Emerging TNCs:
trends, patterns and determinants of outward FDI by Indian enterprises

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This article analyses the trends, patterns and determinants of outward foreign direct investment (OFDI) by Indian enterprises, which has increased markedly since the onset of reforms. It finds that the sharp rise in OFDI since 1991 has been accompanied by a shift in the geographical and sectoral focus of Indian investments. It develops an analytical framework for explaining the probability of an Indian enterprise investing abroad and undertakes empirical analysis using a large exclusive dataset of Indian enterprises. The findings suggest that Indian enterprises draw ownership advantages from accumulated production experience, cost effectiveness of their production processes and adaptations to imported technologies made with technological effort, and sometimes with the ability to differentiate the product. Firm size exerts a positive but non-linear effect. Enterprises that are already engaged in exporting are more likely to be outward investors. Finally, policy liberalization of the 1990s has encouraged Indian enterprises to venture abroad.

1. Introduction

Growing outward foreign direct investment (OFDI) from some developing countries, especially in Asia, over the past decade represents another and perhaps more dynamic aspect of their growing economic integration with the world economy, in addition to their deepening trade linkages and FDI inflows. UNCTAD's *World Investment Report 2004* noted that India stood out among Asian developing countries, not only because of the recent significant increase in the OFDI flows but also because of "its potential to be a large outward investor" with annual outflows averaging $1 billion during the period 2001-2003 (UNCTAD 2004, p. 27). A growing number of Indian enterprises are beginning to see OFDI as an important aspect of their corporate strategies and are emerging as transnational corporations (TNCs) in their own right.

Although a few Indian enterprises were investing abroad in the mid-1960s (Lall, 1983, 1986), OFDI activity has became significant only since the onset of economic reforms in 1991. OFDI underwent a considerable change in the 1990s in terms not only of magnitude, but also the geographical focus and sectoral composition of the flows (Kumar, 2004). It has been argued that this change in the geographical and sectoral composition of OFDI has been in line with the change in their motives from essentially market-seeking to more asset-seeking ones to support exporting with a local presence (Kumar, 1996, 1998).

The theory of international operation of the firm – which evolved over the years with the contributions from Hymer (1976), Caves (1971) and Dunning (1979), among many others, posits that the ownership of some unique advantages having a revenue generating potential abroad combined with the presence of internalization and locational advantages leads to OFDI. Enterprises based in the industrialized countries have emerged as TNCs on the strength of ownership advantages derived from innovatory activity that is largely concentrated in these countries. Very little is known about the sources of the strength of enterprises based in developing countries, such as India, that enables overseas investment. It is of potential analytical and

policy interest to examine the determinants of the OFDI activity of Indian enterprises. However, the lack of corporate statistics giving information on OFDI from India has prevented such analysis. This article quantitatively analyses the patterns and determinants of OFDI activity of Indian enterprises using an exclusive panel dataset covering 4,271 Indian enterprises in manufacturing for the period 1989/90 to 2000/01. The rest of the article is organized as follows. Section two briefly discusses government policy towards OFDI and broad trends and patterns of Indian OFDI. Section three develops a framework for analyzing the determinants of Indian OFDI. Section four presents the results of the quantitative analysis and draws some inferences. Section five concludes the article with a few remarks on policy implications.

2. Liberalization and patterns of OFDI by Indian enterprises
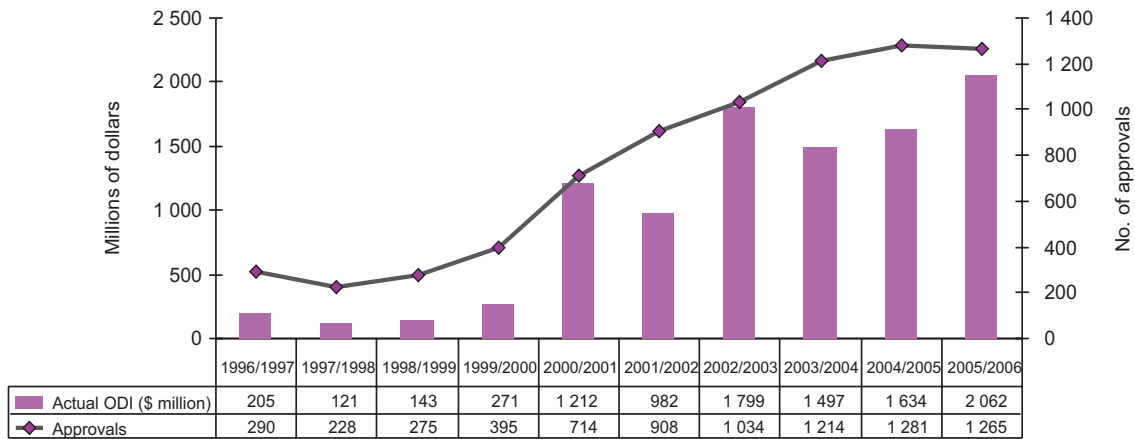
Alongside the liberalization of policy dealing with inward FDI, the policy governing OFDI has also been liberalized since 1991. The Guidelines for Indian Joint Ventures and Wholly Owned Subsidiaries Abroad, as amended in October 1992, May 1999 and July 2002, provided for automatic approval of OFDI proposals up to a certain limit that was expanded progressively from $2 million in 1992 to $100 million in July 2002. In January 2004, the limit was removed altogether and Indian enterprises are now permitted to invest abroad up to 100% of their net worth on an automatic basis.

