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How Do Indian Multinationals Affect Exports from Home Country?

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Jaya Prakash Pradhan[*]

[**Abstract:** *Since 1990s a large number of Indian firms emerged as multinational corporations with ever increasing outflows of foreign direct investment (FDI). The present paper examines how these emerging multinationals have affected the exports from the home country. The findings from this study suggest that Indian multinationals have played an important role in promoting Indian exports in the global markets. Therefore, instituting favourable policies for promoting outward FDI (OFDI) activities of Indian multinationals could be instrumental in boosting India's export performance.*]

1. Introduction

Outward foreign direct investment (OFDI) has emerged as an important mode of internationalization by Indian enterprises during 1990s (UNCTAD, 2004, 2005, 2006; Pradhan 2003, 2004, 2005, 2007; Pradhan and Sahoo 2005; Sauvant 2005). With growing number of Indian firms expanding overseas through large-scale direct investment, the role of Indian multinationals in international production has come of age. Prior to the 1990s Indian multinationals, mostly consisting of a few large-sized Indian business conglomerates, were modestly active in overseas investment activities. They overwhelmingly belong to the manufacturing sectors (within which mainly low-technology and labour-intensive sectors), investing mainly in developing countries, holding minority equity ownership, and basically market-seeking in character. However, since 1990s Indian multinationals emerged from almost all sectors of the Indian economy but increasingly from services sector led by software industry and have progressively

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[*] Assistant Professor at the institute. This paper is a substantially improved, revised and modified version of a paper co-authored with Nagesh Kumar on export competitiveness in knowledge-based industries. However, the author alone is responsible for views expressed in this paper. E-mail: pradhanjayaprakash@gmail.com

targeted developed countries with majority owned OFDI projects and are becoming increasingly strategic asset-seeking and trade-supporting type (Pradhan and Sahoo, 2005). The activities of Indian multinationals are not confined to undertaking just greenfield investments but include an increasing drive for overseas acquisitions, of which some are of international significance like the acquisition of Daewoo Commercial Vehicle Company (Republic of Korea) by Tata Motors Ltd., Tetley Tea (United Kingdom) by Tata Tea, Flag Telecom (United Kingdom) by Reliance Infocomm (Pradhan and Abraham, 2005).

India's OFDI stock, which was mere $78 million in 1980, rose to $113 million in 1991, and then to $9.57 billion in 2005 (Figure-1). The available estimates indicate that there are about 1700 Indian firms investing abroad toady, with about 3000 foreign affiliates across the globe (Sauvant, 2005). Between 1991 and 2003 the number of firms undertaking OFDI has grown at a rate of 809 per cent from 187 to 1700 for India, which is a much higher rate of growth than China, Republic of Korea, Brazil and Hong Kong over roughly comparable periods (UNCTAD, 2006). With the current trends of policy liberalization and globalization accentuating further, Indian multinationals are going to be more visible in world markets in the near future. As the number of Indian firms joining in the international production systems is increasing with large quantity of capital outflows, it becomes more important to explore the impact of these multinationals on the home country.

Figure-1
India's Outward FDI Stock, 1980–2003, (Millions of dollars)
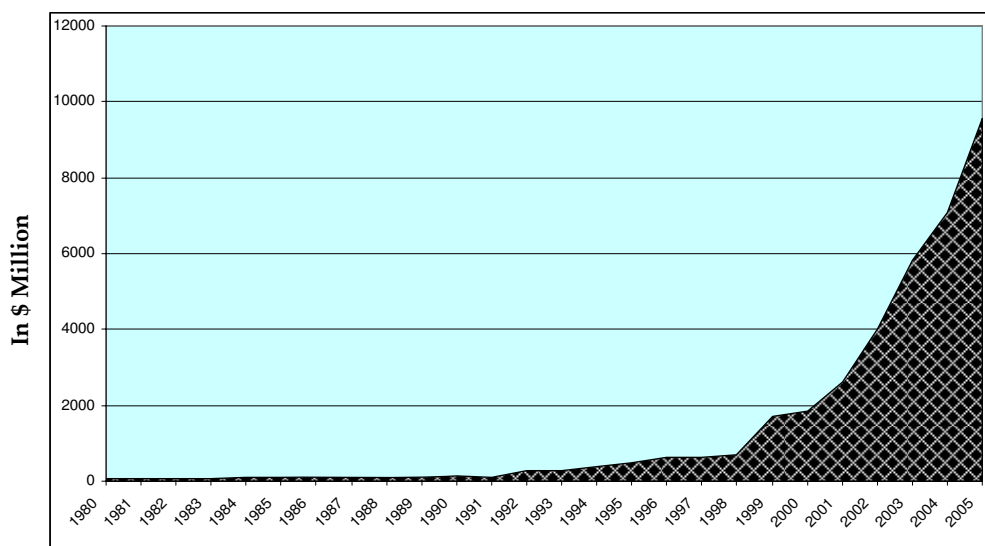
Source: Based on UNCTAD (2006), available at
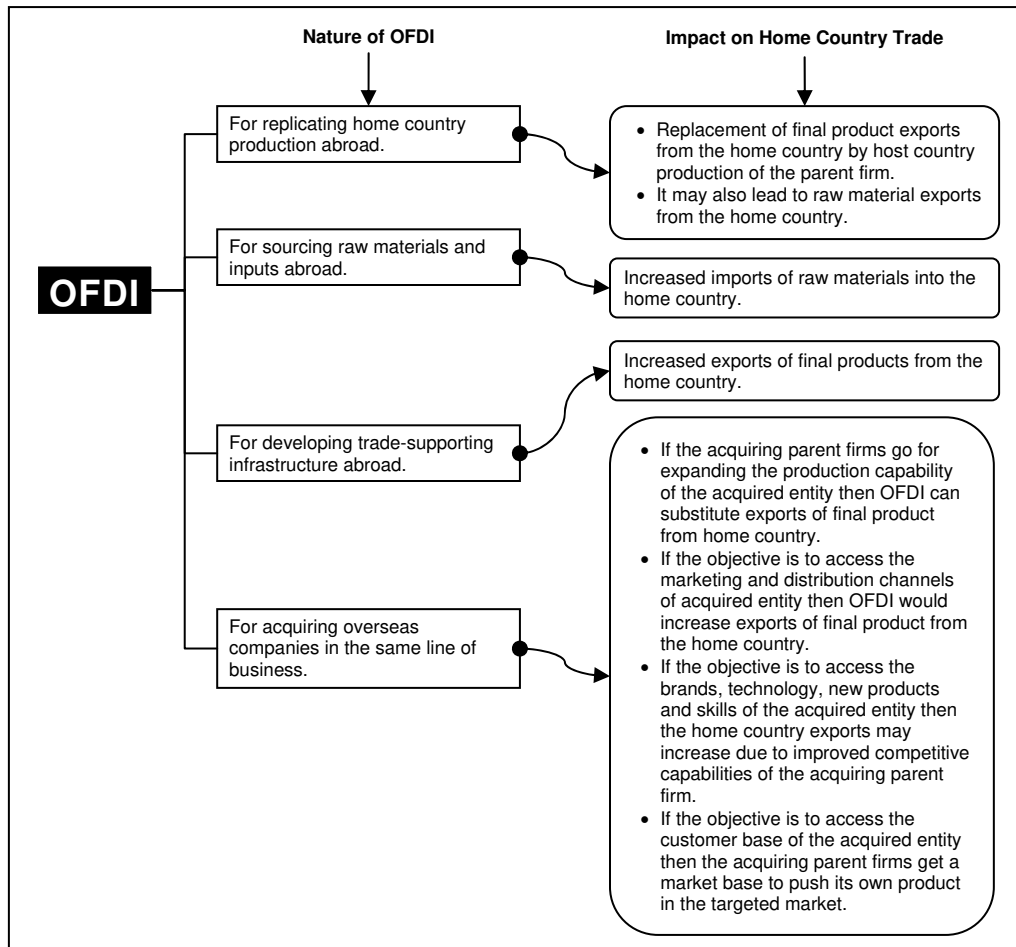http://stats.unctad.org/FDI/TableViewer/tableView.aspx?ReportId=334

In this paper we will investigate the role of Indian multinationals in the export performance of Indian economy. India's experience can be useful for two reasons. First, this issue has not yet received any serious attention in India even though over the last decade the OFDI activity of Indian multinational firms has grown dramatically. Second, the previous research on the trade effects of OFDI has been largely confined to the experience of developed countries and the empirical evidence from a developing country like India may add to the existing evidence. The present study differs from previous firm-level research in that it could control the impact of a large number of firm-specific factors that can affect the relationship between OFDI and exports but has not been accounted for in the previous literature. Further, the dataset having unbalanced panel structure allow firm level entry and exit from export activities.

