

Graduating to globalisation: A study of Southern Multinationals

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Abstract

FDI by firms in developing countries is a recent phenomenon that demands explanation, and constitutes a part of the puzzle of capital flowing ‘uphill’. Using a firm level dataset in India, we argue that exporting and outbound FDI at the firm level are interrelated aspects of outward orientation. Firms make a choice about whether to serve foreign customers by exporting or by investing in the foreign country. We find a ladder of quality where some firms graduate to exporting and some of them graduate to outbound FDI. There is strong firm heterogeneity in the decision to export and to do outbound FDI. Both phenomena are unified with an ordered probit model; the explanatory variables prove to be related to productivity as predicted in the recent literature.

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1 Introduction

In recent years there has been a sharp increase in firms from developing countries engaging in outbound FDI. Using both stock and flow measures, outbound FDI from developing countries accounts for 13-14 percent of the world total. The sharp increase in outbound FDI from developing countries poses a puzzle.

Some outbound FDI by Indian firms is sent to other developing countries, or motivated by the quest for natural resources. But in the post-2000 period, more than 60 percent of investment abroad from India has been to developed countries. It constitutes one element of the puzzle of ‘capital flowing uphill’ which has been of interest to development economists.

There is a consensus that inward FDI is important for exports and economic growth in developing countries. Inbound FDI into India rose ten fold from 2000 to 2007. But at the same time, outbound FDI from India has also risen sharply. In 2007, while inbound FDI to India was USD 22 billion, outbound FDI was USD 13.5 billion. Capital is ‘flowing uphill’ out of India to a substantial extent. While inbound FDI stood at a healthy 2.2% of GDP, after taking into account the outward FDI flow, the net resources that came into the country through FDI were much smaller at 0.85% of GDP.

Traditionally, the literature on outbound FDI has focused on decisions of firms to invest abroad based on a number of factors such as seeking resources, markets, assets, or on ownership or location. A more recent literature, based on new trade theory, treats outbound FDI as serving foreign customers by other means. Firms choose between serving foreign customers by exporting or by producing in the customers’ home country. These models find that firm productivity strongly influences the decisions of firms.

A key feature of new trade theory is the focus on firm heterogeneity. In recent years the prediction of new trade theory – that some firms export while others cater only to the domestic market because they are less productive and unable to afford the higher unit costs of exporting – has been extended to show that similar considerations apply on the transition to the next level, of investing abroad. Understanding both cross-border trade and cross-border investment is then linked up to firm heterogeneity. While this literature is supported by empirical work on firms or plants in industrial countries, there is relatively little empirical work for developing countries about these issues.

The phenomenon of FDI flowing from a poor country with cheap labour to rich countries with high wages demands exploration. This paper analyses this

new phenomenon in the context of heterogenous firms and locates it in the recent theoretical and empirical literature. In this framework, the decision to export and the decision to invest abroad are linked and seen as a choice made by firms depending on their characteristics. It offers a new perspective on outward orientation of firms. India is a good location for such research given the sharp increase in FDI by Indian firms to developed countries, or ‘uphill capital flows’.

The bulk of the empirical literature testing this model is in the context of capital flowing out of rich countries (Helpman *et al.*, 2004; Greenaway and Kneller, 2004). There is a gap in this literature on the extent to which this model describes capital flowing out of developing countries. The empirical literature about FDI from developing countries has emphasised traditional ideas such as the quest for markets, raw materials or technology.

In this analysis, firms are classified into four groups (Head and Ries, 2003). The first is the firms who only sell in the domestic market. The second is firms who sell both in the domestic market and export. These are firms producing tradables. The third group consists of firms which, in addition to selling at home and abroad, also invest abroad. The fourth group is the group of firms that sell at home and invest abroad without exporting. These are firms that produce non-tradables, but also serve foreign customers by doing outbound FDI.

In India, economic reforms involving trade liberalisation and reductions in costs of transportation of goods began in the early 1990s. By 2001, the first year in our dataset, this process had made considerable progress. In 2001, we observe 317 firms which only sell domestically, and 702 firms which also export. At the same time, only 70 firms had FDI outside the country. This was, then, a scenario where many firms had started exporting but outbound FDI was uncommon.