The magnitudes of OFDI flows as well as their numbers have risen considerably over the past few years as shown in figure 1. In 2005/06, the latest year for which the data are available, India's OFDI flows crossed the $2 billion mark. A more detailed examination of the patterns of OFDI has been carried out with the help of the RIS database compiled from published and unpublished sources.[1] As is apparent from table 1, the pattern of OFDI activity has also undergone a considerable change in the post-liberalization period in terms of the geographical focus as well as the sectoral composition. In the

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[1] See annex 1 for details.

pre-1991 period, as much as 86% of Indian OFDI was concentrated in other developing countries. However, in the 1990s, an overwhelming (nearly 60%) proportion of these investments was directed to developed countries.

Figure 1. Indian outward FDI, 1996/1997 to 2005/2006
(Millions of dollars, number)

	1996/1997	1997/1998	1998/1999	1999/2000	2000/2001	2001/2002	2002/2003	2003/2004	2004/2005	2005/2006
Actual ODI ($ million)	205	121	143	271	1 212	982	1 799	1 497	1 634	2 062
Approvals	290	228	275	395	714	908	1 034	1 214	1 281	1 265

Source: India, Ministry of Finance.
*   Up to February 2006

Table 1. Geographical distribution of approvals of outward FDI from India, 1975-2001
(Millions of dollars)

Region	1975-19990				1991-March 2001			
	No	Equity	No (% of total)	Equity (% of total)	No	Equity	No (% of total)	Equity (% of total)
South-East and East Asia	67	80.79	29.26	36.32	379	399.35	14.79	9.37
South Asia	30	20.91	13.10	9.40	197	157.39	7.69	3.69
Africa	29	37.83	12.66	17.01	254	513.94	9.91	12.06
West Asia	19	21.54	8.30	9.68	185	376.5	7.22	8.83
Central Asia	4	23.2	1.75	10.43	49	50.99	1.91	1.20
Latin America & the Caribbean	2	0.58	0.87	0.26	36	180.6	1.41	4.24
Developing Countries	**165**	**191.52**	**72.05**	**86.09**	**1176**	**1719.82**	**45.90**	**40.35**
Western Europe	40	17.29	17.47	7.77	565	1450.2	22.05	34.02
North America	23	13.51	10.04	6.07	749	1029.52	29.23	24.15
Developed Countries	**64**	**30.89**	**27.95**	**13.89**	**1386**	**2542.6**	**54.10**	**59.65**
Total	**229**	**222.46**	**100**	**100**	**2562**	**4262.52**	**100**	**100**

Source: RIS database.

Similarly, table 2 shows that Indian OFDI before 1990 was largely concentrated in manufacturing, which accounted for over 65% of the flows. Since 1991, however, nearly 60% of these flows have gone to services. Within these broad groups, OFDI is concentrated in industries like drugs and pharmaceuticals in the manufacturing sector, and IT, communication and software and media, broadcasting and publishing services in the services sector, viz. areas where Indian enterprises have a competitive advantage.

Table 2. Sectoral composition of outward FDI flows from India, 1975- 2001
(Millions of dollars)

Sector	1975-19990				1991-March 2001			
	No	Equity	No (% of total)	Equity (% of total)	No	Equity	No (% of total)	Equity (% of total)
Exploration & refining of oil	1	0.02	0.43	0.01	5	61.10	0.20	1.43
Exploration of minerals & precious stones	2	4.02	0.87	1.81	2	0.04	0.08	0.00
Extractive	**3**	**4.04**	**1.30**	**1.82**	**7**	**61.14**	**0.27**	**1.43**
Oilseeds, food products & processing	10	9.06	4.35	4.07	91	69.34	3.55	1.63
Textiles and garments	12	9	5.22	4.05	158	112.56	6.17	2.64
Wood, pulp and paper	3	11.51	1.30	5.17	11	17.72	0.43	0.42
Leather, shoes & carpets	4	20.55	1.74	9.24	63	28.41	2.46	0.67
Chemicals, petro-chemicals & paints	18	7.82	7.83	3.52	94	92.13	3.67	2.16
Drugs & pharmaceuticals	8	4.72	3.48	2.12	163	270.24	6.36	6.34
Rubber, plastic & tyres	6	2.32	2.61	1.04	45	85.80	1.76	2.01
Cement, glass & building material	2	4.19	0.87	1.88	58	79.78	2.26	1.87
Iron and steel	10	16.17	4.35	7.27	47	50.65	1.84	1.19
Electrical & electronic equipment	6	2.11	2.61	0.95	63	90.86	2.46	2.13
Automobiles and parts thereof	6	3.21	2.61	1.44	26	24.00	1.02	0.56
Gems & jewellery	1	0	0.43	0.00	56	17.85	2.19	0.42
Electronic goods & consumer durables	2	0.27	0.87	0.12	29	20.75	1.13	0.49
Beverages & tobacco	7	3.24	3.04	1.46	37	142.05	1.44	3.33
Engineering goods & metallurgical items	18	8.53	7.83	3.83	84	66.24	3.28	1.55
Fertilizers, pesticides & seeds	5	39.93	2.17	17.95	27	326.96	1.05	7.67
Miscellaneous	10	2.59	4.35	1.16	184	183.58	7.18	4.31
Manufacturing	**128**	**145.22**	**55.65**	**65.28**	**1236**	**1678.92**	**48.26**	**39.39**
IT, communication & software	6	5.64	2.61	2.54	761	1354.49	29.71	31.78
Hotels, restaurants, tourism	24	24.96	10.43	11.22	53	112.45	2.07	2.64
Civil Contracting & engineering services	6	1.8	2.61	0.81	44	16.57	1.72	0.39
Consultancy	7	0.43	3.04	0.19	31	8.07	1.21	0.19
Trading & marketing	27	12.47	11.74	5.61	146	96.45	5.70	2.26
Media broadcasting & publishing	2	0.01	0.87	0.00	61	739.64	2.38	17.35
Financial services & leasing	17	26.32	7.39	11.83	96	95.49	3.75	2.24
Transport services	3	0.55	1.30	0.25	44	48.33	1.72	1.13
Other professional services	7	1.05	3.04	0.47	82	50.69	3.20	1.19
Services	**99**	**73.2**	**43.04**	**32.91**	**1318**	**2522.17**	**51.46**	**59.17**
Total	**230**	**222.45**	**100.00**	**100.00**	**2561**	**4262.23**	**100**	**100**

Source: RIS database.

