Graduating to Globalisation: A Study of Southern Multinationals

Dilek Demirbas, Ila Patnaik, Ajay Shah

Working Paper No. 2010-65

January 2010

Graduating to Globalisation: A Study of Southern Multinationals[1]

Dilek Demirbas[*]   Ila Patnaik[**]   Ajay Shah[***]

Abstract

FDI by firms in developing countries is a recent phenomenon and demands a study of relationship between firm productivity and different modes of globalisation activities. This paper attempts to understand this relationship through ordered probit models, examining two key hypotheses using firm level panel data from India. First, we test whether there are characteristic differences between domestic firms, exporting firms and firms engaging with FDI. Second, we test if FDI is an integral part of the evolution of firms in developing countries. Our results suggest that there are strong differences between domestic firms, exporting firms, and firms that invest abroad, especially in their knowledge investment, indicating the presence of a ladder of quality in graduating to globalisation.

JEL Classification: F12, F14, F23, L1, D20
Keywords: Outbound FDI, Panel data, India, Ordered Probit models.

[*] Dilek Demirbas is a Reader in Economics in SMIB subject group and the subject group leader at Newcastle Business School, Northumbria University, Newcastle upon Tyne, England. Email: Dilek.Demirbas@unn.ac.uk

[**] Ila Patnaik is a Professor at National Institute of Public Finance and Policy, New Delhi. Email: ilapatnaik@gmail.com

[***] Ajay Shah is a Professor at National Institute of Public Finance and Policy, New Delhi. Email: ajayshah@mayin.org

Graduating to Globalisation: A Study of Southern Multinationals

Introduction

The recent developments in the literature on international trade and foreign direct investment (FDI) emphasises the systematic relation between firm-specific characteristics and their participation in exports and FDI. To address questions such as which firms serve foreign markets and in the set of firms serving the foreign customers, which of them decide to export and which choose FDI as the mode of serving foreign markets, New Trade Theory focuses on firm's optimisation behaviour based on some fundamental characteristics of firms which determine firm's choice of markets (domestic versus foreign) to serve and the mode of serving (export versus FDI).

The seminal work of Melitz (2003) and its extension by Helpman, Melitz, and Yeaple (2004) (henceforth, HMY) places heterogeneity in the firm productivity at the heart of these questions. Assuming that firms need to incur certain fixed cost to start exporting and certain variable costs per unit of export, only more productive firms cross this threshold since their payoffs from exporting will pay for the variable and fixed cost. In equilibrium, firms self-select themselves so that more efficient firms export while less efficient firms serve the domestic market. Again, if serving foreign customers through affiliates in the foreign countries involves a fixed cost that is even higher than the composite variable and fixed cost of exporting, then even more productive firms will choose FDI as a mode for serving the foreign market.[2]

While the HMY hypothesis finds empirical support for the firms in the industrialised economies (Head and Ries, 2003; HMY, 2004; Greenway and Kneller, 2004; Girma, Kneller and Pisu, 2005; Tomiura, 2007; Damijan, Polanec and Prasnikar, 2007; Greenway and Kneller, 2007; Aw and Lee, 2008; Gorg and Jabbour, 2009; Bitzer and Holger, 2009), the evidence from developing countries is limited. Given the spurt in FDI activities by firms in developing economies and availability of firm level data, this paper attempts to contribute empirical insights into the theoretical framework laid out by Melitz (2003), HMY (2004), and Head and Reis (2003) with data from a fast growing economy, India.

---

[2]The HMY paradigm has been extended to various directions depicting various international organisational and integration structure of firms. These include Melitz and Ottaviona (2003) on asymmetries between competing countries and export; Yeaple (2003) and Grossman, Helpman and Szeild (2006) on cost advantage of intermediate goods production of South and export-platform hypothesis of FDI by Northern firms; Falvey, Greenaway and Yu (2003) on technological efficiency and export; Blalock and Gertler (2004); Bernard and Jensen (2004a, 2004b); Alvarez and Lopez (2004); Gorg *et al.* (2005) on trade liberalisation and export at industry level.

Firms in developing countries have engaged in direct investment abroad at a rapid pace in recent years. Using both stock and flow measures, outbound FDI from developing countries account for about 14 percent of the world total FDI in 2006 (UNCTAD, 2006), 12 percent in 2007 and 15 percent in 2008 (UNCTAD, 2009). In the Indian case, while inbound FDI was at USD 22 billion in 2007, outbound FDI for the same time period was as high as USD 13.5 billion. The FDI outflow from India is almost four times in 2007 than in 2005 and dominated by private conglomerates. Moreover, one of the major driving forces in FDI from Asia in Europe in 2006 is India (UNCTAD, World Investment Report, 2006).

Given the scenario of such rapid growth in FDI from India, whether there exists a systematic relationship between firms' overseas investment decision and firms' position in the quality ladder is worth exploring. In this paper, we attempt to examine the predictions of the literature on firms' exports versus FDI decision exposited in HMY (2004) and Head and Reis, (2003).

We explore the relationship between trade, FDI, and firm productivity in a wider sense by looking at other firm characteristics using firm level data from India for the period 2001-2007. First, as in HMY (2004), we test whether there are any characteristic differences between domestic firms, exporting firms, and firms engaging with FDI. Second, we test whether outbound FDI is an integral part of the evolution of firms in a developing country towards higher productivity and outward orientation.