The paper is organized as follows. Section 2 explores the theoretical links between OFDI by Indian multinationals and home country exports. The exports effect of OFDI for India has been examined via an analytical framework that was developed based on the past literature on export performance in Section 3. The results obtained from empirical analysis with the inferences drawn are also discussed. Section 4 concludes the paper with some remarks on policy implications.

2. OFDI Activities of Indian Multinationals and Home Country Exports: Theoretical Linkages

The OFDI activities of Indian multinationals can complement aggregate exports from India or even substitute it. It is well established in the literature, both theoretical and empirical, that the overall export effects of a home country depend on the type and nature of OFDI projects undertaken by its domestic enterprises. Figure-2 summarizes four different types of FDI based on its objective and their possible impact on home country trade. If an OFDI project by an Indian multinational is motivated to exploit firm-specific advantages via horizontal production to serve the host country then this project tends to substitute exports of final products from parent firms. However, such horizontal OFDI projects may also trigger additional exports of raw materials, intermediate inputs, capital goods, spare parts, etc., from the home country and thus can promote intermediate exports from the home country. The vertical OFDI projects by Indian multinationals involve opposite effects on home country exports. When Indian multinationals undertake OFDI to secure sources of raw materials and inputs abroad then that would directly results in higher imports into the home country. Contrary to the raw material seeking OFDI projects, the vertical OFDI in the form of building trade-supporting infrastructure like distribution networks, customer care centre, etc., by Indian multinationals can be expected to boost exports of final product from the home country.

Figure-2
Nature of OFDI and Impact on Home Country Exports

Nature of OFDI	Impact on Home Country Trade
For replicating home country production abroad.	• Replacement of final product exports from the home country by host country production of the parent firm. • It may also lead to raw material exports from the home country.
For sourcing raw materials and inputs abroad.	Increased imports of raw materials into the home country.
For developing trade-supporting infrastructure abroad.	Increased exports of final products from the home country.
For acquiring overseas companies in the same line of business.	• If the acquiring parent firms go for expanding the production capability of the acquired entity then OFDI can substitute exports of final product from home country. • If the objective is to access the marketing and distribution channels of acquired entity then OFDI would increase exports of final product from the home country. • If the objective is to access the brands, technology, new products and skills of the acquired entity then the home country exports may increase due to improved competitive capabilities of the acquiring parent firm. • If the objective is to access the customer base of the acquired entity then the acquiring parent firms get a market base to push its own product in the targeted market.

OFDI

The brownfield investment by Indian multinationals can also affect Indian exports positively or negatively. The overseas acquisitions effected by Indian firms for seeking efficiency based on locational advantages of host countries can lead to increased import of products produced by overseas affiliates into home country. In this case Indian parent firms are intended to get access to the production capability of targeted foreign companies and to expand the acquired overseas production capability further. In case the overseas acquisitions are motivated to get access to the customer base, marketing networks, brands, technology, new products, and skills then such brownfield OFDI can be expected to increase exports from the home country. Given such a variety of OFDI projects with opposite effects that Indian multinationals may be undertaking, predicting

the exact nature of the overall outcome of their activities on Indian exports is not at all possible.

This 'all depends' prediction on the nature of relationship between OFDI and home country exports is clearly visible in different theoretical perspectives on the subject. For example, Mundell (1957) demonstrated that in the traditional Heckscher-Ohlin economy the product trade and international factor movements were substitutes for each other. On the other hand, Markusen (1983) provided several cases such as differences in production technology, imperfect competition, factor market distortions, returns to scale where factor mobility generated by international factor-price differences leads to increased trade volume.

However, as compared to the ambiguous prediction made by theoretical research, the empirical studies overwhelmingly indicate that the overall role of horizontal OFDI in the export performance of the home country is positive. Particularly for the US the link between OFDI and home country exports remained at the centre of four decades long debate with trade unions claiming losses in the US employment due to exports substituting effect of American production overseas. However, the majority of empirical studies on the US economy do not support this contention (see Lipsey, 1994, 2002 for surveys). On the contrary they had provided evidence that the effect of OFDI on US exports and employment was positive or favourable.

Lipsey and Weiss (1981) in a cross section estimation of a standard gravity model for 14 U.S. manufacturing industries found that each dollar of overseas production by U.S. affiliates in these estimations caused, on an average, about $0.16 of U.S. exports. This positive relationship has also been obtained at the firm level analysis of a cross section of U.S. parent firms (Lipsey and Weiss, 1984). Blomström *et. al.* (1988), based on the direct investment census for 1982, further confirmed that generally the affiliate operations were associated with higher levels of U.S. exports when the U.S. exports equations is being estimated for the sample comprising both minority and 50 per cent owned U.S. affiliates. Other studies that supported a positive association between OFDI and exports in the case of U.S. include Brainard (1993), Hufbauer *et. al.* (1994), Buigues and Jacquemin (1994), Graham (1996), and Hejazi and Safarian (2001). Complementarities between outward FDI and exports also have been reported for several other countries such as Sweden, Japan, Germany, Austria, Spain, Taiwan, and South Korea[1].

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[1]   Sweden by Swendenborg (1979, 1982, 1985, 2001) and Blomström *et. al.* (1988); for Canada by Rao *et. al.* (1994); for Japan by Hufbauer *et. al.* (1994), Graham (1996), Buigues and Jacquemin (1994), Head and Reis (1999) and Lipsey *et. al.* (2000); for Germany by Hufbauer *et. al.* (1994); for

contd...

These studies conducted at the economy level, industry level and firm level suggest that OFDI helps national firms to improve their international competitiveness. They point out that although the horizontal OFDI is directly substituting the export of final product to create trade and employment losses, it more than offsets such displacement effect by raising the intermediate exports from the home economy. Therefore, the net effects of horizontal OFDI are likely to be job creating in the economy with positive effects on the exports of the economy. On the experience of the U.S. economy, Lipsey (1994) argued that outward production is the strategy of U.S. firms to maintain their world market share and in fact, this had contributed to the increase in their share in global exports of manufactures between 1966 and 1985 when the U.S. as a country was witnessing long-term decline in its export share. Those cases of vertical OFDI where investing firms create and establish trade-supporting infrastructure in overseas market tends to helps directly in improving exports from the economy without causing any adverse effects. Yamawaki (1991) tested and found evidence to support the hypothesis that Japanese direct investment in the distributional activities of the U.S. wholesale trade sector has strongly promoted Japanese exports to the U.S. markets. Therefore, OFDI both in horizontal and vertical cases is a means of strengthening export competitiveness of the home economy.

The cases of overseas production leading to negative impact on the home country exports are very few in the literature. Sevensson (1996) found that the overall impact of foreign operation of Swedish MNCs tends to be negative on parent exports but is statistically not significant. Similarly, Braunerhjelm (1996) for Swedish engineering firms observed that the firm's foreign production capacity measured by the percentage of fixed assets abroad out of total assets has a consistently negative impact on firms' exports across different model specifications. Egger (2001) in the case of intra-EU exports and OFDI did not find statistical support for the relationship between OFDI and exports. Blonigen (1999) tested the relationship for Japanese exports and production in the U.S. at the product level data and found substantial evidence for both substitution and complementarity effects for U.S. production of Japanese automobiles, and a substitution effect for a set of Japanese-produced final consumer goods.

Therefore, the empirical evidence reviewed briefly above finds an overwhelmingly positive association between foreign production and home country exports.

Austrian manufacturing by Pfaffermayr (1994, 1996); for Spain by Bajo-Rubio and Montero-Munoz (2001) and Alguacil and Orts (2002); for Mexico by Blomström *et. al.* (1988); for Australia by Industry Commission (1996); for Taiwan by Lin (1995) and Liu and Graham (1998) and for South Korea by Liu and Graham (1998).