It has been argued that the OFDI activity in the pre-1991 period was of the market-seeking type where Indian enterprises established a presence in developing countries on the basis of their intermediate technologies in relatively low technology industries such as light engineering (Lall, 1983, 1986; Kumar, 1996). Since the 1990s, however, OFDI has been undertaken by Indian enterprises to improve their global competitiveness with a local presence in major markets, acquiring strategic assets and access to markets in emerging trading blocs in the context of the increased emphasis on outward orientation as part of the reforms (Kumar 1996, 1998). Therefore, it is concentrated in countries that are key destinations for Indian exports (viz. EU and North America) and in sectors in which they are trying to develop their competitive advantages.

A number of Indian enterprises are establishing growing webs of overseas operations. They include pharmaceutical companies such as Ajanta Pharma (with 18 overseas investment approvals by 2001), Ranbaxy Laboratories (14 approvals) and Dr Reddy's Laboratories (9 approvals); IT software development enterprises such as NIIT Ltd. (15 approvals), Aptech (12 approvals), Infosys Technologies (10 approvals), Mastek (9 approvals); engineering companies like L&T, Voltas and Usha Beltron (11 approvals each); Asian Paints (13 approvals); and Essel Packaging (12 approvals), among others. Of late, Indian enterprises have also started using overseas acquisition as a mode of establishing a foreign presence. The motives of the acquisitions are often similar to those of greenfield entries (viz. building marketing networks in foreign markets), but they are sometimes strategic with a view to filling gaps in their capabilities or obtaining access to technologies, brands, natural resources and other assets. Hence, these are also generally concentrated in the areas of the competitive advantages of Indian companies. For instance, Ranbaxy acquired RPG Aventis in France, Dr Reddy's Labs acquired Beetapharm in Germany; Cadila acquired the generics business of Alpharma in France; Asian Paints acquired Berger International, thus obtaining a foothold in 22 countries across the world; Tata Steel set up an affiliate in South Africa and acquired NatSteel in Singapore;

Tata Tea acquired Tetley of the United Kingdom, one of the world's biggest tea companies for $430 million, thus gaining the control of a full value chain in tea processing; and Titan Industries has set up a network of foreign affiliates in Europe and Asia to conduct its overseas business and build its brand internationally. Indian companies are also acquiring stakes abroad to strengthen their access to resources. These include ONGC Videsh Ltd.'s investments in/acquisitions of oil-related equity abroad; the Aditya Birla Group's acquisition of two copper mines in Australia; and, Reliance Group's acquisition of Flag International.

3. Determinants of OFDI: analytical framework and hypotheses

According to the ownership, location and internalization (OLI) theory, a prerequisite for a firm to become international is the ownership of unique advantages that outweigh the disadvantages of being "foreign" in overseas markets. Therefore, a key question in identifying the determinants of overseas investment is the nature of the ownership advantages or unique assets of Indian enterprises that allow their outward expansion. It has been argued that the main source of the advantage enjoyed by Indian enterprises was their ability to absorb, adapt and build upon the technologies imported from abroad rather than produce completely novel technologies. Indian enterprises have accumulated considerable learning and technological capabilities as well as managerial and technical expertise, during the first four decades of independence, when the Government pursued a strategy of import substitution industrialization (Lall, 1986; Kumar, 1996). Sometimes, these included adaptation of imported designs to make them appropriate for local conditions and more cost-effective, given their experience of dealing with highly price conscious and demanding customers in India. A number of Indian pharmaceutical and chemical enterprises developed cost-effective processes of known chemical entities, helped by the absence of product patents in India. With this capability, they began to enter the generics market in the United States and other developed countries after the expiry of product

patents. Therefore, the strengths of Indian enterprises are likely to be concentrated in relatively standardized and mature technologies in industries characterized by competition based on price. They are not likely to move abroad primarily on the strength of innovative proprietary technologies or globally recognized brand names, as with established developed country TNCs. In what follows, we develop a model for explaining the probability of an Indian enterprise investing abroad in the light of these observations.

To explain the OFDI decision of Indian manufacturing firms, we have formulated a simple qualitative response model where the dependent variable takes the value one if the enterprise has invested abroad and zero otherwise. Denoting X_{it} as a vector of k ($k=1...k$) elements capturing ownership advantages and other factors explaining the ith firm's overseas investment decision in the tth time period. These factors are expected to provide the outward investing Indian enterprise some edge over local rivals in order to overcome the cost of "foreignness" in the host location. Thus, our empirical model is as follows:

$$L i_i = X_{it} \beta + u_{it} \qquad [1]$$

where β is the vector of logit coefficients and u_{it} is a normally distributed error term. L_i is the log of odds ratio, viz. the probability of an Indian enterprise undertaking OFDI. L_i viz., logit is linear in X and in the parameters.

We now identify different factors in X_{it} that are the sources of the ownership advantages for Indian enterprises investing abroad. We have specified X_{it} to include three sets of factors: firm-specific intangibles, industry-specific characteristics and policies. The firm-specific intangibles, in turn, are assumed to be dependent upon a host of firm-specific characteristics such as age, technology, product differentiation, managerial skill, firm size, export orientation and ownership. The theoretical basis for including these variables in the model is provided in the following discussion.

3.1 Ownership advantages of enterprises

Here, we identify certain variables that can be measured objectively to capture the possible sources of the ownership advantages of Indian enterprises.