By 2007, 240 Indian firms were exporting and investing abroad. These were some of India’s most productive firms producing tradables. They included computer software and automobile firms. The group of firms that exported had also grown. The aggregate exports to sales ratio of our dataset rose from 9.84% in 2001 to 24.5% in 2007. Their foreign assets to total assets ratio had risen from 1.27% in 2001 to 2.66% in 2007.

The transition probability matrix of these events shows that once firms rise to exporting or outward FDI, they are unlikely to slip back. Further, exporting is generally an intermediate step that precedes outbound FDI.

Firm characteristics of the different groups show a very distinct pattern. We

find that the median size of the group engaged in FDI and exports is the biggest. The exporting firms are smaller and the firms that serve only the domestic market are the smallest. The FDI firms also engage in the most R&D. Exporting firms are second in terms of R&D expenditure and domestic firms are the worst. This hierarchy holds in all years.

We estimate probit models separately for the exporting status and outbound FDI status of firms. The latent variable of the two probit models proves to have a correlation of 0.72. The estimates of the two probit models have some striking similarities. This suggests an ordered probit model, where a single propensity measure explains both exports and FDI. Big values of this latent variable induce exports and even bigger values induce outbound FDI. The explanatory variables in this model are largely related to firm productivity in a way that is predicted by the Helpman *et al.* (2004) (HMY) model.

Our findings thus suggest that there is a ladder of quality in graduating to globalisation: some firms export and some of them go on to do outbound FDI. Exporting and outbound FDI are connected aspects of the process of outward orientation. This helps us understand one element of capital flowing uphill.

From a development economics perspective, there is interest in outward orientation and in the phenomenon of capital flowing uphill. Our work contributes to a deeper understanding of these phenomena, with a dataset drawn from a large developing country, India, in an important period of opening up the economy, 2001-2007. In addition, the existing empirical literature analysing outbound FDI at the firm level primarily analyses the globalisation of firms by looking at firms in industrial countries. Our work complements this research with analysis of a new dataset drawn from a developing country.

The rest of the paper is organised as follows. Section 2 lays out the theoretical framework and reviews the empirical literature in this field. Section 3 describes our data set, definitions and broad empirical facts. Section 4 discusses our empirical analysis and results and Section 5 concludes.

2 Theoretical framework

2.1 Traditional approach

The mainstream literature on FDI has focused on the setting where a developing country is the recipient of FDI. In the traditional view, countries are

seen to go through five stages (from least developed to developed), in which the propensity of being a net recipient to ultimately becoming a net source of FDI evolves (Dunning, 1986; Dunning and Narula, 1996; Dunning, 1998).

In the first stage, there is likely to be very little inward and outward FDI. This is because, at this stage, there are very few country-level factors (i.e. location-specific advantages such as a sizeable market or clusters of development) that might attract inward FDI, with possible exceptions being assets such as natural resources. Local firms have not created or acquired many firm-specific advantages that might allow them to invest overseas. In the second stage, inward FDI starts to rise (because of the increase of per capita incomes and other location-specific assets), while outward FDI remains low or negligible (firms are still developing). At stage three, the rate of growth of inward FDI is expected to decline (as local firms become more competitive), and that of outward FDI to grow faster. In the fourth stage, outward FDI stock should exceed or equal the stock of inward FDI in the country. By this stage, most domestic firms are now capable of competing with foreign firms abroad as well as in their own market. Finally, at stage five, the net investment position of a country tends to fluctuate around zero, reflecting relatively similar magnitudes of the stocks of inward and outward FDI (UNCTAD, 2006).

By this logic, the outward and inward FDI position of any country is closely and directly related to its level and structure of economic development. Outward FDI is expected to be undertaken only when a country has reached a certain minimum level of development.

Structural changes in the composition of outbound investment are also an important element of these transformations. Inbound FDI is first directed to low/medium knowledge-intensive or resource based industries; later they may move into the high-technology- intensive industries, and/or more efficiency-seeking FDI takes place. Similarly, outward FDI first takes place in low-technology or resource-based industries and then in high value added activities (UNCTAD, 2006).