3. Exports Effect of Indian Multinationals

3.1. Empirical Framework and Hypotheses

To analyze the export effects of OFDI by Indian multinationals we have estimated a standard export model that takes account of the firm's decision to export as well as how much to export, i.e. a Tobit specification of the export behaviour. Drawing upon the existing literature on India at the firm level export performance (Lall, 1986; Kumar and Siddharthan, 1994; Patibandla, 1995; Bhavani and Tendulkar, 2001; Aggarwal, 2002; Siddharthan and Nollen, 2004 among others), a set of traditional firm-specific factors such as age, size, technology intensity, raw materials import intensity, product differentiation and productivity are specified to affect the export behaviour of Indian firms. Along with these independent variables, OFDI has been included as another firm-specific independent variable. A set of sector-specific dummies are entered into the specification to capture the inter-sectoral differences in the export behaviour. Further, to account for the policy change caused by the implementation of economic reforms in India a regime-specific dummy has been included in the model. The empirical Tobit specification estimated in the study takes the following form:

$$
\begin{aligned}
EXPOINT_{it} =\ & \beta_0 + \beta_1 OFDINT_{it} + \beta_2 AGE_{it} + \beta_3 AGE_{it}^2 + \beta_4 SIZE_{it} + \beta_5 SIZE_{it}^2 + \beta_6 RDINT_{it} \\
& + \beta_7 TECHIM_{it} + \beta_8 KIMPO + \beta_9 IMRINT_{it} + \beta_{10} SELLING_{it} + \beta_{11} LPROD_{it} + \beta_{12} FDUM \\
& + \beta_{13} LIBDUM + \sum_j \beta_j SECDUM_j + u_{it} \qquad\qquad if\ RHS > 0 \\
=\ & 0 \qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad if\ RHS \leq 0 \qquad\qquad (A)
\end{aligned}
$$

where,

$EXPOINT_{it}$: Exports of ith firm as a percentage of sales in the year t.

$OFDINT_{it}$: The stock of OFDI equity held abroad by ith firm as a percentage of net worth in the year t.

AGE_{it}: The age of ith firm in number of years.

AGE^2_{it}: The squared term of the age of ith firm in number of years.

$SIZE_{it}$: Total sales of ith firm in tth year.

$SIZE^2_{it}$: The squared term of the sales of ith firm in tth year.

$RDINT_{it}$: Total R&D expenditure as a percentage of total sales of ith firm in tth year.

$TECHIM_{it}$: Royalties, technical and other professional fees remitted abroad by ith firm as a percentage of sales in tth year.

$KIMPO_{it}$: Capital goods imports by the ith firm as percentage of sales in tth year.

IMRINT $_{it}$:	Raw material imports by the ith firm as a percentage of sales in tth year
SELLING $_{it}$:	Advertising and sales promotion expenses incurred by ith firm as a percentage of sales in tth year.
LPROD $_{it}$:	Labor productivity defined as net value-added generated per unit of wage cost (%).
FDUM:	Foreign ownership dummy taking 1 if at least 25 per cent foreign owned and 0 otherwise.
LIBDUM:	Liberalization dummy taking 1 for reform period 1993–94 to 2000–01 and 0 for the pre-reform period 1990–91 to 1992–93.
SECDUM $_j$:	The set of sector-specific dummies.

Hypotheses on Independent Variables

Outward FDI

The main variable of interest, OFDI, has been predicted to have a positive effect on the export performance of Indian firms. This is because of the specific nature of past OFDI projects undertaken by the Indian parent firms. Under the past regulatory requirement, OFDI projects from India have to be in the same core business activity as the Indian parent company[2]. In the same core activity, Indian firms can use OFDI for producing the final product (i.e. horizontal OFDI) or for building marketing networks (vertical OFDI) or sourcing raw materials (vertical OFDI) from abroad or any combination thereof. For example, an Indian pharmaceutical company can undertake OFDI to produce drugs in a host country or develop trading and distribution infrastructure for marketing its drugs in the host country or source raw materials and bulk drugs for producing formulations in India. Most of the OFDI projects by Indian firms are directed at manufacturing abroad and/or marketing and distributions. In the report of Indian Investment Centre that summarizes the Indian OFDI projects up to December 1995, the cases of OFDI for sourcing raw materials from abroad could not be detected (Indian Investment Centre, 1998). In the case of pharmaceutical OFDI projects during 1990–1999, about 45 per cent of them have gone for manufacturing, another 48 per cent for trading and marketing and just 7 per cent for manufacturing and trading (Pradhan and Alakshendra, 2006). Given India's strong emphasis on indigenization of industrial development in the past, the local content of production activities of Indian firms is very high and the need for undertaking OFDI for securing raw materials is thus limited. Further, the incident of Indian firms

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[2] Only on March 01, 2003, Indian firms are allowed to undertake OFDI in any bonafide business activity [Reserve Bank of India, Exchange Control Department, A.P. (DISR Series) Circular No. 83, March 01, 2003].

undertaking overseas acquisitions is really significant after 2000 onwards and thus for the study period 1990–91 to 2000–01 the role of brownfield OFDI on home country exports is quite limited. Therefore, Indian multinationals' OFDI activities can largely be taken as greenfield project for manufacturing and/or trading and marketing. As argued before, the trade-supporting categories of OFDI projects directed towards distributional activities are likely to positively affect the exports of Indian parent firms since they enable exporter to ensure better sales and after sale services crucial for export success. In the case of manufacturing, OFDI projects certainly substitute final product exports from India, but also likely to cause exports of intermediates and raw materials from home country. The combined positive effects of trade-supporting OFDI (promoting exports of final product) and manufacturing OFDI (increasing intermediate exports) is predicted to more than offset the substitution of final products exports production OFDI entails. Hence, the OFDI intensity, OFDINT, measured as the stock of OFDI equity held abroad as percentage share of net worth of the firm is postulated to positively affect its export performance.

The justification for the inclusions of other independent variables is amply available in the past literature. Without rigorously reviewing the literature we are simply putting our hypotheses on other independent variables as follows.

Technology Variables

Firm's technological capabilities that enable firms to acquire, assimilate, use, adapt, change and create technology (Ernst *et. al.*, 1998) play a crucial role in improving export competitiveness of enterprises. They are important sources of price and non-price competitiveness, crucial in the global market. The importance of innovative activities in export performance has been confirmed statistically in many studies: Daniels (1993) on a cross country sample for technology-intensive manufactures, Kumar and Siddharthan (1994) on some relatively low technology intensive Indian industries, Braunerhjelm (1996) on a sample of Swedish firms, Wakelin (1998) and Bleaney and Wakelin (1999) on U.K. firms, Lefebvre and Lefebvre (2001) on Canadian SMEs, and Sterlacchini (2001) on Italian firms.

Drawing upon the past export literature three measures of technological activities have been employed in the study. The in-house R&D expenses as a percentage of sales, RDINT, is used to measure firm's indigenous technological efforts. This measure, however, tends to underestimate the true extent of technological efforts as there remain significant elements of creativity and innovation that the formal R&D reported by the firms is not able to capture. Firms also can strengthen their technological capabilities by the acquisition of foreign technology. This is particularly significant for firms from a

developing country like India, which often lack the financial, scientific, and skill resources required for internal technology development. These firms tend to import foreign technology both in disembodied and embodied forms. The technological payments made abroad by the firm as a percentage of sales has been employed as a measure of firm's disembodied technology imports (TECHIM). The imports of capital goods embodied with the latest technological knowledge as a percentage of sales is being utilized as a measure of firm's embodied foreign technology imports (KIMPO).

Holding other factors constant RDINT and KIMPO is expected to help the firm in achieving higher export success. The impact of TECHIM on export behaviour is posited to be ambiguous. The underlying rationale for the above prediction is three-fold: technology contracts to developing countries like India come with export prohibition clauses which directly restrict the sale of manufactures produced using the imported technology to the technology importing country[3] (UNCTC, 1984; Kumar, 1985); the large technology gap between firms in developed and developing countries along with the conditionality of 'no reverse engineering' accompanying technology contracts may be inhibiting effective technology transfers; technology import per se may not be crucial for export competitiveness unless the technology receiving developing country firm is able to develop its own firm-specific technological capabilities from the imported technology as the global competitors are the technology suppliers themselves.