Accumulated learning and managerial skills

Accumulated production experience is a source of considerable learning and absorption of know-how. This learning is a source of incremental innovations on the shop floor that are not captured by indicators of more formal innovatory activity. Accumulated experience also helps an enterprise acquire managerial skills, knowledge of the market and reputation, among other advantages. These advantages can be valuable for overseas investments especially in relatively mature and standardized industries, if not in more skill- or knowledge-intensive ones. Hence, other things being equal, we expect accumulated learning (*LEARNING*) measured in terms of the years the enterprise has been in production to affect favourably its probability of undertaking OFDI.

Technological effort

Further technological effort at the enterprise level is often required for absorption and adaptation of knowledge imported from abroad before it can lend an advantage to the firm, except possibly in very mature and low technology industries. Technological effort is also likely to capture the ability of the enterprises to replicate processes and methods at a foreign location. It is also a source of the cost effective process development that Indian firms have been engaged in, in the chemicals and pharmaceuticals industries. Hence, technological effort (*TECHEFFORT)* of the enterprises, measured in terms of R&D intensity is posited to increase their probability of being outward investors.

Product differentiation

Developing country firms are not likely to be strong in terms of the ability to differentiate their products with brand/

trade names having good reputations worldwide. However, enterprises that are able to differentiate their product and build their brand names in domestic markets would be better placed to tap the opportunities abroad than others. This ability of branding (*BRANDS)* or differentiating the product, measured in terms of advertising intensity, may be valuable, at least in certain knowledge-intensive industries where quality enjoys a relatively high premium. Hence, it may favourably affect the probability of OFDI being undertaken by the enterprises.

Cost effectiveness of processes

As argued earlier, one of the unique advantages enjoyed by Indian enterprises could be their ability to bring about adaptations and incremental changes to production processes to make them more cost effective, in view of their experience of operating in a highly price competitive environment. Hence, we expect the ownership of cost effective processes or methods of production (*COSTEFFECT)* measured in terms of profitability to be positively associated with the probability of investing abroad.

Firm size

Larger firms are more likely to venture abroad than smaller firms, because they often have better access to market information and possess financial strength, allowing them to bear greater risks. A number of studies have found that firm size is an important determinant of overseas operations for developed as well as developing country enterprises (Caves, 1996). Hence, firm size (*SIZE)* is posited to have a favourable effect on the probability of the enterprise crossing the border. The effect of size, however, is generally observed to be non-linear in many firm level studies of R&D activity and export performance. To check the possible non-linearity of the effect, a quadratic term of *SIZE* will be used in the estimation.

Export-orientation

In the product cycle theory of Vernon (1966), overseas investment is postulated to follow the initial exploration of overseas markets through exporting. It has been argued that the recent boom of overseas investment by developing country enterprises has been motivated by the need to support exporting with a local presence (i.e. developing marketing networks, providing after-sales services etc.) (Kumar, 1998). Exporting activity enhances the international competitiveness of the enterprise and may also provide valuable information on emerging opportunities in other countries. Hence, the export-intensity (*EXPORT)* of Indian enterprises is posited to be positively linked to the probability of establishing overseas operations. One may argue that there could be a simultaneity bias in the export intensity and overseas operations as the network of overseas operations may also generate exports for the firm. Studies for developed countries find exports and OFDI to be related.[2] Indian enterprises, however, appear to be at a rather early stage of evolution on the international scene with overseas operations following exports. In any case, a verification of simultaneity bias in the present context is constrained by the limited availability of methodological tools.

Technological dependence

OFDI activity is posited to be based on firms' own "created" assets, which may be adapted from knowledge imported in the past. They are unlikely to have an edge over other enterprises in foreign markets on the basis of imported know-how and imported equipment. Therefore, the dependence of enterprises on imported technology (*TECHIM)* and capital goods *(MACHIM)* is likely to be negatively related to the probability of being outward investors.

Local ownership

The overseas expansion of operations from India is likely to be limited to domestic enterprises, as foreign owned

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[2] See, for instance, Lipsey and Weiss (1984) and Liu and Graham (1998).

enterprises in India come to India primarily to explore the Indian market. Any overseas expansion of foreign affiliates in India would be subject to corporate decisions at headquarters. Hence, a dummy identifying foreign owned firms (*FOREIGN)* is likely to be negatively related to overseas expansion.

3.2 Liberalization of outward investment policy

In the pre-1991 phase, government policy towards OFDI was rather restrictive and required overseas investments to be only through the capitalization of exported machinery and know-how fees. Outflows of liquid investment were generally restricted. As noted above however, the policy has been progressively liberalized since 1991 along with the policy governing inward investment. Hence, a dummy identifying the 1991 liberalization (*LIBERAL)* is expected to have a positive effect on the probability of undertaking OFDI.

3.3 Industry effects

The incidence of overseas activity is expected to vary across industries because of industry-specific comparative advantages and the specialization of the country. In particular, Indian enterprises are likely to be active abroad in industries that require adaptations, large inputs of skilled manpower or managerial resources. The inter-industry differences in the intensity of outward orientation are controlled in the estimation with the help of a set of industry dummies (*INDDUM$_n$*).

Having identified various components of vector X_i, we may now expand equation [1] as follows:

$$\log\left(\frac{P_i}{1-P_i}\right) = \beta + \beta_1 LEARNING + \beta_2 SIZE + \beta_3 SIZE^2 + \beta_4 TECHEFFORT + \beta_5 TECHIM$$
$$+ \beta_6 MACHIM + \beta_7 BRANDS + \beta_8 COSTEFFECT + \beta_9 EXPORT$$
$$+ \beta_{10} FOREIGN + \beta_{11} LIBERAL + \sum_n \delta_n INDDUM_n + u_{it} \qquad [2]$$

4. Empirical estimations

The model as expressed in equation [2] is estimated using an exclusive RIS dataset described earlier, compiled by pooling company annual report statistics for 4,271 Indian manufacturing firms listed on stock exchanges from the Centre for Monitoring Indian Economy (CMIE)'s Prowess database and linking it with the OFDI information gathered from various published and unpublished sources for 1988/89 to 2000/01. (See annex for more details and measurements of variables.)