The rapid rise of outbound FDI from developing countries in recent years (UNCTAD, 2006) is a challenge to this framework. The evidence indicates that countries at similar levels of development or GDP per capita display dissimilar patterns of net outbound investment per capita. This reflects different levels and patterns of industrial development, as well as the consequences of government policies. Countries such as Brazil, China, India, Mexico, South Africa and Turkey are home to leading MNCs, are sending out substantial outbound FDI, and have begun outward FDI earlier than might be expected

(UNCTAD, 2006).

A series of researchers (Moon and Roehl, 2001; Mathews, 2002; Buckley, 2004; Mathews, 2006; Mortimore, 2005) have pointed out that the many developing-country MNCs appear to be investing overseas at a very early stage. Further, it is argued that their sources of firm-specific or other competitive advantages seem to cover a wider range than the technological and expertise-based competencies that the prevailing theory has normally considered. In developing countries outbound investment by firms is assumed to be driven by the small home market, competitive pressure triggered by trade liberalisation and government policies aimed at encouraging foreign expansion.

In the framework of the investment theory literature explanations for Indian firms investing abroad have focused on firm characteristics such as age, size, R&D intensity and export orientation (Pradhan, 2004), strategic and knowledge based foreign assets and trade supporting infrastructure (Pradhan, 2006). Kumar (2007) finds support for the role of diffusion of imported technologies, cost effective strategies of their production processes and accumulated production experience on managerial skills.

2.2 New Trade Theory approach

Until recently, the study of the decision of a firm to serve foreign customers was implemented through two distinct directions: cross-border trade and cross-border investment. In recent years, a new literature has emerged, which emphasises the complementarity between export and investment decisions of heterogeneous firms.

While early research on trade did not focus on differences between firms, the trade literature in the 1990s has emphasised the fact that not all firms export. Bernard *et al.* (1995) show that even in one industry, some firms export while others do not owing to different costs and productivity levels. Only firms with sufficiently high profits to cover the sunk costs of entering export markets are exporters. Once a firm enters an export market, there is learning by exporting (Blalock and Gertler, 2004). In addition, the incentives to innovate could go up for a firm that is exporting owing to greater size, greater heterogeneity of customers and greater competition faced in diverse markets. This could result in accelerated productivity growth (Clerides *et al.*, 1998).

Greenaway and Kneller (2004) examine the evidence for firms in the UK and

find that (i) sunk costs are important, (ii) as a result of self-selection in an industry, only larger and more productive firms enter export markets and (iii) firms have to become more productive in order to continue being exporters. Wagner (2007) provides a useful survey of the empirical strategies applied, and the results produced, in 45 microeconomic studies with data from 33 countries published between 1995 and 2004 on the link between exports and productivity at the firm level.

The cross-border investment literature focuses on the drivers and determinants of firms participating in international markets through investment abroad. The classical theory of international trade had implied that firm investment decisions follow the comparative advantages of different locations. The New Trade Theory emphasises the specific capabilities (e.g. with respect to technology, finance, etc) which firms possess, which can be successfully exploited at home as well as at foreign locations. This implies that firms get involved directly in foreign activities to minimize transaction costs (e.g. securing quality standards by integrating suppliers of key components into the own firm).

Why do some firms decide to export or invest abroad while others produce for domestic markets? New Trade Theory emphasises the differences in productivity, size and capital and skill intensity between firms. These differences shape firms participation in global markets and exporting. For example, when the size of the foreign market increases, or the costs of exporting increases, the conditions for foreign production and outward investment become preferable compared to exporting. When the cost of producing abroad is high, then exports might be preferred (Melitz, 2003; Helpman *et al.*, 2004). Heterogeneity in productivity levels generates self-selection, as firms are faced with different costs in serving domestic and foreign markets. Only the most productive firms invest abroad. Less productive firms export, while the least productive ones serve their domestic markets. These arguments have found support in Head and Ries (2003, 2004); Kimura and Kiyota (2006); Tomiura (2007); Girma *et al.* (2004b,a).