Our paper attempts to contribute to the literature in two novel ways. *First*, the limited number of studies on developing countries and particularly on India, in this field follows the paradigm exiting prior to the evolution of 'new trade theory'. In this paradigm, several firm-specific and country-specific characteristics were explored in the literature to explain outward FDI. The firm-specific characteristics include endowment of human, knowledge and physical character, marketing capabilities, organisation, finance, export orientation etc. Country or location-specific characteristics include factor endowments, institutional settings and transaction costs in the export market.[3] While these studies attempt to explain the single question about whether the firm decides to serve foreign customers on the basis of the above mentioned characteristics, we unify the firm's choice of markets (domestic versus foreign) and mode of serving foreign markets (export versus FDI) in a single framework on the lines of HMY. Using an ordered-probit model, we examine the relative position of domestic market-oriented, exporting and outward FDI-oriented firms in the quality ladder (which can also be perceived as productivity of the firm) which is a latent variable and identify the factors determining this latent variable for each type of firms. The *second* novelty of this paper is that we also explore impact of innovation captured by Research and Development (R&D) expenditure of the firm on its relative ranking in the quality-ladder. We find that a higher level of knowledge investment as measured by expenditure on research and development is a characteristic of firms that serve foreign markets.

---

[3] *See* Horstmann and Markusen, 1992; Brainard, 1993, 1997; Dunning, 2000; Markusen and Venables, 2000; Bernard et al. 1995; Bernard et. al, 2003; Bernard and Jensen 2004a, 2004b; Tybout, 2003; Wagner, 2005, 2007. The studies on developing countries following this approach are; Lal, 1986; Narula and Dunning, 2000; Pradhan, 2004; Blalock and Gertler, 2004; Kumar, 2007.

Our findings are that there are strong differences between the characteristics of domestic firms, exporting firms, and firms that invest abroad and these characteristics intensify the hierarchy of outbound FDI, exporting and domestic market-oriented firms in the quality-ladder. We also find that innovation positively influence firm's latent quality parameter which in turn intensifies internationalisation of firms.

The rest of the paper is organised as follows: *Section 2* lays out the related empirical studies while *section 3* describes the background of our dataset, classification of dataset and broad empirical facts. Section 4 discusses our econometric analysis and presents our findings, concluding with *section 5.*

II. Empirical Studies On Firm Heterogeneity and Internationalisation Modes

Most empirical studies on firm heterogeneity and internationalisation modes use firm level data from industrialised economies. Helpman, Melitz, and Yeaple (2004) use data on US exporting firms in 1996 and affiliate sales data that cover 52 sectors and 38 countries. They regress the ratio of exports to FDI (measured by sales of overseas affiliates) unit costs of international trade, plant fixed costs, traditional proximity-concentration variables, and some new industry variables. The study confirms their theoretical prediction on productivity ranking, i.e, only the most productive firms become multinational companies and invest abroad; the less productive ones export, and least productive ones serve domestic markets.

Head and Reis (2003) associate productivity with export and FDI and use different indicators of performance to differentiate firms in a sample of 1070 large Japanese companies classified into 17 two-digit industries in 1989. The paper tests for substitution within industries between FDI and exports looking out for productivity differences using indicators such as sales, value added, and total factor productivity. Using the idea from Helpman *et. al.* (2004), Head and Reis (2003) show that there exists a hierarchy in performance levels of firms, investing abroad, exporting firms and purely domestic firms. Head and Reis (2003) also find weak correlation between firm size and productivity. However, Greenaway and Kneller (2007) claim that results in Head and Reis (2003) cannot be generalised because of a biased sample consisting of only large listed companies.

Using a non-parametric approach based on the principle of first-order stochastic dominance, Girma, Gorg, and Strobl (2004) compare sales, productivity and profitability of domestic firms, domestic exporters and domestic multinationals for Ireland in the year 2000. They find that there is no clear evidence of differences in plant performance between domestic exporters and non-exporters. Girma, Kneller, and Pisu (2005) and Arnold and Hussinger (2005) apply the same methodology to data from the United

5

Kingdom and Germany and they find that the productivity distribution of multinational firms dominates that of exporting firms, which in turn dominates non-exporters.[4]

More recently, Damijan *et al.*, (2007) also examine the theoretical prediction on heterogeneity and internationalisation modes and test this prediction using micro evidence from the Slovenian manufacturing industry. They find evidence that firms that export and engage with FDI are 20 percent more productive than firms that serve only domestic markets, while they found no evidence on productivity advantage of investing firms over exporting firms in data set.

Aw and Lee (2008) focus on the production location decision of Taiwanese electronic multinationals in 2000 and examine their productivity differences. They find that more productive firms engage in outbound FDI, with the most productive ones investing in both China and the USA. Further, they also provide evidence on the point that the MNCs investing in the US are more productive than MNCs investing in China.

III. Data and Descriptive Statistics

The dataset that we utilise is based on the firm-level database maintained by the Centre for Monitoring Indian Economy (CMIE).[5] We create a dataset of the firms which were members of the CMIE 'COSPI' stock market index on 31 March 2007[6], subject to five exclusions:

1. Foreign investment by firms that are controlled by the government might reflect political considerations; hence, firms controlled by the government are ignored.
2. Political considerations may also influence FDI decisions of mining firms; hence we do not consider these.
3. Export by financial firms is infeasible given India's capital controls. In addition, financial firms present unique difficulties in measurement of accounting data. Hence financial firms are excluded.

