	0.066	1.23	0.477	0.212	2.24**
YD05	0.110	0.065	1.70***	0.418	0.213	1.96**
YD06	0.071	0.067	1.06	0.363	0.228	1.59
YD07	0.031	0.066	0.46	0.576	0.246	2.34**
Constant	0.218	0.232	0.94	-2.315	0.672	-3.44*
Number of Firms	177					
Number of observations	936					
Number of censored observations	149					
Logpsedolikelihood	-778.45					
Rho (estimated correlation coefficient between error terms)	0.2898					
Wald Chi^2 (23)	145.09					
Prob > Chi^2 (23)	0.00					
Wald test of independence of equations (ñ = 0)	Chi^2 (1) = 5.34; Prob > Chi^2 = 0.021**					

Note: *, **, *** denote significance level of coefficients at 1%, 5% and 10% respectively

Appendix

Foreign Control Dummy Variable (FCD): FCD assumes value 1 for a FCF and 0 for a DF. A firm is defined as FCF (or DF) if a foreign promoter holds at least 26 per cent (or less than 26 per cent) share in the paid-up capital of the company. The adoption of this criterion is justified on two grounds: First, the sharing of resources and cross-border value adding activities can take place in a firm even with MNE affiliation involving minority percentage of equity holding (Narula and Dunning 2010). Second, a foreign promoter can effectively control an Indian company with a minimum of 26 per cent equity holdings in the paid up capital of a public limited company since the Indian Company Act 1957 gives to a single entity (or a group of shareholders) with 26 per cent equity the power to block special resolution, involving several important proposals (Majumdar 2007). Similar studies on India have adopted various criterions for defining FAs ranging from 10 per cent foreign share-holding to 51 per cent.

Firm Size (SZ) Sales turnover is a most commonly used measure of firm size in empirical studies on manufacturing sector. We approximate sales turnover by net sales (NS), which equals gross sales minus indirect taxes. NS does not include other income from non-recurring transactions, income of extra-ordinary nature and prior period income. We follow this concept but measure firm size (SZ) by natural logarithmic value of net sales of a firm in a year. This measure of firm size has advantage over measuring size by absolute value of net sales as the former reduces degree of variability in size across firms, and thereby avoids the problem of heteroskedasticity in the estimation of the regression equations.

Age of a Firm (AGE): Age of a firm is measured by the number of years of operation of a firm which is the difference between the year of presence in the sample and the firm's year of incorporation to. As every year of operation may not add significantly to the experience or oldness, we use natural logarithm of age (AGE) to represent the age of a firm.

Capital intensity (CAPI): Capital intensity (CAPI) is measured by the ratio of the original cost of plant and machinery to wage bill of a firm in a year.

Product Differentiation (AMI): We measure product differentiation advantage of a firm by its advertising and marketing intensity (AMI), which the ratio of sum of a firm's expenditure on advertising and marketing to net sales in financial year. The advertising expenses include expenses on launching, promotion and publicity of goods, etc. and marketing expenses comprises commission paid to selling agents, discounts, rebates, etc.

Export Intensity (XI): It is a ratio of export to net sales of a firm in a FY in which export is measured by the firm's earnings from the f.o.b. value of exports of goods and services.

Intensity to Import Intermediate Goods (MI): MI is a ratio between c.i.f values of imported inputs to net sales of a firm in a FY. The imported inputs include raw material, stores, spare parts, capital goods, etc. We use combined value of imported inputs as some firms do not report reliable data on import of capital goods and raw materials separately and also both the components of imports provide benefits of foreign networks for exports.

Intensity to Import Disembodied Technology (MTI): Indian firms import disembodied technology from a foreign technological col-laborator against the payment of royalty and technical fee and /or lump-sum payments for obtaining technical know-how, use of patents, engineering services, drawings and designs, brand names, trademarks and the like, etc. The royalty is normally paid on the recurring basis as a certain percentage of domestic sales and/or of exports while technical fee may be paid on lump-sum basis as one-time payments. The sum of royalty (net of tax) and lump sum payments may approximate that part of technological capability of a firm, which is acquired by the import of disembodied technology. We measure intensity of imported disembodied technology of a firm by the ratio of sum of royalty and lump sum payment to net sales.

Financial Capacity (FINC): FINC is measured by a ratio of networth to total assets of a firm.

Net worth is the summation of equity capital and reserves and surplus. In the reserve and surplus, we do not include revaluation reserves. Higher FINC of a firm (relative to other firms) means that it is financing greater proportion of its assets by owned fund (i.e. net worth) than by borrowed fund.

Index of Market Concentration (IMC): In order to construct IMC, we first categorize the Indian NEMI into 8 sub-industries (SI1,….,SI8) with the help of facilities provided in PROWESS. A minimum 51 per cent of gross sales made up from a sub-industry in a particular financial year is used as the norm for this reclassification. IMC is calculated as the sales weighted average of an index of a four-firm seller concentration ratio (SCR4) of each of the sub-industries of Indian NEMI in which a firm operates. The SCR4 is defined as the share of sales of four largest firms taken together in gross sales of a sub-industry of NEMI. Since a sample firm may operate in one or multiple sub-industries belonging to NEMI, we calculate a weighted average of SCR4 to obtain firm-specific IMC. The weight is calculated as ratio of a firm's sales revenue generated from an individual sub-industry to gross sales of the firm in a year. The procedure of calculating IMC can be more clearly illustrated by the following example. If a firm's gross sales of Rs.15 crore generated from sale of Rs.10 crore worth of bearings (SCR4 = 0.90) and Rs. 5 crore worth of pumps (SCR4 = 0.30), IMC applicable to the firm would be 0.70 (10/15*0.90 + 5/15*0.30).

Sub-industry Specific Dummy Variables: We categorize our sample firms into its 8 major sub-industries of the Indian NEMI, namely, SI0, SI1,…,SI7. Thereafter, we construct 7 dummy variables, SID1,…,SID7, corresponding to 7 sub-industries SI1,…,SI7. The observations on a dummy variable (say SID1) assumes the value 1 if a sample firm belongs to the corresponding sub-industry (say SI1), otherwise 0. The sub-industry SI0 is treated as the reference sub-industry, therefore, we do not use dummy variable for this sub-industry so as to avoid dummy variable trap.

Year-specific Dummy Variables: To account for developments over the period of study, we employ six year-specific additive dummy variables, YD02, YD03, YD04, YD05, YD06 and YD07 corresponding to the years 2001/02, 2002/03, 2003/04, 2004/05, 2005/06, 2006/07. We do not use any dummy variable for the reference year 2000/01 to avoid dummy variable trap.

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Reflecting Applicability in Real Life

Identify firms in your or other relevant industries that have achieved high export jumps and review trends in revenues, profits and export intensity.

How would you define and measure productivity and international competitiveness and trends in same for the firms?

Which of the firm-specific factors affecting exports identified in this article seems to be effective in your context? Any additional factors you identified?

Identify other concepts that can help improve your firm's internationalization capabilities, including exports.

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