In the context of FDI from industrialised countries Helpman *et al.* (2004) (HMY) show that there is a hierarchy of firms sorted by productivity where more productive firms export and the most productive firms invest abroad. Head and Ries (2003) find empirical support for the HMY model from Japanese firms but also suggest that these predictions can be reversed when a firm in an advanced country is investing in a low-wage country. In such a setting, the most *unproductive* firms may find it useful to invest in low-wage countries, thus using low wages to offset their inherent lack of productivity. When

thinking about outbound FDI from a developing country such as India, with some of the lowest wages in the world, this possibility is ruled out.

3 Data and descriptive statistics

The dataset that we utilise is based on the firm-level database maintained by Centre for Monitoring Indian Economy (CMIE).¹ We create a dataset of the firms which were a member of the CMIE ‘COSPI’ stock market index on 31 March 2007,² 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 dropped.
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. 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 which are 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.

¹India 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).

²The rationale for this is based on isolating the firms with the highest data quality.

Table 1 Industry composition of 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 |

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% of GDP), value added of Rs.2.9 trillion (7.3% of GDP) and exports of Rs.2.95 trillion (32% 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.

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

Year of incorporation The age and birth cohort of a firm is proxied by the year of incorporation.

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.

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.

Sales The revenues of the firm are measured by sales.

Gross value added The value added of the firm measures the output of the firm.

Research and development intensity The R&D activity of the firm is mea-

Table 2 Summary statistics about dataset

| | Min | 25% | Median | 75% | Max | Mean |
|-----------------------|---------|---------|---------|---------|---------|---------|
| Year of incorporation | 1863.00 | 1964.00 | 1982.00 | 1989.00 | 2005.00 | 1974.60 |
| 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 and D to 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 investment | 0.00 | 0.00 | 0.00 | 0.00 | 30.03 | 0.13 |

sured by summing capital account and current account expenses on R&D and expressing these as a fraction of sales.

Exports The direct exports by each firm is observed in the CMIE database.

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.

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 by exporting and by 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

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 |

large, these firms have sufficiently high productivity to be able to overcome this friction and are exporting.

DXI firms are the firms which export and invest abroad. Production at locations across the world helps avoid the costs of transportation costs suffered when 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 that they are able to overcome this.

Finally, there are **DI** firms. The big firms of this set are engaged in 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% of sales and as having outward FDI is international assets exceed 1% of total assets.

Table 3 shows the number of firms falling into the four categories in all years. The number of **DI** firms are 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 the firms in this category in the remaining analysis.

The data shows that some firms have built up very large positions abroad. As an example, the firm ‘Tata Tea’ has 52.4% of total assets outside the country in 2007. Other firms have more modest positions. As an example, the firm ‘Infosys Technologies’ had 1.64% 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

Table 4 Foreign assets of Indian firms

| Year | For. inv. | Total Assets | FI/TA (%) |
|------|-----------|--------------|-----------|
| 2001 | 79.98 | 6285.23 | 1.27 |
| 2002 | 94.57 | 7010.32 | 1.35 |
| 2003 | 105.21 | 7638.79 | 1.38 |
| 2004 | 103.39 | 8341.18 | 1.24 |
| 2005 | 155.69 | 10778.19 | 1.44 |
| 2006 | 211.81 | 13230.90 | 1.60 |
| 2007 | 340.05 | 12800.35 | 2.66 |

Table 5 Exports by Indian firms

| Year | Exports | Sales | X/S (%) |
|------|---------|----------|---------|
| 2001 | 644.20 | 6549.19 | 9.84 |
| 2002 | 720.13 | 6856.60 | 10.50 |
| 2003 | 877.93 | 7764.20 | 11.31 |
| 2004 | 1104.00 | 8951.52 | 12.33 |
| 2005 | 1745.97 | 11585.83 | 15.07 |
| 2006 | 2201.12 | 14109.73 | 15.60 |
| 2007 | 2954.47 | 12058.46 | 24.50 |

number went up dramatically from Rs.79.98 billion in 2001 to Rs.340 billion (roughly \$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% of the sum of total assets of the firms in 2007.