Firm Size

Firm size (SIZE) has evidently played an important role in the export performance of enterprises (for a survey see Bonaccorsi, 1992; Calof, 1994). Firm size reflecting the resource base of a firm that offers preferential advantages in the product as well as inputs markets and its ability to bear risk and uncertainty is postulated to have a positive impact on export performance. The study by Roberts and Tybout (1997) on Colombian manufacturing, by Bernard and Jensen (1999) on U.S. manufacturing, by Bernard and Wagner (2001) on German manufacturing corroborate the favourable impact of firm size on export behaviour. Some past studies on export behaviour also indicate a non-linear relationship between the two (Kumar and Siddharthan, 1994; Sterlacchini, 2001). The

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[3] Various R.B.I. surveys on foreign collaborations evidence high incidence of export restrictive clauses associated with foreign technical collaborations coming into Indian manufacturing. In the latest surveys for the period 1986–94 as many as 40 per cent of technology agreements were found to have exports restrictions. The export prohibition clause takes the form of direct prohibition export by the technology importing Indian firms to all countries or specified countries in 62 per cent of cases. Another 27 per cent of cases contain the requirement of prior permission for exports on the part of Indian party (see R.B.I., 1999).

positive effect of SIZE may be valid for a certain range, beyond which increase in SIZE may not be useful for export activity. When firms grow very large in size they may lose the proactiveness and flexibilities that are their competitive strength during the stage of moderate size and may suffer from competence traps where core capabilities become core rigidities.

Firm Age

The age of the firm (AGE) measures the effect of firm's accumulated learning in the production and business and is expected to affect positively firm's export behaviour. We have introduced a quadratic term of firm age, AGE^2, in order to check the possibility of 'non-linearity' effect.

Product Differentiation Intensity

The product differentiation strategy of a firm may also be crucial for the success of its export efforts. Unless the firm is able to create the requisite marketing skills and knowledge it may not be able to achieve higher export performance in many segments of international market that are marked by higher marketing entry barriers. Lower export performances of developing country enterprises in these segments of global markets clearly result from the relative scarcity of product differentiation knowledge in these countries (De La Torre, 1971). By undertaking brand building exercise the firm is attempting to create a unique and superior image of its product in the minds of the buyers as opposed to the products offered by the rivals. This brand loyalty, which is generated by the firm's competitive strategy, based on product differentiation can be an important source to compete in the world market. Typically, SELLING, which is employed to measure firm's product differentiation activities is postulated to have a positive influence on the export behaviour of enterprises, other factors being constant.

Labour Productivity

Firm's ability to utilize resources relatively efficiently can be an important component of its competitive market strategy. Thus, one should expect to find that firms with higher labour productivity, LPROD, which may have resulted in turn from higher mechanization process and increase in general skill of the labour, are more export-oriented than inefficient high cost firms.

Foreign Ownership

MNE affiliation can be instrumental in the export success of firms from developing countries (UNCTAD, 2002). Foreign affiliates have greater access to market information, distribution channels and marketing skills for exports market than do domestic firms (De La Torre, 1971). Several studies such as Sun (2001), Liu, *et. al.* (2002), Liu and Shu (2003) on China; Ramstetter (1999a b) on Hong Kong, Indonesia, Malaysia, Singapore, and Taiwan; Lutz and Talavera (2004) on Ukraine; Jensen (2002) on Poland; Leichenko and Erickson (1997) on the U.S. States indicate a strong role of FDI in the host country export performance. Thus the foreign ownership dummy, FDUM, is predicted to have a positive impact on the export performance of Indian enterprises.

Policy Liberalization

The exporting strategy of the firm is significantly shaped by the overall policy environment of the home country. The firm's export involvement is likely to be minimal if the policy regime creates an anti-export bias environment and assures a large protected domestic market to firms as it happened under the inward looking strategy of India during the pre-1990s period. However, the policy regime of India towards industry, trade, FDI, and technology has seen significant changes during 1990s to be an outward looking one. The implementation of economic reforms saw phasing out of many qualitative and quantitative restrictions on imports, liberalization of FDI policy, implementation and simplification of direct and indirect export promotion measures like establishment of Special Economic Zones (SEZs), tax benefits, simplifying export credit scheme and green cards for exporters, more flexible Duty Exemption Scheme to take care of import needs of the exporters, Golden Status Certificate for exporters and trading houses, etc.

This shift in the policy regime coupled with the accelerated globalization process of the world economy during 1990s can affect positively the export behaviour of domestic enterprises through increased competitive pressure in the domestic market and lowering the level of protection in the overseas market. The entry of new foreign competitors and free imports directly force domestic firms to look for markets beyond the domestic boundary for future growth. They are also forced to utilize their existing resources more efficiently than before and continuously upgrade their technological capabilities to meet the ever increasing competitive changes. This improved productivity can also positively help firms in their exporting ventures. Domestic firms can now freely import low-cost quality raw materials from abroad to further strengthen their competitive positioning. Thus, ceteris paribus, LIBDUM, capturing the impact of regime shift has been posited to play a positive role in the export orientation of Indian enterprises.

3.2. Database, Empirical Findings and Inferences

Model A was estimated for an unbalanced sample of 3951 Indian manufacturing firms with about 22395 observations, of which there are 374 outward investing firms with about 2155 observations and 3577 non-investing firms with about 20240 observations. The study period covers 11 years from 1990–91 to 2000–01. The dataset has been constructed by merging firm-level financial data like sales, exports, R&D, extracted from the Prowess Database of the Centre for Monitoring Indian Economy (CMIE) and the firm-level OFDI statistics collected from published reports of the Ministry of Finance through the Indian Investment Centre (IIC), and unpublished data from the Ministry of Commerce of India. This OFDI dataset has been compiled at the Research and Information System (RIS), New Delhi, for a research project on export competitiveness of Indian manufacturing firms sponsored by the Department of Scientific and Industrial Research, Ministry of Science and Technology, Government of India.

The estimation results have been summarized in Table-1. There are two sets of results pertaining to two ways of tackling the problem of simultaneity involved in the relationship between OFDI and exports. Bi-way causation is reflected in the past export experience that may motivate OFDI by providing more information on the host country as well as for providing after sales services critical for export activities. Today's OFDI in the form of trade supporting infrastructure can affect tomorrow's export performance. The endogeneity problem of the independent variable, OFDI, has been addressed by two methods—*(i)* to use one period lagged OFDINT, and *(ii)* to estimate the model through instrumental variables. As suggested by Swedenborg (2001) we have used the age of mulitinationality, i.e. the age of firm's oldest OFDI project as an instrumental variable. This variable, which captures the accumulated experience of the firms in the overseas production, is expected to directly relate with its OFDI position but not so with its export activity. In Table-1, the set of results presented under the heading of 'Estimation 1.1' pertain to the Maximum Likelihood Tobit estimation of the model when the OFDINT has lagged one period to minimize the simultaneity bias. The set of results provided under the heading 'Estimation 1.2' pertains to the instrumental variable Tobit estimation using the Amemiya Generalized Least Squares (Newey, 1987). In the case of the Maximum Likelihood Tobit estimation apart from providing robust standard errors that are consistent with non-constant error variances, McDonald-Moffitt Decomposition of marginal effects into export probability and export intensity are provided (McDonald and Moffitt, 1980). This decomposition divides the total change in export intensity into two effects—*(i)* the change in export intensity of exporting firms [$\partial E(EXPOINT^*)/\partial X_k$,] weighted by the probability of non-exporting firms to undertake exporting activities, and *(ii)* the change in the probability of non-exporting firms to exports [$\partial F(z)/\partial X_k$], weighted

by the expected value of export intensity of exporting firms. The empirical estimations were conducted with the help of the STATA statistical package. Both estimated models are significant in terms of Wald Chi-square test at one per cent level indicating that all the independent variables taken together explain significantly the inter-firm variability in export intensity. The performances of individual variables are discussed below.