---

[4] On the country level study, Kimura and Kiyota (2007) undertake similar study for Japanese firms for the period 1994-2000 and compare mean values on panel data. For that Kimura and Kiyota (2007) investigate the self selection idea of Helpman *et. al* (2004) using the method laid out in Clerides *et. al* (1998). They conclude that firms with foreign presence become more productive than others. On similar lines, Tomiura (2007) uses cross section data of Japanese manufacturing firms in 1998 and sort productivity levels on the basis of foreign activities. Similarly, Ito (2007) also highlights the difference between the service sector and the manufacturing sector regarding panel data on Japanese listed firms from 1980 to 2005. Similarly, Girma *et al.* (2004) show the positive causality from exporting to productivity growth in UK manufacturing firms in 1998 and 1999.
[5] India has a long tradition of sound accounting standards. Publicly traded corporations face pressures from public shareholders and the securities regulator. Owing to these factors, Indian firm level data is of a high quality by the standards of emerging markets. CMIE has a well developed 'normalisation' methodology which ensures inter-year and inter-firm comparability of accounting data. This database has encouraged an emerging empirical literature, including papers such as Khanna and Palepu (2000); Bertrand *et al.* (2002); Ghemawat and Khanna (1998).
[6] The rationale for this is based on isolating the firms with the highest data quality.

6

4. The concepts of exporting vs. FDI are blurred in the construction industry. Hence, construction firms are excluded.
5. The smallest firms, which may have behavioural characteristics quite unlike the main dataset, were excluded by removing firm-years where either sales or assets were below Rs.10 million (roughly $2 million). Capital controls in India substantially interfered with outbound FDI by firms until 2001, when these restrictions were eased. Hence we focus on data from 2001 onwards. We obtain all firm-years for this set of firms available in the CMIE database from 2001 till 2007, covering a period of seven years. This gives us an unbalanced panel dataset.

This dataset captures a substantial slice of the Indian economy. In the most recent year, 2007, the firms in our dataset had total assets of Rs.12.8 trillion (32 percent of GDP), value added of Rs.2.9 trillion (7.3 percent of GDP) and exports of Rs.2.95 trillion (32 percent of Indian goods and services exports). *Table 1* shows the number of firms observed in various years and in various industries in this dataset. The total number of firms ranges from 1019 in 2001 to 1462 in 2007.

Table 1: Industry Composition of the Dataset

	2001	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**
Chemicals	237	253	273	277	299	320	320
Diversified	21	19	23	21	21	23	22
Electricity	5	5	5	6	6	10	9
Food	80	87	92	102	106	111	122
Machinery	153	163	169	162	178	187	190
Metals	77	88	99	104	110	126	134
MiscManuf	39	50	49	50	55	63	72
NonMetalMin	62	65	67	67	73	76	81
Serv.IT	73	67	70	70	87	100	108
Serv.Other	85	83	92	91	106	128	145
Textiles	110	108	121	120	127	147	161
TransportEq	77	83	86	85	92	94	98
Sum	**1019**	**1071**	**1146**	**1155**	**1260**	**1385**	**1462**

We draw the following indicators from the CMIE database in order to describe firm-specific characteristics:

1. *Year of incorporation:* The age and birth cohort of a firm is proxied by the year of incorporation.
2. *Total assets:* The balance sheet size of the firm is a measure of the capital employed by the firm and a measure of the size of the firm.
3. *Gross fixed assets:* Some of the total assets of the firm are utilised to own fixed assets. We use the 'gross' measure of fixed assets so as to avoid the tax-induced difficulties of depreciation. Gross fixed assets divided by total assets is a measure of the asset tangibility of the firm.
4. *Sales:* The revenues of the firm are measured by sales.
5. *Gross value added:* The value added of the firm measures the output of the firm.

6. *Research and development intensity:* The R&D activity of the firm is measured by summing capital account and current account expenses on R&D and expressing these as a fraction of sales.
7. *Exports:* The direct exports by each firm are observed in the CMIE database.
8. *Foreign investment:* The investments by a firm outside the country are observed in the CMIE database.

Table 2 shows summary statistics about these variables in the pooled dataset. As is typical with firm level data, it shows a small number of very large firms. For example, while the largest value of total assets was Rs. 1176.51 billion, the mean value was just Rs.7.78 billion.

Table 2: Summary Statistics about Dataset

	Min	25%	Median	75%	Max	Mean
Year of Incorporation	1863	1964	1982	1989	2005	1974
Total Assets	0.02	0.64	1.60	4.44	1176.51	7.78
Gross Fixed Assets	0.00	0.36	0.92	2.67	1070.61	5.27
Sales	0.01	0.59	1.48	4.26	1994.31	7.99
Gross Value Added	0.01	0.11	0.28	0.83	225.63	1.56
R&D Sales	0.00	0.00	0.00	0.00	8.47	0.01
Exports	0.00	0.01	0.10	0.54	585.32	1.21
Foreign Investments	0.00	0.00	0.00	0.00	30.03	0.13

Along the lines of the analysis in Head and Ries (2003) who investigate similar questions in the context of Japanese firms, we divide firms into four groups:

D — A purely domestic firm;
DX — A firm that produces domestically for both the home country and foreign markets through exports;
DXI — A firm that serves foreign customers exporting and producing in their country (i.e. through outbound FDI);
DI — A firm that serves foreign customers by producing in their country only.
The **D** firms are generally firms that have been shielded from trade competition by virtue of production of relatively non-tradeable goods such as electricity, natural gas, or telecommunications services.

The **DX** are firms that produce tradeables such as steel or petroleum products. For these firms, India is a low-wage production site. While transportation costs from India to markets that are located physically far away are high, these firms have sufficiently high productivity to be able to overcome this conflict and are exporting.