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 percent to sales went up from 9.84% to 24.5% over this period.

While the dataset has many attractive properties, it has several limitations. The firms included in the data set tend to be the larger ones and so we are missing out small exporting firms. It is 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% to 118500%. In order to address this, we do ‘winsorisation’ for such variables, which involves clipping the distribution to the (.01, .99) quantiles.

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 |

3.1 Transitions between categories

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 $t + 1$.

There is significant on-diagonal mass. Firms do not seem to fluctuate around; 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% chance of moving up to exporting. There is only a 0.23% chance of 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% chance of dropping back to being a domestic firm. There is a 90.84% chance of staying in the same state, and a 3.91% chance of jumping up to **DXI**.

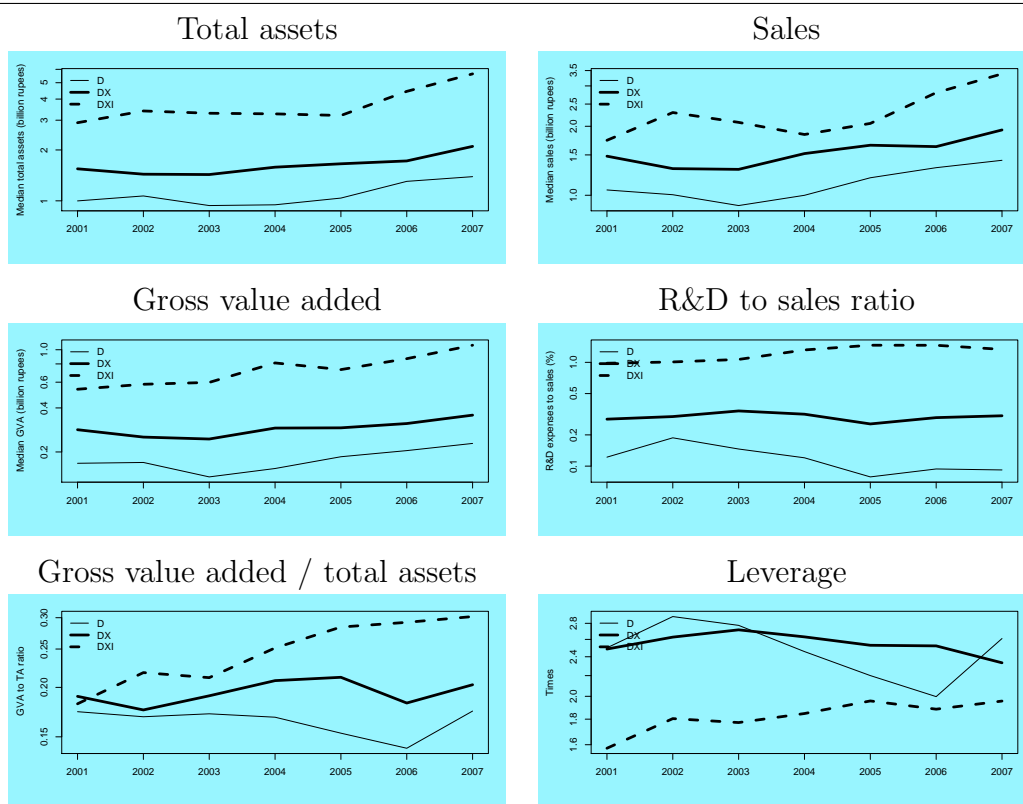
Once a firm has exports and outbound FDI, there is a 93.54% chance of staying there. With a 6.32% probability, the firm drops down to only exports, and with a 0.14% probability, it drops down to being a domestic firm.

This examination of transition probabilities has three key implications. First, internationalisation is relatively ‘sticky’; firms tend to not 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**.