The logit model has been estimated using the maximum likelihood method with robust standard errors. The statistical package STATA provides the robust standard errors using the Huber-White sandwich estimators that can effectively deal with problems of not meeting some assumptions like normality, homoscedasticity, or some observations that exhibit large residuals, leverage or influence. Standardized logit coefficients, which are free of scale and hence are useful in assessing the relative strength of the independent variables in addition to marginal effects, are estimated.

Full-sample estimations

Table 3 presents estimation results for model [2] for the full sample. The overall fitted model in terms of Wald Chi-squares is statistically highly significant. The explanatory power in the case of total manufacturing is about 16%. The performance of individual variables is discussed below.

The variable, *LEARNING*, capturing accumulated learning by the firm comes up with a strong positive effect on the probability of Indian enterprises undertaking OFDI. Therefore, accumulated learning from production experience is an important source of ownership advantages for Indian enterprises. It is likely to give them an edge, especially in other developing countries and in relatively low technology and mature industries.

Table 3. Determinants of probability of outward investments of Indian enterprises

Independent Variables	Coefficients	Robust Z-Statistics
LEARNING	0.01404869***	14.87
TECHEFFORT	0.04872711***	2.74
BRANDS	0.02689367*	1.66
COSTEFFECT	0.00017099	1.51
SIZE	0.00287626***	22.74
SIZE2	-0.00000034***	10.6
EXPORTS	0.01977054***	25.28
FOREIGN	-1.35730201***	9.29
TECHIM	-0.00010668	0.39
MACHIM	-0.00161704***	3
LIBERAL	0.46447587***	6.77
DTEXTIL&LEATHER	0.41846904***	4.73
DWOOD&PAPER	0.15081544	0.96
DRUBBER&PLASTICS	0.59830256***	5.27
DNONMETALICMINERAL	-1.49406861***	3.19
DCEMENT&GLASS	0.56007601***	4.22
DBASICMETAL	0.35157936***	3.28
DCHEMICALS	0.29241594***	2.73
DELECTRICALS	0.51836462***	4.24
DMACHINERY	0.28631712**	2.08
DAUTOMOTIVE	-0.09043282	0.57
DPHARMACEUTICALS	0.97833303***	9.34
DELECTRONICS	0.40439671***	2.9
Constant	-4.28644974***	39.96
Pseudo R-square	0.1564	
Wald chi2	1723.8	
Log likelihood	-6688.3925	
Number of obs.	29051	

Source: Estimations as explained in the text.

Note: * Significant at 10%; ** Significant at 5%; *** Significant at 1%. Food & beverages products has been treated as the base industry.

The variable capturing the technological effort of enterprises, *TECHEFFORT*, turns out to have a significant positive effect on the probability of OFDI by Indian enterprises as expected. Enterprise level technological effort, as represented by in-house R&D activity, leads to adaptations and innovations in the products and processes that could often lend Indian enterprises an advantage abroad. Similarly, *BRANDS*, capturing the ability of Indian enterprises to differentiate their products, certainly increases the likelihood of undertaking OFDI.

As expected, *SIZE* and *SIZE²* have statistically significant positive and negative impacts respectively, suggesting a favourable but a non-linear effect of firm size on the probability of undertaking OFDI. Size increases the probability of undertaking OFDI up to a limit beyond which it turns negative.

As expected, *EXPORTS*, a variable capturing the export intensity of enterprises, has a positive effect on the probability of OFDI being undertaken. It appears that a part of Indian OFDI is undertaken by exporters to support their exporting activity with a local presence.

The two variables capturing technological dependence, viz. *TECHIM* and *MACHIM*, have expected negative signs and the latter also reaches statistical significance. Obviously, OFDI activity is not possible on the basis of borrowed knowledge and capital goods alone. An enterprise needs to develop a base of created assets to be able to move abroad. Similarly, *FOREIGN*, a variable capturing the foreign ownership of Indian enterprises, also comes up with a statistically significant negative effect indicating that foreign TNCs come to India for exploring the Indian market and not to go abroad from India. Outward investment activity is undertaken by Indian enterprises on the strength of their own created assets.

LIBERAL, the variable capturing the effect of the 1991 liberalization of the Government's policy towards investment – inward as well as outward – is robustly positive. Liberalization has removed the policy constraints on OFDI in addition to promoting the external orientation of enterprises.

The sectoral dummy variables are generally significant with a positive sign but, being intercept coefficients, they only indicate that compared to the food and beverages industries, these industries have a better probability of OFDI. A more direct analysis of inter-industry patterns of OFDI is carried out with sectoral estimations, which are reported later.

Technology intensity and determinants of OFDI: sub-sample estimations

The full sample estimations were followed up with separate estimations for four sub-samples of Indian manufacturing, grouped by the technology-intensity of the industry following the revised OECD technological classification (see annex), viz. high technology, medium-high technology, medium-low technology and low technology. We also estimate the determinants of the probability of OFDI being undertaken for each of the 13 broad industry groups that are summarized in annex table 1. These sub-sample estimations may provide additional insights into the relative importance of the ownership advantages across industries. The estimations summarized in table 4 and annex table 1 are broadly similar to the full sample estimation except for some variations across technology classes and industries in terms of the relative importance of individual variables. Hence, we confine ourselves to a discussion of the major differences from the general pattern.