DXI firms are the ones which export and invest abroad. Production at locations across the world helps avoid the costs of transportation suffered when

8

producing in India and serving foreign customers. While producing abroad involves large fixed costs, and induces the use of higher-cost labour than is found in India, these firms have a large enough edge in productivity to enable them to overcome this.

Finally, there are *DI* firms. The big firms of this set are engaged in the production of non-tradeables such as electricity or paint, but have embarked on outbound FDI as a way to serve foreign customers. This decision is based on a belief that the firm is a high productivity firm by international standards.

We operationalise these definitions in our dataset by defining a firm as an exporter if exports exceed 1 percent of sales and as having outward FDI if international assets exceed 1 percent of total assets.

Table 3 shows the number of firms falling into the four categories in all years. The number of *DI* firms is quite small. In 2007 there were just 14 of them in a dataset of 1462 firms. With only 14 firms in this category, any statistical estimation would be imprecise. In general, these firms produce non-tradeables or are in industries where high transportation costs render exporting infeasible. In further analysis we drop this category.

Table 3: Count of Firms Classified into Four Categories

	2001	2002	2003	2004	2005	2006	2007	Sum
D	312	311	321	323	342	360	369	2338
DI	5	8	10	12	15	12	14	76
DX	637	650	700	694	744	817	853	5095
DXI	65	102	115	126	159	196	226	989
Sum	**1019**	**1071**	**1146**	**1155**	**1260**	**1385**	**1462**	**8498**

The data shows that some firms have built up very large positions abroad. As an example, the firm 'Tata Tea' had 52.4 percent of total assets outside the country in 2007. Other firms have more modest positions. As an example, the firm 'Infosys Technologies' had 1.64 percent of total assets outside the country in 2007, and this number had actually dropped when compared with the situation in 2002.

Table 4 sums up the foreign assets of all the firms in our dataset. This number went up dramatically from Rs.79.98 billion in 2001 to Rs.340 billion (roughly USD 9 billion) in 2007. The total assets of these firms also rose sharply. The sum of foreign investments of the firms stood at 2.66 percent of the sum of their total assets in 2007.

Table 4: Foreign Assets of Indian Firms

Year	Foreign Inv	Total Assets	FI/A
2001	79.98	6,285.23	1.27
2002	94.57	7,010.32	1.35
2003	105.21	7,638.79	1.38
2004	103.39	8,341.18	1.24
2005	155.69	10,778.19	1.44
2006	211.81	13,230.90	1.60
2007	340.05	12,800.35	2.66

Table 5 sums up the exports of all the firms in our dataset. This number went up dramatically from Rs.644.2 billion in 2001 to Rs.2954.47 billion in 2007. Exports as a percentage of sales went up from 9.84 percent to 24.5 percent over this period.

Table 5: Exports by Indian Firms

Year	Exports	Sales	X/S(%)
2001	644.20	6,549.19	9.54
2002	720.13	6,859.60	10.50
2003	877.93	7,764.20	11.31
2004	1,104.00	8,951.52	12.33
2005	1,745.97	11,585.83	15.07
2006	2,201.12	14,109.73	15.60
2007	2,954.47	12,058.46	24.50

While the dataset has many attractive properties, it has several limitations as well. The firms included in the data set tend to be the larger ones and so we are excluding small exporting firms. It is an unbalanced panel data; the set of large firms with good quality disclosure was chosen in the latest year and followed into the past.

Many accounting variables have extreme values. As an example, in this dataset, the return on equity ranges from -32900 percent to 118500 percent. In order to address this, we employ 'winsorisation' for such variables, which involves clipping the distribution to the (.01, .99) quintiles.

IV. Empirical Analysis and Findings

4.1 Testable Hypotheses

The probability of a firm serving domestic market only and both domestic and foreign markets *via* either export or FDI or both will depend on its productivity level which is an unobserved variable. Higher is the firms productivity level, higher is the probability of serving foreign market in a sequence of *via* export only, *via* both export and FDI and *via* FDI only. Again, the unobserved productivity level will depend on firm-specific characteristics (taken into account in the current version of empirical methodology), variable and fixed costs of exports, and fixed cost of FDI and probability of death shock.

4.2 Transition between categories

What are the chances of the globalisation status of a firm changing from year to year? *Table 6* shows the transition probability matrix for firms across the three categories. Each row of this matrix shows transition probabilities from the stated category at time *t* to all possible categories at time *t* + 1.

Table 6: Transition Probabilities Across Firm Categories

	D	DX	DXI
D	83.53	16.23	0.23
DX	5.25	90.84	3.91
DXI	0.14	6.32	93.54

There is significant on-diagonal mass. Firms do not seem to fluctuate; there is an 84 / 91 / 94 percent chance of staying in a given state.

When a firm starts out as a **D**, there is a 16.23 percent chance of it moving up to exporting. There is only a 0.23 percent chance of it jumping up to exporting and outbound FDI. This suggests that the transition to **DXI** generally involves **DX** as an intermediate stage.

Once a firm is an exporter, there is a 5.25 percent chance of it dropping back to being a domestic firm. There is a 90.84 percent chance of it staying in the same state, and a 3.91 percent chance of it jumping up to **DXI.**

Once a firm has exports and outbound FDI, there is a 93.54 percent chance of it staying there. With a 6.32 percent probability, the firm drops down to only exports, and with a 0.14 percent probability, it drops down to being a domestic firm.

This examination of transition probabilities has three key implications. First, internationalisation is relatively 'sticky'; firms tend not to flit around these categories. Second, **D** firms rarely jump directly to **DXI.** The process of graduating to

globalisation generally involves first achieving *DX* status. Third, the progression towards internationalisation is not inevitable. Many firms drop down from *DXI* to *DX* and from *DX* to *D*.