Table-1
Pooled Tobit Estimation of Export behaviuor of Indian manufacturing firms

Dependent variable: Export intensity (%)					
Independent Variables	Estimation 1.1				Estimation 1.2
	Coefficients (Robust Z-value)	McDonald-Moffitt Decomposition		Fully Standardized Coefficients	Coefficients (Z-value)
		Marginal Effect at mean			
		$\partial E(EXPOINT^*)/\partial X_k$	$\partial F(z)/\partial X_k$		
OFDINT(%)	0.34311294*** (7.30)	.13357779	.00493897	0.0667	2.57817163*** (13.70)
AGE	-0.03594203** (2.51)	-.01399264	-.00051737	-0.0260	-0.02925508* (1.86)
AGE²	0.00001968 (0.09)	7.662e-06	2.833e-07	0.0008	0.00000819 (0.03)
SIZE	0.00471931*** (10.34)	.00183728	.00006793	0.0952	0.00315952*** (4.27)
SIZE²	-0.00000031*** (6.80)	-1.202e-07	-4.445e-09	-0.0696	-0.00000019*** (2.94)
RDINT(%)	0.86169628*** (3.72)	.3354682	.01240377	0.0393	0.48481930*** (3.92)
TECHIM(%)	0.22831585 (1.02)	.08888597	.00328651	0.0055	0.13488071 (1.54)
KIMPO(%)	0.24594848*** (5.45)	.09575055	.00354033	0.0611	-0.00206614 (1.16)
IMRMINT(%)	0.65945608 (1.08)	.25673378	.0094926	0.0243	0.87621282*** (4.37)
SELLIN(%)	-0.00386107 (0.71)	-.00150316	-.00005558	-0.0067	0.00512674 (0.93)
LPROD(%)	0.00167800*** (4.40)	.00065326	.00002415	0.0744	0.00154295*** (9.03)
FDUM	6.54585186*** (11.84)	2.6942415	.09260463	0.0699	8.70566783*** (12.61)
LIBDUM	2.89010047*** (5.68)	1.0985097	.04174345	0.0316	3.83209778*** (6.74)
D_ Beer &	-	-5.4269376	-	-0.0698	-

contd...

Dependent variable: Export intensity (%)					
Independent Variables	Estimation 1.1				Estimation 1.2
	Coefficients (Robust Z-value)	McDonald-Moffitt Decomposition		Fully Standardized Coefficients	Coefficients (Z-value)
		Marginal Effect at mean			
		$\partial E(EXPOINT^*)/\partial X_k$	$\partial F(z)/\partial X_k$		
Liquors	16.51439034*** (11.39)		.23227838		21.52022053*** (10.30)
D_Cement	- 15.49938776*** (11.59)	-5.1632536	- .21919798	-0.0840	- 19.86487866*** (11.56)
D_Chemicals	-2.95436898*** (2.76)	-1.1188198	- .04268975	-0.0251	-4.95343002*** (4.00)
D_Electrical Machinery	-5.51161126*** (5.33)	-2.0372939	- .07970437	-0.0455	-7.32503663*** (5.83)
D_Electronics	-0.26314116 (0.22)	-.10218222	- .00378964	-0.0020	-1.83754107 (1.40)
D_Fertilizers	-9.30603823*** (6.89)	-3.2990474	- .13408606	-0.0539	- 13.25816784*** (8.40)
D_Food Products	9.05323139*** (5.55)	3.8533348	.12613213	0.0646	8.89083545*** (6.67)
D_Footwear	34.89046635*** (8.74)	19.454799	.37213357	0.0824	34.15885295*** (11.66)
D_Gems & Jewellery	65.24110387*** (19.00)	45.497514	.45397346	0.1890	63.40201448*** (25.46)
D_Iron & Steel	-7.53119617*** (6.71)	-2.7336205	- .10879332	-0.0639	- 11.32053957*** (8.99)
D_Leather Products	27.35807235*** (13.63)	14.102617	.32335551	0.1209	25.39711007*** (14.23)
D_Metal Products	2.25353259* (1.77)	.89716479	.03226657	0.0153	-1.08116924 (0.78)
D_Non-electrical Machinery	-0.41396734 (0.43)	-.16054318	- .00596317	-0.0036	-1.44070142 (1.19)
D_Paints & Varnishes	- 10.18907679*** (5.19)	-3.5620567	- .14648036	-0.0268	- 13.17097664*** (4.44)
D_Paper & Products	- 15.98202335*** (12.98)	-5.3215547	- .22579964	-0.1047	- 18.25880650*** (12.18)

contd...

Dependent variable: Export intensity (%)					
Independent Variables	Estimation 1.1				Estimation 1.2
	Coefficients (Robust Z-value)	McDonald-Moffitt Decomposition		Fully Standardized Coefficients	Coefficients (Z-value)
		Marginal Effect at mean			
		$\partial E(EXPOINT^*)/\partial X_k$	$\partial F(z)/\partial X_k$		
D_Pharmaceutical	5.40108961*** (4.82)	2.2126484	.07658405	0.0455	2.59426591** (2.10)
D_Plastic & Products	-5.58761734*** (5.17)	-2.0645488	-.08080131	-0.0470	-7.26451558*** (5.82)
D_Rubber Products	5.29585805** (2.42)	2.1802538	.0749672	0.0196	2.43003880 (1.15)
D_Tea & Coffee	2.32923440 (1.52)	.92876569	.03333619	0.0123	-0.79520281 (0.49)
D_Textiles	9.80248280*** (9.51)	4.1217152	.13720508	0.1168	8.27143376*** (7.71)
D_Transport Equipments	-2.39366602** (2.50)	-.91106766	-.03457186	-0.0198	-3.21805497*** (2.61)
D_Tyres	5.50792381*** (3.09)	2.2736812	.07788519	0.0167	4.88270819** (2.00)
D_Wearing Apparel	16.83460292*** (10.99)	7.7592168	.22232306	0.1071	17.55510296*** (12.51)
Constant	-2.82606535*** (3.03)	-1.1002195	-.04068006		-3.58727909*** (3.43)
Sigma	27.53066				
Log likelihood	-72925.338				
Wald chi2(36)	2646.98				3447.02
Prob > chi2	0.0000				0.0000
Observations	22395				26346
Obs with exporting	14203				
Obs with non-exporting	8192				

Note: Absolute value of z-statistics in parenthesis; * significant at 10%; ** significant at 5%; *** significant at 1%

Table-2
Ranking based on standardized coefficients

Independent Variables	Rank
OFDINT(%)	5
AGE	9
AGE^2	13
SIZE	1
SIZE^2	4
RDINT(%)	7
TECHIM (%)	12
KIMPO(%)	6
IMRMINT(%)	10
SELLIN(%)	11
LPROD(%)	2
FDUM	3
LIBDUM	8

Note: Rank is based on absolute value of standardized vector reported in Table-2.

Outward FDI

The variable OFDINT measuring the firm's propensity to undertake foreign production emerges as an important variable positively influencing export performance in both the estimations 1.1 and 1.2. In estimation 1.1, an increase of rupees one crore in the OFDI stock (relative to networth) of the sample firms in the last year, on an average, lead to rupees 0.133 crore increase in the export (relative to sales) of sample firm in the current year, controlling for other determinants (McDonald-Moffitt Marginal effects). The increase in the probability to export is about 0.0049. From the scale-free standardized coefficients reported in Table-1 and their ranking in Table-2 it can be seen that OFDI is the fourth dominant determinant of export behaviour after size, labour productivity and foreign ownership. Thus, the empirical findings corroborate the hypothesis that OFDI by Indian multinational firms have played an instrumental role in their export performance. The complementary relationship between OFDI by Indian multinationals and home country exports appears to have dominated their substitution relationships. Indian multinationals seem to be using OFDI to meet the challenge of competitiveness by enhancing their ability to provide better sales and after sales services to global buyers and to ensure reliability, flexibility and timeliness to the provision of those services.

Other Independent Variables

Contrary to our expectation, AGE exerts a negative effect on export behaviour of Indian enterprises and achieves a moderate level of statistical significance in both the equations. This suggests that the probability as well as the propensity to export is greater among relatively younger firms. The above result could have resulted from two factors. First, AGE is surrogate for the experience factor of Indian firms, which has been accumulated under an inward looking policy regime spanning over more than three decades. During that phase as the domestic markets were protected from foreign competition, the oligopolistic domestic firms had little incentive to improve quality, design or after sales services. Experience gathered during that phase may be of little help to firms under outward looking policy regime and particularly for breaking into the global markets. Second, the older and well-established Indian firms are still finding large-sized domestic markets that are relatively less open to be more attractive for growth and survival than foreign markets. The competitive pressures generated by the implementation of economic reforms may take more time to dislodge the market position of older firms to force them to look for overseas market. The quadratic term of age turns out to be statistically not different from zero. This verifies that the relationship between AGE and export intensity is a linear one.