LEARNING continues to have a positive and statistically significant effect on the probability of OFDI in all technology classes except for high technology industries where it has actually a significant negative effect. Apparently, because of rapidly changing technology, accumulated experience is not an advantage in high technology industries. Younger firms are perhaps more dynamic and flexible in responding to the challenges of fast changing technologies in these industries. At the industry level, 8 out of the 13 industries (viz. textiles and leather, rubber and plastics, cement and glass, metals, chemicals, electrical machinery, non-electrical machinery, and transport equipment) follow the general pattern of having a significant positive effect on OFDI. In the remaining industries (food and

beverages, pharmaceuticals, electronics, wood and paper, and non-metallic mineral products), it has a negative effect.

Table 4. Determinants of probability of outward investments of Indian enterprises: sub-samples by technology-intensity

Independent Variables	High Technology	Medium-high Technology	Medium-low Technology	Low Technology
LEARNING	-0.01225145**	0.01983054***	0.02839336***	0.00601868***
	(2.55)	(9.35)	(12.94)	(4.28)
TECHEFFORT	0.03825016	0.03738665*	0.14036360**	-0.04089900
	(1.60)	(1.92)	(2.51)	(0.34)
BRANDS	0.00070178	0.17323670***	0.01918220	0.01431513
	(0.09)	(9.81)	(0.67)	(1.32)
COSTEFFECT	0.00035855	0.00002231	0.00004253	0.00031543**
	(1.07)	(0.34)	(0.38)	(2.48)
SIZE	0.00721355***	0.00220079***	0.00218862***	0.00524463***
	(9.05)	(11.30)	(13.66)	(16.23)
SIZE2	-0.00000220***	-0.00000025***	-0.00000026***	-0.00000054***
	(3.78)	(5.41)	(9.81)	(13.60)
EXPORT	0.01846809***	0.02167980***	0.02491160***	0.01883140***
	(8.23)	(12.08)	(13.09)	(16.37)
FOREIGN	-1.79946462***	-1.79051006***	-3.31540517***	-1.25973224***
	(4.61)	(7.54)	(3.38)	(3.11)
TECHIM	0.00089860	-0.01566338	-0.00502218	-0.07882066
	(1.30)	(1.33)	(1.11)	(0.49)
MACHIM	-0.00169882**	-0.00110926	-0.00028239	-0.00134145
	(2.12)	(1.51)	(0.95)	(1.14)
LIBERAL	0.75100189***	0.32023588***	0.49989376***	0.32389356***
	(3.27)	(2.59)	(3.71)	(2.75)
Constant	-4.16541252***	-4.01165425***	-4.02677182***	-4.21724622***
	(15.93)	(26.94)	0	(29.53)
Pseudo R-square	0.2318	0.1608	628.5500	0.1747
Wald chi2	345.29	526.93	-1649.18	567.08
Log likelihood	-812.3679	-1776.4646	7227.0000	-2243.1509
Number of obs	3 198	8 282		10 344

Source: Estimations as explained in the text.
Note: Robust z-statistics in parentheses; * Significant at 10%; ** Significant at 5%; *** Significant at 1%. Relevant industry dummies have been included in the estimations but suppressed here.

Enterprise level technological effort (*TECHEFFORT*) has a statistically significant positive effect in the case of the medium-high technology and medium-low technology groups. However, it has a coefficient that is not significantly different from zero in statistical terms in the case of the low technology

group. Apparently, in these industries, because of mature and standardized technology, the ownership advantage based on accumulated production experience is generally adequate. In the high technology group, *TECHEFFORT* just misses the statistical significance, suggesting that in these industries, local technological effort alone may not be adequate and firms would need other advantages to be able to operate abroad. In the estimations at the level of individual industries, *TECHEFFORT* has a significant positive effect in the case of food and beverages, non-metallic metal products, chemicals, non-electrical machinery and pharmaceuticals; and a positive and nearly significant effect in rubber and plastics, cement and glass, automotive, electrical machinery and electronics. Its effect is not significantly different from zero only in those industries that are highly mature like textiles, leather and metals. It is therefore clear that the enterprise level technological effort of the firms is an important source of their unique ownership advantages.

BRANDS also has a positive impact on OFDI in a significant positive manner only in the case of the medium-high technology group. In other groups, its coefficient is not significantly different from zero. Evidently, the ability of Indian enterprises to differentiate their products as a source of the advantage has been effective only in selected industries that are characterized by moderate technology intensity. Industry level estimations suggest that product differentiation or branding is a source of the advantages for Indian enterprises in food and beverages, textiles and clothing (nearly significant), cement and glass, chemicals, electrical machinery, non-electrical machinery, and pharmaceuticals. It is clear that enterprises that develop their brand identities and pay attention to their quality do better in international markets.

Finally, *COSTEFFECT* is relevant only in the case of the low technology group. At the industry level, the cost advantage has a strong positive effect in the case of textiles and leather, cement and glass, chemicals and electronics. Therefore, the experience of Indian enterprises in developing cost effective processes and products could be a source of the advantages in their overseas forays, at least in certain industries.

The technology dependence variables follow the general pattern of having either a negative or not significantly different from zero effect except in the pharmaceuticals industry, for which *TECHIM* has a significant positive effect. The Indian pharmaceuticals industry has a long tradition of building on knowledge imported from abroad and absorbing other spillovers with its own technological effort. Hence, it could be interpreted as indicating that a source of the unique ownership advantages of Indian enterprises in this industry is in the adaptation of imported know-how as reflected by the significant positive effect of both their own technological efforts as well as imported knowledge variables.

A striking finding is the consistent performance of *SIZE*, *FOREIGN*, *EXPORT* and *LIBERAL* across different technology classes and across most of the industries. Apparently, economic reforms and policy liberalization have had an important effect on the outward orientation of Indian enterprises. Export-orientation exposes Indian enterprises to the opportunities available in foreign markets and hence facilitates OFDI.