4.3 Firm characteristics in the three categories

We now embark on a broad understanding of firms' characteristics in the three categories *D, DX* and *DXI*. *Figure 1* shows six graphs where the median value for each year is reported for each of the three categories of firms.

Figure 1 Firm characteristics : comparing *D*, *DX* and *DXI*
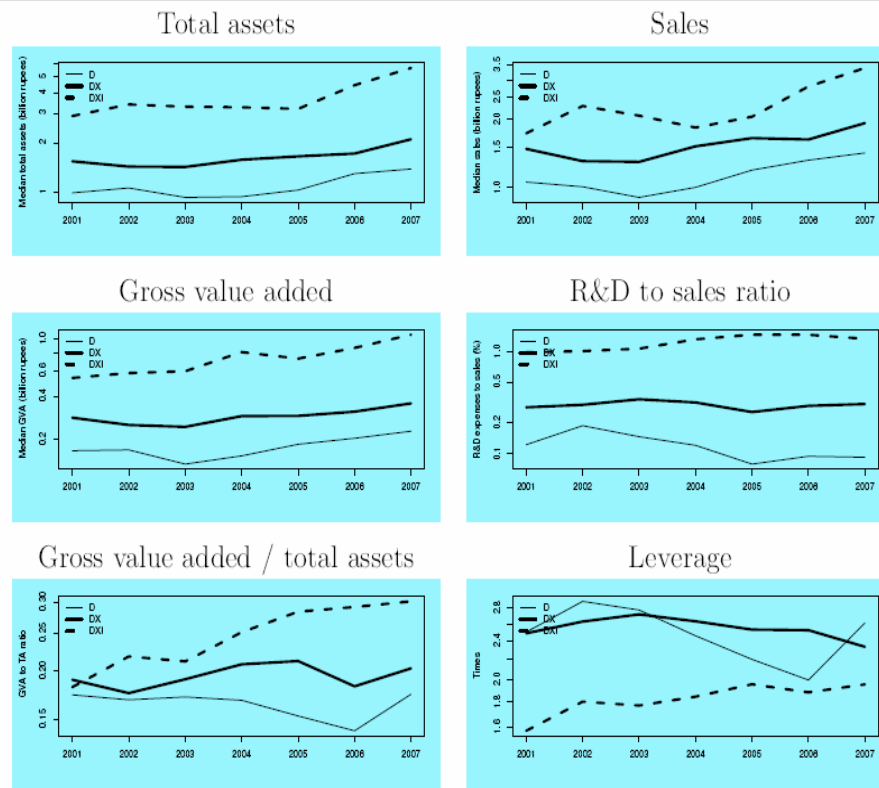
Total assets are a measure of firm size. There is a clear hierarchy where the biggest firms are found in *DXI,* smaller firms are found in *DX* and the smallest firms in *D*. Using revenues or value added as a measure of firm size also, the same pattern is found. Thus, whether we measure size by total assets, sales or value added, the identical ordering is found in all years, with the biggest firms being *DXI,* smaller firms being *DX* and the smallest firms being *D*.

The ratio of R&D expenses to sales is believed to convey investments into technological sophistication which is expected to be linked to productivity. Here also, a clear pattern is seen: firms with the highest R&D to sales ratio are *DXI;* lower

12

values are *DX* and the smallest values are *D*. The output per total assets is both a measure of asset productivity and a measure of capital intensity. Since 2002, a separation has opened up where *DXI* firms have the highest output per unit of total assets, *DX* firms are second and *D* firms have the lowest value. While this could reflect productivity differences, it also reflects differences in industries: *D* firms tend to be in more capital-intensive industries.

Finally, *DXI* firms are seen to have the lowest leverage. This may reflect the lack of tangibility of their assets, and the difficulties of the Indian debt market which has emphasised loans against tangible collateral. While leverage of this group has risen, it is still less than that of the other two groups. This could also reflect the greater comfort of the equity market, and thus access to adequate equity financing, for the *DXI* firms.

4.4 Firm level analysis

We start by estimating separate probit models for the exporting status and outbound FDI status at firm level (*Table 7*).

A set of industry-fixed effects are present in the estimation in order to control for industry effects (the details are omitted in the interest of brevity). An industry such as IT services proves to have a bigger value for industry fixed effects coefficients in both probit models. This suggests that IT services firms engage in exporting and outbound FDI even when other firm characteristics are not as conducive to internationalisation. Firms in the electricity industry have the lowest proclivity for internationalisation, after controlling for firm characteristics.

Table 7: Probit Models for Exporting and Outbound FDI

	Probit for Exports		Probit for FDI	
Year	**Co-efficients**	**t**	**Co-efficients**	**t**
Industry fixed effects	present	present	present	present
Year fixed effects	present	present	present	present
Year of Incorporation	0.0018	2.2300	0.0043	3.5600
Log value added	0.2687	10.4800	0.1480	3.8100
Log total assets	-0.0789	-3.0700	0.1441	3.7300
Asset tangibility	-0.0058	-	-0.0101	-12.0700
R&D to sales	0.0997	11.0900	0.1129	8.2700
Return on Equity	-0.0013	5.3200	-0.0035	-3.4700
		-2.1300		
LogL	-4415.3800		-2080.1000	
AIC	8878.7600		4208.2100	

A set of year-fixed effects are also present in the estimation in order to control for macroeconomic effects (the details are omitted in the interest of brevity). In the case of exports, all the year-fixed effects are essentially the same; the introduction of these year-fixed effects actually worsens the AIC. In the case of outbound FDI, there

is a certain increase in the coefficient from 2002 to 2005 after which the coefficients are stable. The introduction of these fixed effects improves the AIC.