The variable SIZE comes up with a predicted positive sign and is statistically highly significant in both the estimations. Therefore, size appears to be an important factor inducing firms to diversify into export markets. The quadratic term of SIZE also comes up with a significant coefficient with a negative sign. This supports the earlier findings on export literature that firm size and export are non-linearly related, represented by an inverted U-shape curve.

Among technology factors, RDINT, capturing firm's indigenous technological efforts has a positive sign and is statistically significant in both the estimations. TECHIM measuring disembodied technology imports has a positive sign but could not achieve the accepted level of statistical significance. In the case of embodied technology imports, KIMPO has got a statistically significant coefficient with positive sign in estimation 1.1 but has an insignificant coefficient in estimation 1.2. It would appear, therefore, that while the export performance of enterprises crucially depends upon their in-house R&D efforts, their reliance on foreign technology, particularly through technology licensing, may not be important from exporting point of view. The role of capital goods imports is beset with mixed findings between estimations.

IMRINT has an expected positive sign in both the estimations and could achieve statistically significant effect only in estimation 1.2. Therefore, imports of raw materials

may be adding significantly to the competitive strength of enterprises and favourably affect their export performance. In both the estimations, SELLING never has a statistically significant coefficient. From this it would appear that the product differentiation activities of Indian firms do not have an independent effect on their export behaviour once we hold other independent factors constant.

LPROD has strong positive effect across estimations. Hence, firms with a higher efficiency of resource use are typically more export oriented than others, holding other factors constant. The bulk of Indian exports consist of low and medium technology products where higher labour productivity achieved through higher mechanization and skill up-gradation may be an important source of price competitiveness. FDUM has a positive sign and is statistically significant in the case of both the estimations. Therefore, holding other factors constant, foreign firms in Indian manufacturing have shown significantly higher export orientation. This supports the postulated hypothesis that MNE affiliation helps firms to achieve export success relatively higher than what domestic firms could achieve presumably because foreign firms have access to the superior technology, market knowledge, marketing skills and distribution channels of their parents.

The estimations also indicate that the change in policy regime in India had a distinct bearing on the exporting behaviour of Indian enterprises. LIBDUM comes up with a positive coefficient that is statistically significantly different from zero. Therefore, shift of trade regime from an inward looking one to an outward looking and trade-supporting regime had significantly pushed more Indian firms into export activities as well as higher exporting on the part of exporting firms.

The Role of OFDI in Individual Industry Level Estimations

The relationship between OFDI by Indian multinationals and exports can vary over industries as there are inter-industry differential in the nature of OFDI projects. In certain industries like automobile sector outward investing Indian firms may have strong vertical linkages in the home country and hence may cause more exports of raw materials and intermediates from the home country. The development of intermediate industries in the host country in relation to the home country may also lead to such an expectation. In industries where the host country provides relatively cheaper raw materials and components than home country (for example, this is true in the case of Indian computer hardware industry), OFDI by Indian multinationals in those cases may involve strong substitution effect of final products as compared to weak complementarity effect of intermediates. The inter-industry differential in the relationship between OFDI and exports can also result from the fact that the local content

policy requirements postulated by the individual host countries like the U.S. and/or regional trading blocs like NAFTA and EU[4] vary over industries. In what follows we have estimated the model-A for all the twenty-four industries individually adopting the lagging approach to minimize simultaneity bias. The detailed results obtained from that have been presented in the Appendix Table-A1 and summarized in the Table-3.

Table-3
Summary Results of Industry-wise Estimations on Role of OFDI in Export Performance of Indian enterprises

Dependent variable: Export Intensity (%)			
Industry Name	Coefficient and Z- value of OFDINT		Other Factors Controlled
	Coefficient	Absolute Robust Z- value	
Beer & Liquors	0.14645718*	1.72	Are those specified in the Model such as Firm Age, Size, R&D intensity (%), Disembodied technology import intensity (%), Capital goods import intensity (%), Raw material import intensity (%), Selling cost intensity (%), Labour Productivity (%), foreign ownership dummy and liberalization dummy.
Cement	0.0879109	1.05	
Chemicals	0.2619836	1.53	
Electrical Machinery	0.17819494**	2.14	
Electronics	0.2389069	0.41	
Fertilizers	0.14823632**	2.07	
Food Products	1.11137695***	3.36	
Footwear	-1.77498968***	5.09	
Gems & Jewelry	2.34729304***	4.27	
Iron & Steel	0.22588570**	2.18	
Leather Products	-0.0916623	0.61	
Metal Products	0.1679005	1.46	
Misc. Manufacturing	0.3452286	1.48	
Non-electrical Machinery	0.36153043**	2.15	
Paints & Varnishes	-0.1655149	0.34	
Paper & Products	0.51652172***	2.78	
Pharmaceutical	0.29024370***	2.82	
Plastic & Products	0.0865702	0.75	
Rubber Products	0.79669891***	4.25	
Tea & Coffee	0.3427868	0.75	
Textiles	0.31787446***	2.58	
Transport Equipments	0.43273167*	1.88	
Tyres	-0.5687445	0.74	
Wearing Apparel	1.72082494***	3.2	

Note: * significant at 10%; ** significant at 5%; *** significant at 1%; *Source:* Based on Appendix Table-A1.

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[4] These regional trading blocs impose what is known as the 'Rules of Origins' which require that a specified portion of inputs must originate within the region to qualify as an internal product in a preferential trading agreement.

From Table-3 it can be seen that partial effect of OFDI intensity on the export behaviour of Indian firms is found to be statistically significant in the case of thirteen industries out of twenty-four industries included in the study. Most of the industries where the effect of OFDI is significant are observed to have a positive sign, twelve with positive sign and one with negative sign. Therefore, overwhelmingly the industry-wise results on OFDI support the earlier result from overall manufacturing estimation that OFDI by Indian multinationals had contributed significantly to the exports from India. Apparently, the complementary effect of OFDI in the case of India more than offsets its substitution effect. Only in the case of footwear industry the overall trade effect of OFDI is found to be negative for Indian economy.

4. Concluding Remarks

The existing studies on exports effect of OFDI are predominantly based on the experiences of developed countries. However, developing countries including India are also increasingly undertaking OFDI recently. This paper has investigated the nature of relationship between OFDI by Indian multinational firms and their exports in the case of Indian economy.

The empirical analysis proceeded with the Tobit specification of export behaviour of Indian firms comprising a set of firm-specific factors, sectoral effects, and a dichotomous variable representing the policy shift. By evaluating the nature of OFDI projects undertaken by Indian multinationals and from drawing upon the past empirical literature, we posit that OFDI by Indian multinational enterprises can improve their export performance. The estimations for overall manufacturing as well as individual industries show that OFDI by Indian multinationals has played a major role in significantly improving exports at the firm level. The variable OFDI turns out to possess strong positive effects independent of the export effects of traditional determinants of export performance. This support the finding from previous literature that the overall exports effects of OFDI is largely positive. It appears that Indian firms are using outward FDI to establish distribution and marketing centres in other countries, enhancing their ability to provide sales and after-sales services to global buyers. Foreign affiliates of Indian enterprises may be also contributing to this enhanced export by sourcing raw materials, capital goods and intermediate inputs from India. These positive impacts on exports appear to outweigh any negative impact caused by the foreign affiliates' products displacing export of final products from India. Apart from OFDI, export competitiveness is observed to be positively determined by firm's in-house R&D activities, foreign affiliations, and liberalization of policy regime.