5. Concluding remarks

This article has analysed the trends, patterns and determinants of OFDI by Indian enterprises. OFDI from India has increased notably over the past decade following the reforms and liberalization of policies undertaken by the Government since 1991. OFDI has emerged as an important mechanism through which the Indian economy is integrated with the global economy, along with growing trade and inward FDI.

The sharp rise in OFDI since 1991 has been accompanied by a shift in the geographical and sectoral focus. Indian OFDI is now more evenly distributed across the world compared to the pre-1990 period when it was heavily concentrated in poorer developing countries. Indian companies have also diversified sectorally to focus on areas of the country's emerging comparative advantages such as in pharmaceuticals and IT software. Indian enterprises have also started to acquire

companies abroad to obtain access to marketing networks, brands, natural resources, technology and other strategic assets.

This article developed a framework for explaining the probability of an Indian enterprise investing abroad. This analytical framework was applied to assess the probability of OFDI being undertaken by Indian enterprises with an exclusive panel dataset covering over 4,270 manufacturing companies for the 1989-2001 period. The empirical estimations suggest that in line with hypotheses, Indian enterprises draw their ownership advantages from their accumulated production experience, the cost effectiveness of their production processes and other adaptations to imported technologies made with their technological effort, and sometimes with their ability to differentiate the product. Firm size exerts a positive but a non-linear effect. Enterprises that are already engaged in exporting are more likely to be outward investors. Outward orientation, however, is unlikely to arise if the enterprise is heavily dependent on foreign technology, machinery or under foreign ownership. Finally, the policy liberalization of the 1990s is shown to have pushed Indian enterprises abroad.

The sub-sample estimations highlighted some variations across industries in terms of the relative importance of explanatory variables. In the low technology industries, accumulated production experience and cost effectiveness are sufficient, and enterprise level technological effort does not appear to be crucial for OFDI. In high-technology industries, younger enterprises rather than those with longer production experience appear more dynamic, given their technological dynamism and flexibility in responding to the rapidly changing technological frontier in these industries.

The key lesson emerging from the above analysis is the importance of enterprises' own technological efforts and the focus on absorption and adaptation of knowledge that gives them the confidence to move beyond the confines of the domestic market. Enterprises also need to pay attention to building brand identities and position themselves as providers of qualitatively

superior products or services. Firm size is certainly an advantage in international markets at least up to a level. Hence, a degree of consolidation of fragmented capacity in some industries may be useful. Finally, an enabling policy framework and macroeconomic environment, such as those that are developing with the progressive liberalization of policy, do seem to foster an increased external orientation of Indian enterprises.   ■

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Annex

Dataset and Measurements of Variables

The study uses the exclusive RIS database on Outward Investments of Indian Enterprises. The RIS database has been compiled mainly from the published data of the India Investment Centre (IIC), supplemented by unpublished data from the Ministry of Commerce and the Ministry of Finance, Government of India. The dataset contains information on Indian enterprises investing abroad, the sectors of investment, the amount and share of Indian ownership, year of approval of projects and the status of implementation of the projects. The constructed database on Indian investment abroad over the period 1975 to March 2001 was then merged with the firm-level financial data obtained from the Prowess Data Base (2002) of the Centre for Monitoring Indian Economy (CMIE). The outcome is a panel dataset covering 4,271 Indian enterprises in manufacturing for the period 1989/90 to 2000/01.

Variable Measurements

OFDI : A dummy variable for Indian firms taking value 1 for firms undertaking O-FDI and 0 otherwise.

LEARNING $_{it}$: 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.

TECHEFFORT $_{it}$: 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 the year t.

MACHIM $_{it}$: Imports of capital goods by ith firm as a percentage of sales in tth year.

BRANDS $_{it}$: Advertising expenditure of the ith firm as a percentage of sales in the year t.

COSTEFFECT $_{it}$: The ratio of profit before tax (PBT) of the ith firm to net worth (%) in tth year.

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

FOREIGN: Dummy variable for majority foreign owned firm taking value 1 for firms with 25 % or more foreign equity participation and 0 otherwise.

LIBERAL: Liberalization dummy taking 1 for post-reform period 1993-94 to 2000-01 and 0 for the pre-reform period 1989-90 to 1992-93.

$INDDUM_j$ denotes sectoral dummies included in the estimation.

Technological Classification of Indian Manufacturing Industries

Technology category		*Industry*
Low technology	1.	Food, beverages & tobacco products
	2.	Textile, leather & footwear
	3.	Wood, paper & paper products
Medium-low technology	4.	Rubber & plastic products
	5.	Other non-metallic mineral products
	6.	Cement & glass
	7.	Basic metal & metal products
Medium-high technology	8.	Chemicals excluding pharmaceuticals
	9.	Electrical machinery
	10.	Non-electrical machinery
	11.	Automotives
High technology	12.	Pharmaceuticals
	13.	Electronics

Note: The above technological classification is based on OECD Science, Technology and Industry Scoreboard, 2001.

Annex table 1. Determinants of Probability of Outward Investments of Indian Enterprises: Industry Estimations