The year of incorporation has a small positive coefficient on both probit models. This suggests that younger firms are more internationalised. When using log value added as a size measure, the coefficient on both probits is positive. However, after controlling for this, the log value of total assets exerts a negative effect on exporting but a positive effect on FDI.

Asset tangibility - defined as the ratio of gross fixed assets to total assets — exerts a negative effect on internationalisation with the same coefficient on both models. This suggests that firms with less tangible assets are more likely to internationalise. Firms with greater investments in knowledge, proxied by the ratio of R&D expenses to sales, are more likely to internationalise, with essentially the same coefficient on both models.

Finally, firms which earn a higher return on equity appear to be slightly less inclined towards internationalisation, with essentially the same coefficient on both models. This contradicts the prediction of the HMY model to the extent that we might expect more productive firms to have a higher return on equity.

While the two probit models have unique features, in many respects, the relationships are similar. As the transition probability analysis earlier has shown, firms almost always go through **DX** before they become **DXI.** This suggests a deeper link between the two choices made by firms, about whether to export and whether to invest abroad.

Figure 2: Predictions for the latent variables of the two probit models
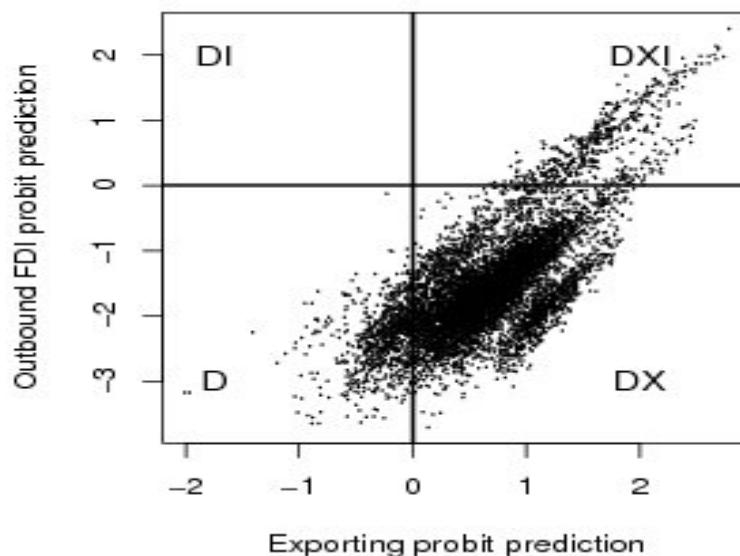
The two latent variables of the exporting and FDI probit models are computed separately and analysed. *Figure 2* shows a scatter plot of the values for the two latent variables. The first quartile corresponds to **DXI** firms. The third quartile corresponds to D firms. The fourth quartile corresponds to **DX** firms. This graph visually shows that even though the two probit models were estimated separately, the two predictions are positively correlated. The correlation coefficient works out to 0.73.

This suggests unification of the two elements of internationalisation into a single ordered probit model. This expresses the intuition that there is a *hierarchy* where firm characteristics that appear to be related to productivity push firms along from **D** to **DX** to **DXI** (Head and Ries, 2003).

Table 8: Ordered Probit Model for Exporting and Outbound FDI

Year	Probit for Exports	
	Coefficients	**t**
Industry fixed effects	present	present
Year fixed effects	present	present
Year of incorporation	0.0018	2.2300
Log value added	0.2687	10.4800
Log total assets	-0.0789	-3.0700
Asset tangibility	-0.0058	-11.0900
R&D to sales	0.0997	5.3200
Return on equity	-0.0013	-2.1300
p cut offs		
p1	4.8112	4181.0200
p2	6.9420	272.3900
LogL	-4415.3800	
AIC	8878.7600	

Hence, we define an ordering (1,2,3) for these three categories and estimate an ordered probit model. In this model, y^* is the unobserved latent variable, and there are cutoffs t_1 and t_2 that determine what we observe:

$$y^* = \mathbf{b}'X + \mathbf{m} \qquad \mathbf{m} \sim N(0, \mathbf{s}^2) \qquad (1)$$

$$y = \begin{cases} D & \text{if } y^* < \mathbf{t}_1 \\ DX & \text{if } \mathbf{t}_1 \leq y^* < \mathbf{t}_2 \\ DXI & \text{if } \mathbf{t}_2 \leq y^* \end{cases}$$

The parameter vector estimated by MLE is *? = (ß,* t *).* The latent variable *EQN* can be interpreted as a single propensity measure; big values induce exports and bigger values also induce outbound FDI.

Key facets of the estimation are the parameters (t_1, t_2). The data could reject the model by giving t values which are smeared together. If, on the other hand, we are able to clearly see $t_2 > t_1$ then it reinforces our conceptual framework of y^* as being the propensity for firms to first export and then to go on to outbound FDI.

Table 8 shows estimated results for this model. Among the industry fixed effects (omitted for brevity), electricity once again stands out as being a sector with a low propensity for internationalisation after controlling for other firm characteristics, and IT services stands out as the sector with the highest propensity. The year-fixed effects (also omitted for brevity) show a rise from 0.14 in 2002 to 0.20 in 2004, and stabilise thereafter.