What is the policy lesson from the above analysis for India as a home country of OFDI? The finding that Indian firms becoming multinationals by undertaking OFDI has significantly strengthened exports activities from India suggests that the home country needs to pursue a proactive strategy towards OFDI. Traditionally the policy with respect to OFDI adopted by India was largely a restrictive one although recently it is being successively liberalized. Indian policy makers, to make better use of OFDI as an engine of exports growth, should consider policies that can reduce the barriers faced by Indian firms while undertaking OFDI. The home country government can provide assistance to Indian firms aspiring to undertake OFDI by making available information on overseas investment opportunities and government regulations in foreign countries, increasing the number of bilateral investment and double tax avoidance treaties, etc.

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Appendix

Appendix Table-A1
Industry-wise Tobit estimation of export behaviour

Dependent variable: Export intensity (%)

Independent variable	Coefficient (Robust Z value)						
	Beer & Liquors	*Cement*	*Chemicals*	*Electrical Machinery*	*Electronics*	*Fertilizers*	*Food Products*
OFDINT(%)	0.14645718*	0.08791089	0.26198361	0.17819494**	0.23890692	0.14823632**	1.11137695***
	(1.72)	(1.05)	(1.53)	(2.14)	(0.41)	(2.07)	(3.36)
AGE	-0.01365790	0.10177541*	-0.26344654***	0.14245138***	-0.20206649***	0.02936654	-0.98080423***
	(0.48)	(1.71)	(5.17)	(3.06)	(2.83)	(0.36)	(6.37)
AGE²	-0.00012456	0.00038767	0.00481798***	-0.00403875***	0.00794616***	-0.00124994	0.00486072
	(0.22)	(0.17)	(5.50)	(4.47)	(3.19)	(0.60)	(1.24)
SIZE	0.02305899***	0.02685067***	0.08828378***	0.01528212***	-0.00050824	0.00265904	0.06938735***
	(4.82)	(5.99)	(5.49)	(3.05)	(0.18)	(1.20)	(3.76)
SIZE²	-0.00001892***	-0.00000943***	-0.00011949***	-0.00000803**	0.00000001	-0.00000185**	-0.00003798***
	(3.80)	(5.45)	(3.30)	(2.39)	(0.01)	(2.25)	(3.37)
RDINT(%)	-3.71585911	1.27328165	0.78906558***	-0.85842684	1.02503815*	11.62259946**	-10.33319453***
	(0.27)	(0.99)	(4.59)	(1.07)	(1.96)	(2.48)	(2.61)
TECHIM (%)	10.42351818	3.51477228**	1.10918236	1.90369274***	-2.79789330**	0.72640750*	-2.23862202
	(1.23)	(1.98)	(1.27)	(3.11)	(2.33)	(1.75)	(1.02)
KIMPO(%)	1.89262379	-0.16020134	-0.13042213	0.01087469	0.12620807	-0.23664468*	0.21218935
	(1.13)	(0.64)	(1.32)	(0.08)	(1.30)	(1.78)	(0.93)
IMRMINT(%)	28.58021524	78.57647577***	50.89928461***	43.93584350**	2.64070758	-7.44668607	61.76979703***
	(1.64)	(3.57)	(8.39)	(2.52)	(0.74)	(1.37)	(2.80)
SELLIN(%)	0.00652454	0.06278157	-0.00440156	0.02007224	-0.04525342	-0.37803171**	0.12081694
	(0.58)	(0.91)	(0.32)	(0.70)	(0.72)	(2.46)	(0.91)
LPROD(%)	0.00313499	0.00634658**	0.00329341	-0.00642609***	0.00032002	0.00035996	0.00472051***
	(1.46)	(2.34)	(1.55)	(3.00)	(0.20)	(0.84)	(2.87)
FDUM	6.75796080***		-0.44236128	1.80187190	14.83277347***	16.63858849***	24.21860892***
	(2.90)		(0.26)	(1.28)	(5.10)	(3.53)	(4.23)

contd...

Dependent variable: Export intensity (%)							
Independent variable	Coefficient (Robust Z value)						
	Beer & Liquors	Cement	Chemicals	Electrical Machinery	Electronics	Fertilizers	Food Products
LIBDUM	-1.03286489	0.80322923	0.90326157	0.37198573	2.92047111	6.67121737***	-0.30764006
	(1.06)	(0.58)	(0.59)	(0.30)	(1.39)	(2.72)	(0.05)
Constant	-4.96387952***	-17.72632660***	-9.92980690***	-2.28112366	-4.33593455**	-8.04827805***	-16.52587613**
	(3.27)	(4.63)	(5.54)	(1.35)	(1.98)	(2.97)	(2.42)
Sigma	5.926186	12.9175	20.64412	16.47027	26.04262	19.68423	50.81658
Log likelihood	-547.73454	-1080.2627	-4341.5337	-3856.7795	-3834.2187	-1646.7513	-3108.1355
Wald chi2	60.02	114.82	224.34	126.06	48.99	46.09	137.60
Prob > chi2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Obs.	343	571	1458	1373	1106	653	1009
Obs. with export	144	241	895	829	768	332	523
Obs. without export	199	330	563	544	338	321	486

Note: Absolute value of z-statistics in parentheses * significant at 10%; ** significant at 5%; *** significant at 1%

Appendix Table-A1 (contd...)

Dependent variable: Export intensity (%)							
Independent variable	Coefficient (Robust Z value)						
	Footwear	Gems & Jewellery	Iron & Steel	Leather Products	Metal Products	Misc. Manufacturing	Non-electrical Machinery
OFDINT(%)	-1.77498968***	2.34729304***	0.22588570**	-0.09166227	0.16790048	0.34522863	0.36153043**
	(5.09)	(4.27)	(2.18)	(0.61)	(1.46)	(1.48)	(2.15)
AGE	-1.04085907***	-0.36561362*	0.34402597***	-0.37224216*	0.31352192***	0.07944161**	-0.00036498
	(2.90)	(1.65)	(5.26)	(1.90)	(3.96)	(2.07)	(0.01)
AGE^2	0.00131751	-0.07483532***	-0.00446922***	0.00858228	-0.00671015***	-0.00167920***	0.00281956***
	(0.07)	(3.94)	(4.10)	(0.96)	(2.96)	(3.48)	(4.45)
SIZE	0.11059625*	0.18188126***	0.00517445***	0.06141794	0.05761358***	-0.00163911***	0.00379680***
	(1.70)	(4.14)	(5.66)	(1.22)	(4.20)	(2.63)	(2.67)
SIZE^2	-0.00002308	-0.00023382	-0.00000030	-0.00007975	-0.00003189*	0.00000009**	-0.00000067***
	(0.30)	(.)	(.)	(0.84)	(1.65)	(2.29)	(3.11)
RDINT(%)	-59.65486567	65.36270983**	0.29454580	-1.85817248	9.98970297**	-1.21467404	-0.07387982
	(1.36)	(2.28)	(0.26)	(0.56)	(2.06)	(0.79)	(0.41)

Dependent variable: Export intensity (%)

Independent variable	Coefficient (Robust Z value)						
	Footwear	*Gems & Jewellery*	*Iron & Steel*	*Leather Products*	*Metal Products*	*Misc. Manufacturing*	*Non-electrical Machinery*
TECHIM (%)	-4.27890521	-24.18232685***	1.25222726	-31.90252241***	-1.80422999*	0.81801146	0.10333731
	(0.82)	(6.31)	(1.28)	(3.26)	(1.88)	(1.49)	(0.51)
KIMPO(%)	0.89837541	6.15446141**	-0.00985293	-0.22896918	0.11029320	0.46203137	0.21537598*
	(0.81)	(2.56)	(0.11)	(0.46)	(0.62)	(1.55)	(1.70)
IMRMINT(%)	156.43920023***	12.13641966	34.59862635***	53.48749937**	46.05793436***	36.41549553**	36.20056452***
	(4.97)	(1.13)	(4.05)	(2.32)	(4.53)	(2.07)	(4.10)
SELLIN(%)	0.85236204	-0.06107762*	-0.00706275	0.15344281	-0.70663271***	0.04255108	0.29472681***
	(1.64)	(1.86)	(0.54)	(0.74)	(2.91)	(0.86)	(2.90)
LPROD(%)	0.02316658*	0.00261297***	0.00796872***	0.00846425**	-0.00078134	0.00062865	0.00396315
	(1.74)	(3.15)	(5.00)	(2.28)	(0.47)	(0.76)	(1.31)
FDUM	-9.37998042	-34.80909774	9.85232657***	-5.48917331	-1.68449777	9.62393373***	0.48608744
	(0.40)	(1.34)	(3.62)	(1.42)	(0.81)	(3.66)	(0.53)
LIBDUM	4.25762185	-13.39576499*	7.46594710***	10.13372765**	0.53766831	2.44216209	1.48358817
	(0.37)	(1.70)	(3.50)	(2.13)	(0.21)	(1.42)	(1.38)
Constant	-1.65109833	72.10595581***	-16.31685123***	9.28543774*	0.27188679	-1.20221367	-2.58379176*
	(0.15)	(6.92)	(6.87)	(1.69)	(0.10)	(0.70)	(1.92)
Sigma	28.06028	37.7136	24.7929	34.45172	25.15809	23.44517	14.28877
Log likelihood	-441.68916	-721.65966	-3744.9702	-1605.9166	-3015.5669	-4064.593	-5144.2503
Wald chi2	368.48	1785.83	208.79	68.48	101.44	72.61	137.36
Prob > chi2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Obs.	106	160	1459	376	911	1207	1542
Obs. with export	90	138	718	311	604	830	1196
Obs. without export	16	22	741	65	307	377	346