Industry Independent Variables	Food, bev. & tobacco	Textiles & leather	Wood & paper	Rubber & plastics	Other non- metallic mineral products	Cement & glass	Metals
LEARNING	-0.00747009**	0.01005395***	-0.00623802	0.02406590***	-0.90597974***	0.03698831***	0.02823189***
	(2.39)	(5.98)	(0.93)	(6.65)	(3.07)	(6.28)	(9.39)
TECHEFFORT	0.10175822**	-0.07647313	-7.35617829**	0.07046386	6.66783085***	0.44935156	-0.00368027
	(2.13)	(1.04)	(2.32)	(1.55)	(2.91)	(1.38)	(0.02)
BRANDS	0.02134473	0.01685106	-0.07653573	-0.02291589	-5.25637265**	0.26485907***	-1.91587103***
	(1.61)	(1.48)	(0.78)	(0.44)	(2.04)	(2.74)	(2.77)
COSTEFFECT	0.00012532	0.00126456**	0.00194693	-0.00052320**	-0.00687360*	0.00066816*	0.00016222
	(1.39)	(2.25)	(1.44)	(2.03)	(1.82)	(1.74)	(0.30)
SIZE	0.00555460***	0.00892902***	0.00430171***	0.00249933***	0.68481605	0.00409309***	0.00180214***
	(10.37)	(12.18)	(2.64)	(7.69)	(1.29)	(6.82)	(9.05)
SIZE2	-0.00000054***	-0.00000474***	0.00000165	-0.00000033***	-0.02590137	-0.00000104***	-0.00000021***
	(8.95)	(5.42)	(1.12)	(4.65)	(0.99)	(4.42)	(7.08)
EXPORTS	0.01029237***	0.02310179***	0.03808611***	0.02187285***	0.05081438*	0.02795647***	0.02733743***
	(4.52)	(15.00)	(4.42)	(7.84)	(1.87)	(4.07)	(9.11)
FOREIGN	-2.02568237**	-0.50660449		-2.76729307***			
	(2.33)	(1.16)		(2.82)			
TECHIM	-0.71152894	-0.01886787	-0.02065755	-0.04656017		-0.00376338*	0.01053096
	(1.42)	(0.17)	(0.39)	(0.80)		(1.69)	(0.60)
MACHIM	-0.00298487	-0.00115727	-0.01403288	-0.00024432	0.00011892	-0.00008515	-0.00100808
	(1.52)	(0.97)	(0.69)	(0.28)	(0.06)	(1.15)	(0.67)
LIBERAL	0.11459941	0.41448666***	0.28905317	0.38381885		0.76956380*	0.45745358**
	(0.53)	(2.65)	(0.76)	(1.64)		(1.93)	(2.42)
Constant	-3.48877965***	-4.38465087***	-3.63931168***	-3.78051629***	-5.24456562**	-5.20789075***	-4.10096000***
	(16.02)	(26.53)	(9.47)	(15.20)	(2.31)	(11.93)	(20.10)
Pseudo R-square	0.1892	0.1911	0.2124	0.1521	0.5842	0.2698	0.1879
Wald chi2	162.21	561.1	87.99	199.84	26.96	161.6	331.72
Log likelihood	- 690.1580	-1 302.3585	- 178.9644	- 573.3642	- 9.4755	- 261.4862	- 764.0534
Number of obs	3 890	5 249	1 158	2 343	178	1 197	3 317

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Annex table 1. Determinants of Probability of Outward Investments of Indian Enterprises: Industry Estimations (concluded)

Industry Independent Variables	Chemicals	Electrical Machinery	Non-electrical Machinery	Transport equipment	Pharmaceuticals	Electronics
LEARNING	0.01855550***	0.02306959***	0.01981240***	0.01061348***	-0.02737287***	-0.04630854***
	-4.85	-4.79	-4.32	-2.64	-3.15	-4.52
TECHEFFORT	0.09014240**	0.15454497	0.02738876*	0.1145422	0.03469031*	0.0493323
	-2.07	-1.57	-1.75	-1.36	-1.8	-1.56
BRANDS	0.18287934***	0.17951839***	0.21412778***	0.019236	0.10029626***	-0.16750628*
	-7.91	-2.75	-3.51	-0.12	-3.02	-1.96
COSTEFFECT	0.00075075**	-0.00041418	0.00003403	-2.435E-05	0.00008224	0.00159732*
	-2.55	-0.89	-0.37	-0.34	-0.11	-1.65
SIZE	0.00336443***	0.00467657***	0.00793652***	0.00149688***	0.01719057***	0.00423678***
	-12.08	-5.77	-7.47	-7.74	-11.37	-6.07
SIZE2	-0.00000054***	-0.00000187***	-0.00000436***	-0.00000012***	-0.00000828***	-0.00000060*
	-5.5	-3	-4	-5.06	-7.29	-1.68
EXPORTS	0.01934662***	0.02309955***	0.01840023***	0.03972878***	0.01749393***	0.01486872***
	-7.79	-5.43	-2.99	-6.22	-5.05	-4.07
FOREIGN	-2.42700671***		-1.48559935***	-0.9090368	-3.31551633***	-1.57986211***
	-5.62	-0.021247	-3.66	-1.3	-5.3	-2.63
TECHIM	0.0109369	-0.43	-0.01617508*	-0.89579637**	0.18339891*	-0.04626719
	-0.49	-0.00210436	-1.85	-2.56	-1.87	-0.59
MACHIM	-0.00018232	-0.65	-0.00036276	-0.0062457	-0.01022129*	-0.00088192
	-0.72	0.74848122**	-0.08	-0.67	-1.92	-0.55
LIBERAL	0.20719872	-2.41	0.62088083**	-0.49205187**	0.09137886	1.45054567***
	-1.04	-4.60694798***	-1.97	-2.11	-0.36	-3.41
Constant	-4.11667846***	-12.69	-4.69081972***	-3.14900133***	-3.34818376***	-3.67815205***
	-18.9	0.1764	-13.81	-11.98	-11.72	-8.32
Pseudo R-square	0.2334	163.96	0.1799	0.1838	0.3583	0.2093
Wald chi2	319.84	-357.47414	153.34	140.54	219.81	150.15
Log likelihood	-646.543	1489	-332.59283	-338.31366	-433.84898	-294.91317
Number of obs	3148		1842	1613	1829	1369

Source: Estimations as explained in the text.
Note: Robust z-statistics in parentheses; * Significant at 10%; ** Significant at 5%; *** Significant at 1%. In many industries, FOREIGN is found to predict failure perfectly and hence has been dropped from the estimation. In the case of other non-metallic mineral products *TECHIM* and *LIBERAL* has been dropped for the same reason.