Figure 3 Distribution of estimated $\hat{t}$
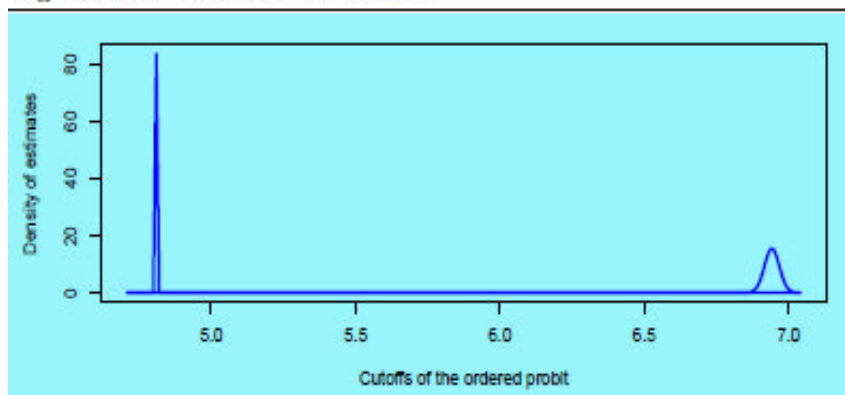
The year of incorporation has a small positive coefficient: younger firms are more likely to internationalise. Log value added as a size metric has a positive coefficient. After controlling for this, log of total assets is not significant.

Asset tangibility exerts a negative effect on internationalisation. Firms that spend more on R&D are more likely to internationalise. Finally, higher return on equity exerts a slight negative impact on internationalisation. This contradicts the prediction of the HMY model to the extent that we might expect more productive firms to have a higher return on equity.

As *Table 8* shows, $\hat{t}$ = (4.81, 6.94) and the estimates have *t* statistics of 4191.02 and 272.39 respectively. Estimates of the ordered probit model could reject the implicit assumption of ordering if the t estimates are smeared together. *Figure 3* shows the distribution of $\hat{t}_1$ and $\hat{t}_2$. These distributions do not overlap at all. This supports the idea of a hierarchy from **D** to **DX** to **DXI**.

The *t* estimates give us a sense of scale for interpreting y^* values. A shift in y^* of 2.13 shifts a firm from the threshold of exporting to the threshold of outbound FDI. This helps us interpret the numerical values for the year-fixed effects: the rise of 0.06 for the year fixed effect (from 0.14 in 2002 to 0.2 in 2004) is a small

value compared with the phenomenon of interest. This suggests that the prime factor explaining the increased internationalisation of Indian firms from 2001 to 2007 was changes in firm characteristics, and not changes in the macroeconomic environment or capital controls.

In summary, we find that firm characteristics play a significant role in ex plaining the decision of a firm to serve a foreign market through exports or FDI; Firm characteristics of Indian firms either exporting or investing abroad show a distinct pattern. The probit models suggest that productivity metrics such as size and R&D intensity positively influence internationalisation. At the same time, there are some unique features of these results: the negative relationship with asset tangibility, the negative relationship with return on equity and the behaviour of young firms. There appears to be a hierarchy where firms go from autarky to exporting to outbound FDI. The ordered probit model represents a unified model of both phenomena.

V. Conclusion

We find that firms make a transition from exporting to outbound FDI. We also find that there are strong differences between the characteristics of domestic firms, exporting firms, and firms that invest abroad. The statistical analysis suggests a unified ordered probit model which predicts that firms with certain characteristics embark on exporting, and an intensification of those very characteristics yields outbound FDI. We find that in the evolution of a firm, there is a ladder of quality in graduating to globalisation: some first achieve exporting status and some of them go on to do outward FDI.

Helpman *et al.* (2004) predict that more productive firms export and the most productive firms do outbound FDI. The Helpman *et al.* model is rooted in the issues faced when discussing FDI by firms in industrial countries. The ordered probit model that we estimate is consistent with the intuition of the Helpman *et al.* model, and the explanatory variables that are statistically significant are largely related to firm productivity.

References

Arnold, J. and K. Hussinger, 2005. Export versus FDI in German Manufacturing: Firm Performance and Participation in International Markets, Centre for European Economic Research, Discussion Paper No. 05-73 (October).

Aw, Band Y. Lee, 2008. "Firm Heterogeneity and Location Choice of Taiwanese Multinationals", *Journal of International Economics*, 75; 167–179.

Bernard, A. and J. B. Jensen, 2004a. "Why Some Firms Export", *Review of Economics and Statistics*, 86; 561-569.

---------------, 2004b. "Entry, Expansion and Intensity in the U.S. Export Boom, 1987-1992", *Review of International Economics*, 12; 662-675.

Bernard, A., J. Jensen, and R. Lawrence, 1995. "Exporters, Jobs, and Wages in US Manufacturing: 1976-1987", Brookings Papers on Economic Activity. *Microeconomics, 1995*; 67-119.

Bernard, A., J.B, Jensen, J. Eaton, and S. Kortum, 2003. "Plants and Productivity in International Trade", *American Economic Review*, 93; 1268-1290.

Bertrand M., P. Mehta and S. Mullainathan, 2002. "Ferreting Out Tunnelling: An Application to Indian Business Groups", *Quarterly Journal of Economics*, 117(1); 121–148.

Bitzer, J. and G. Holger, 2009. "Foreign Direct Investment, Competition and Industry Performance", *The World Economy,* 32(2); 221-233.

Blalock, G. and P.J. Gertler, 2004. "Learning from Exporting Revisited in Less Developed Setting", *Journal of Development Economics,* 75;397-416.

Brainard, L. 1993. "A Simple Theory of Multinational Corporations and Trade with a Trade-off between Proximity and Concentration", NBER Working Paper No. 4269 (February).