Note: Absolute value of z-statistics in parentheses; * significant at 10%; ** significant at 5%; *** significant at 1%

Appendix Table-A1 (contd...)

Dependent variable: Export intensity (%)							
Independent variable	Coefficient (Robust Z value)						
	Paints & Varnishes	*Paper & Products*	*Pharmaceutical*	*Plastic & Products*	*Rubber Products*	*Tea & Coffee*	*Textiles*
OFDINT(%)	-0.16551487	0.51652172***	0.29024370***	0.08657019	0.79669891***	0.34278682	0.31787446***
	(0.34)	(2.78)	(2.82)	(0.75)	(4.25)	(0.75)	(2.58)
AGE	0.61237019***	0.09415092*	0.02629041	0.21395274***	-0.31648112**	0.03355148	-0.09048633**
	(2.89)	(1.84)	(0.50)	(5.24)	(2.33)	(0.33)	(2.04)
AGE²	-0.00723230***	-0.00188293**	-0.00234304**	-0.00433277***	-0.00382940	-0.00022186	0.00173576***
	(3.05)	(2.06)	(2.01)	(4.44)	(1.04)	(0.22)	(3.64)
SIZE	-0.03217754***	0.04686710***	0.02798247***	0.01684887***	0.13004284	0.08980092***	0.05132760***
	(3.06)	(6.15)	(4.85)	(5.11)	(1.25)	(3.42)	(5.89)
SIZE²	0.00001775**	-0.00003167***	-0.00001176***	-0.00000355***	-0.00059621	-0.00009427***	-0.00004005***
	(2.20)	(4.55)	(2.84)	(3.87)	(1.26)	(3.08)	(3.95)
RDINT(%)	0.02940868	-4.14986737	1.40320795***	-0.42095040	0.21924799	2.79184668	0.31704789
	(0.01)	(1.21)	(5.16)	(0.83)	(0.06)	(0.42)	(0.58)
TECHIM (%)	8.13642294	8.50260109***	-2.03350076*	0.84969581	-3.19393587*	33.78828926	-0.63660584
	(1.14)	(2.99)	(1.68)	(1.16)	(1.84)	(1.08)	(0.68)
KIMPO(%)	1.21184742	0.17830031	0.22325978	0.20609695**	-0.06528278	-0.13669548	0.40106894***
	(0.87)	(1.58)	(1.07)	(2.18)	(0.29)	(0.21)	(4.04)
IMRMINT(%)	17.10885929	-0.18646143	92.06768633***	3.96050694	159.10109795***	66.92658710	84.58666200***
	(0.72)	(1.50)	(8.40)	(0.94)	(10.81)	(1.06)	(4.69)
SELLIN(%)	0.14474256	0.02445391	0.10788067*	-0.00292818	-0.19678407***	2.10365512***	0.03673475
	(1.14)	(0.55)	(1.77)	(0.50)	(3.28)	(4.38)	(0.95)
LPROD(%)	0.05864777***	0.00050372	0.00060488	0.00517260***	-0.00649804	0.01394930***	0.00205948**
	(6.50)	(0.20)	(0.99)	(4.64)	(0.95)	(4.26)	(2.48)
FDUM	3.80424659	13.68953965***	-2.10209844	7.59642041***	31.42665510***	8.17397242**	6.19834777
	(1.51)	(4.59)	(1.13)	(4.14)	(3.54)	(2.28)	(1.30)
LIBDUM	-1.35330721	0.72857810	1.68100070	0.67206318	5.83916745	-6.18288394**	6.03302306***
	(0.52)	(0.40)	(1.28)	(0.43)	(1.56)	(2.56)	(3.41)
Constant	-23.85594608***	-11.26635926***	-4.77420308***	-3.74926218**	-10.22080142**	-12.85426882***	-6.44103696***
	(4.60)	(6.05)	(2.69)	(2.33)	(2.12)	(3.50)	(3.61)
Sigma	8.358138	14.08387	23.06795	21.00137	22.02913	22.2322	35.23626

Dependent variable: Export intensity (%)

Independent variable	Coefficient (Robust Z value)						
	Paints & Varnishes	Paper & Products	Pharmaceutical	Plastic & Products	Rubber Products	Tea & Coffee	Textiles
Log likelihood	-297.80846	-1590.2432	-5056.8609	-3965.6415	-832.92973	-1558.9452	-11040.625
Wald chi2	57.35	124.33	318.90	139.34	266.78	352.91	225.37
Prob > chi2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Obs.	132	844	1437	1429	263	542	3125
Obs. with export	78	335	1049	802	173	313	2058
Obs. without export	54	509	388	627	90	229	1067

Note: Absolute value of z-statistics in parentheses; * significant at 10%; ** significant at 5%; *** significant at 1%

Appendix Table-A1 (contd...)

Dependent variable: Export intensity (%)

Independent variable	Coefficient (Robust Z value)		
	Transport Equipments	Tyres	Wearing Apparel
OFDINT(%)	0.43273167*	-0.56874454	1.72082494***
	(1.88)	(0.74)	(3.20)
AGE	0.15017961***	-0.32050763***	-0.16255540*
	(3.78)	(2.81)	(1.68)
AGE^2	-0.00380785***	0.00794352***	0.00008516
	(5.37)	(2.91)	(0.07)
SIZE	-0.00035132	-0.00075924	0.01149563
	(0.80)	(0.18)	(0.83)
$SIZE^2$	0.00000002	0.00000052	-0.00001276
	(0.31)	(0.32)	(1.08)
RDINT(%)	0.86323956***	3.28179277***	-8.95119784**
	(2.85)	(3.09)	(2.15)
TECHIM (%)	-0.66958481	4.18504194	-3.35315167**
	(1.51)	(1.20)	(2.55)
KIMPO(%)	0.00514347	0.23860091	0.44562760**
	(0.11)	(0.65)	(2.25)
IMRMINT(%)	1.30495593	138.15132656***	166.68898618***
	(0.76)	(11.20)	(5.51)

Dependent variable: Export intensity (%)			
Independent variable	Coefficient (Robust Z value)		
	Transport Equipments	Tyres	Wearing Apparel
SELLIN(%)	0.00645130	0.06876044	0.02007723
	(0.43)	(0.83)	(0.75)
LPROD(%)	0.01479046***	-0.00157721	-0.00042581
	(5.38)	(0.30)	(0.68)
FDUM	3.55642840***	-4.73738924**	13.98967162
	(4.34)	(1.98)	(1.42)
LIBDUM	0.02993543	-1.62910124	4.58840409
	(0.03)	(1.15)	(1.21)
Constant	-0.14950831	-2.96288225	6.37919605*
	(0.12)	(1.31)	(1.70)
Sigma	13.90077	9.52581	34.82442
Log likelihood	-4479.264	-593.73916	-3036.0433
Wald chi2	85.73	248.38	112.35
Prob > chi2	0.0000	0.0000	0.0000
Observations	1378	176	795
Obs. with export	1044	157	575
Obs. without export	334	19	220

Note: Absolute value of z-statistics in parentheses; * significant at 10%; ** significant at 5%; *** significant at 1%

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