3.2 Firm characteristics in the three categories

We now embark on a broad understanding of the firm 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 is 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 are **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 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. After 2002, a separation has opened up where **DXI** firms have the highest output per unit 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, but there is still less leverage than 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 Empirical analysis

We start by estimating separate probit models for the exporting status and outbound FDI status at the 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 do 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 | |
|------------------------|--------------------|----------|----------------|----------|
| | Coefficient | <i>t</i> | Coefficient | <i>t</i> |
| Industry fixed effects | Present | | Present | |
| Year fixed effects | Present | | Present | |
| Year of incorporation | 0.0018 | 2.23 | 0.0043 | 3.56 |
| Log value added | 0.2687 | 10.48 | 0.1480 | 3.81 |
| Log total assets | -0.0789 | -3.07 | 0.1441 | 3.73 |
| Asset tangibility | -0.0058 | -11.09 | -0.0101 | -12.07 |
| R&D to sales | 0.0997 | 5.32 | 0.1129 | 8.27 |
| Return on equity | -0.0013 | -2.13 | -0.0035 | -3.47 |
| LogL | -4415.38 | | -2080.10 | |
| AIC | 8878.76 | | 4208.21 | |

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.

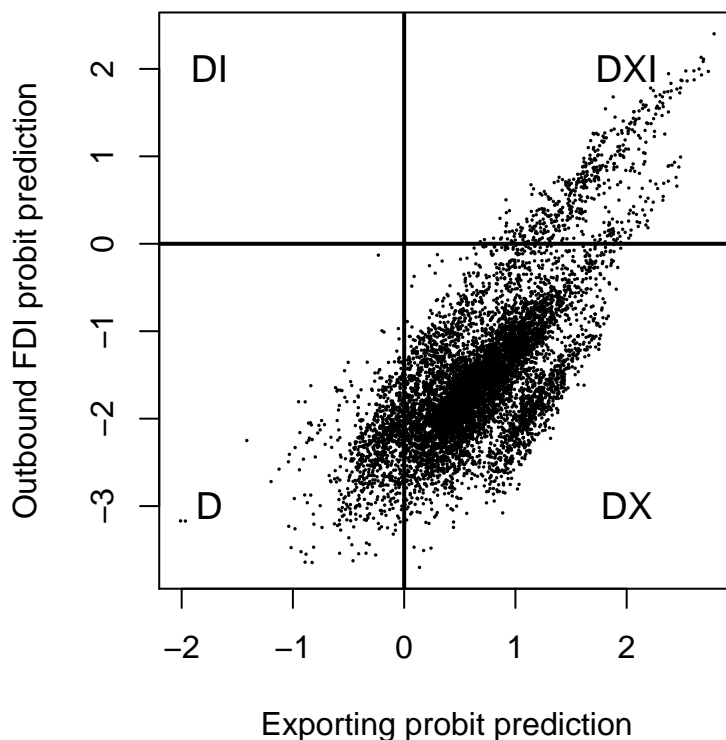
The year of incorporation has a small positive coefficient on both probit models. This suggests that younger firms are more internationalised. When using log value added as a size measure, the coefficient on both probits is positive. However, after controlling for this, log total assets exerts a negative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

Figure 2 Predictions for the latent variables of the two probit models



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.

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, 2004).

Hence, we define an ordering (1, 2, 3) for these three categories and estimate

Table 8 Ordered probit model for exporting and outbound FDI

| | Coefficient | t |
|------------------------|-------------|---------|
| Industry fixed effects | Present | |
| Year fixed effects | Present | |
| Year of incorporation | 0.0026 | 76.86 |
| Log value added | 0.2207 | 10.17 |
| Log total assets | 0.0037 | 0.17 |
| Asset tangibility | -0.0069 | -15.24 |
| R&D to sales | 0.1160 | 10.46 |
| Return on equity | -0.0017 | -3.27 |
| τ cutoffs | | |
| τ_1 | 4.8112 | 4181.02 |
| τ_2 | 6.9420 | 272.39 |
| LogL | -6539.89 | |
| AIC | 13129.77 | |

an ordered probit model. In this model, y^* is the unobserved latent variable, and there are cutoffs τ_1 and τ_2 that determine what we observe:

$$y^* = \beta'X + u \quad u \sim N(0, \sigma^2)$$

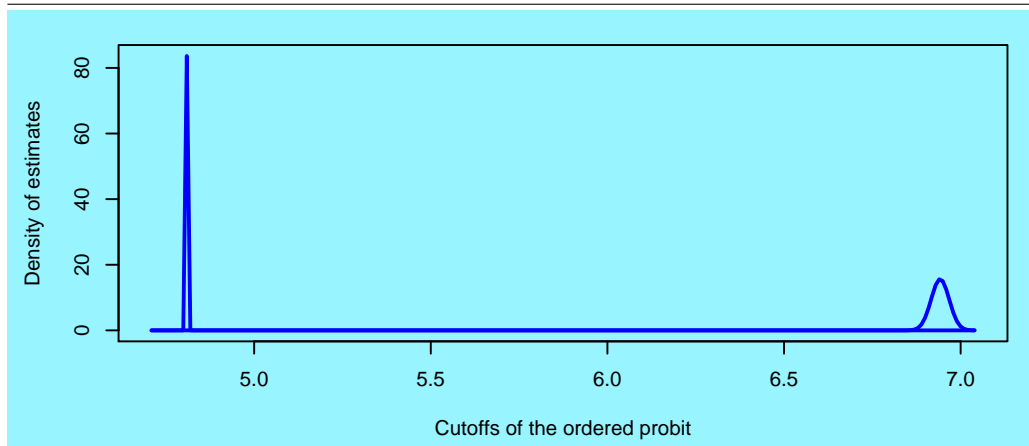
$$y = \begin{cases} \mathbf{D} & \text{if } y^* < \tau_1 \\ \mathbf{DX} & \text{if } \tau_1 \leq y^* < \tau_2 \\ \mathbf{DXI} & \text{if } \tau_2 \leq y^* \end{cases}$$

The parameter vector estimated by MLE is $\theta = (\beta, \tau)$. The latent variable $y^* = \beta'X$ can be interpreted as a single propensity measure: big values induce exports and bigger values induce outbound FDI too.

A key facet of the estimation is the parameters (τ_1, τ_2) . The data could reject the model by giving τ values which are smeared together. If, on the other hand, we are able to clearly see $\tau_2 > \tau_1$ 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 estimation 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 $\hat{\tau}$



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 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, $\hat{\tau} = (4.81, 6.94)$ 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 τ estimates are smeared together. Figure 3 shows the distribution of $\hat{\tau}_1$ and $\hat{\tau}_2$. These distributions do not overlap at all. This supports the idea of a hierarchy from \mathbf{D} to \mathbf{DX} to \mathbf{DXI} .

The τ 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.

5 Summary and conclusions

Development economists have been interested in outward orientation. In addition, in recent years, one element of the puzzle of capital ‘flowing uphill’ out of developing countries has been the phenomenon of outbound FDI by firms in developing countries. In this paper, we offer new insights into the issues of outward orientation and capital flowing uphill in a large country, India. This is a good setting for this analysis, since there has been a sharp rise in exports and in outbound FDI over a brief time period, and there is a high quality firm-level database.

The recent literature has emphasised the role of firm heterogeneity in both international trade and outbound FDI. Understanding these phenomena hence requires an examination of firm characteristics. Further, there is a close link between exporting and investing abroad, for these are alternative mechanisms for a firm to serve foreign customers.

We 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. This suggests that outbound FDI from India is an integral part of the evolution of Indian firms into outward orientation. In contrast with the traditional literature which has looked at the determinants of exporting and outbound FDI separately, our results emphasise a unification of these issues in understanding the globalisation of Indian firms. 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 HMY model is rooted in the issues faced when discussing FDI by firms in industrial countries. Outbound FDI by firms in a developing country poses a puzzle for the HMY model given the low costs of labour at home. Yet, we find that the broad ideas of the HMY model are applicable to FDI by firms in a developing country also. The ordered probit model that we estimate is consistent with the intuition of the HMY model, and the explanatory variables that are statistically significant are largely related to firm productivity.

Our results suggest that outward FDI is an integral part of the evolution of firms in a developing country towards higher productivity and outward orientation. To this extent, these results help explain some of the capital that has been flowing uphill.

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