Brainard, L. 1997. "An Empirical Assessment of the Proximity-Concentration Trade-off between Multinational Sales and Trade". *American Economic Review,* 87(4); 520–544.

Clerides, S., S. Lach, and J. Tybout, 1998. "Is Learning by Exporting Important? Micro-Dynamic Evidence from Colombia, Mexico, and Morocco". *The Quarterly Journal of Economics,* 113(3); 903-947.

Damijan, J. P., S. Palanec, and J. Prasnikar, 2007. "Outward FDI and Productivity: Micro-evidence from Slovenia", *The World Economy,* 30(1), 135-155.

Dunning, J.H. 2000. "The Eclectic Paradigm as an Envelope for Economic and Business Theories of MNE Activity", *International Business Review,* 9; 163-190.

Ghemawat P. and T. Khanna, 1998. "The Nature of Diversi?ed Business Groups: A Research Design and Two Case Studies", *Journal of Industrial Economics*, 46(1); 35–61.

Girma, S., H. Gorg, and E. Strobl, 2004. "Exports, International Investment, and Plant Performance: Evidence from a Non-Parametric Test", *Economics Letters,* 83(3); 317-324.

Girma, S., D. Greenaway, and R. Kneller, 2004. "Does Exporting Increase Productivity? A Microeconometric Analysis of Matched Firms", *Review of International Economics,* 12(5); 855-866.

Girma, S., R. Kneller, and M. Pisu, 2005. ''Exports versus FDI: An Empirical Test", *Review of World Economics / Weltwirtschaftliches Archiv*, 12; 855-866.

Gorg, H. and L. Jabbour, 2009. "Multinational Enterprises and Foreign Direct Investment: Introduction", *The World Economy,* 32(1);1-5.

Greenaway, D. and R Kneller, 2004. "Exporting and Productivity in the United Kingdom", *Oxford Review of Economic Policy,* 20(3); 358-371.

-------------------, 2007. "Firm Heterogeneity, Exporting and Foreign Direct Investment", *Economic Journal*, 117; F134–F161.

Grossman, G. M., E. Helpman and A. Szeidl, 2006. "Optimal integration strategies for the multinational firm", *Journal of International Economics*, 70; 216-238.

Head, K, and J.Reis, 2003. "Heterogeneity and the FDI versus export decision of Japanese manufacturers", *Journal of the Japanese and International Economies,* 17(4); 448-467.

Helpman, E., M. Melitz, and S. Yeaple, 2004. "Export Versus FDI with Heterogeneous Firms". *The American Economic Review,* 94(1); 300-316.

Horstmann, I. and J. R. Markusen, 1992. "Endogenous Market Structures in International Trade", *Journal of International Economics*, 32; 109-29.

Ito, Y. 2007. "Choice for FDI and Post-FDI Productivity", RIETI Discussion Paper Series **07 E 049.**

Khanna, T. and K. Palepu, 2000. "Is Group Affiliation Pro?table in Emerging Markets? An Analysis of Diversi?ed Indian Business Groups", *Journal of Finance,* 55(2); 867–891.

Kimura, F. and K. Kiyota, 2007. "Exports, FDI, and Productivity: Dynamic Evidence from Japanese Firms", *Review of World Economics,* 142(4); 695-719.

Kumar, N. 2007. "Emerging TNCs: Trends, Patterns and Determinants of Outward FDI by Indian Enterprises", Transnational Corporations, April, 2007.

Lall, R. 1986. "Third World Multinationals, The Characteristics of Indian Firms Investing Abroad", *Journal of Development Economics*, 20; 381-397.

Markusen, J.R. and A.J., Venables, 2000. "The theory of Endowment, Intra-industry, and Multinational Trade", *Journal of International Economics*, 52; 209– 234.

Melitz, M., 2003. "The Impact of Trade on Intra-Industry Reallocations and Aggregate Industry Productivity", *Econometrica,* 71(6); 1695-1725.

Melitz, M. and G. Ottaviano, 2003. "Market Size, Trade and Productivity", Harvard University, USA (mimeo).

Narula, R.and J.H.Dunning, 2000. "Industrial Development, Globalisation and Multinational Enterprises: New Realities for Developing Countries", *Oxford Development Studies*, 28(2);141-167.

Pradhan, J.P., 2004. "The Development of Outward Foreign Direct Investment: A Firm-level Analysis of Indian Manufacturing", *Oxford Development Studies,* 32(4); 619-639.

Tomiura, E., 2007. "Foreign Outsourcing, Exporting, and FDI: A Productivity Comparison at the Firm Level", *Journal of International Economics,* 72(1); 113-127.

Tybout, J., 2003. "Plant- and Firm-Level Evidence on New Trade Theorie", in (*eds*.) Choi, K., and J. Harrigan, J. *Handbook of International Trade*, Oxford: Blackwell.

UNCTAD, 2009. Assessing the Impact of the Current Financial and Economic Crisis on Global FDI Flows. New York and Geneva: United Nations.

UNCTAD, 2006. World Investment Report 2006. New York and Geneva: United Nations.

Wagner, J. 2005. "Exports, Foreign Direct Investment and Productivity: Evidence from German Firm Level Data", University of Lueneberg: Lueneberg (mimeo).

Wagner, J.2007. "Exports and Productivity: A Survey of the Evidence from Firm-level Data", *The World Economy,* 30(1); 60-82.

Yeaple, S.R. 2003. "The Complex Integration Strategies of Multinationals and Cross Country Dependencies in the Structure of Foreign Direct Investment", *Journal of International Economics*, 60; 293-314.