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Abstract

Using data from more than 6,000 manufacturing firms in India for 1996–2008, we investigate the impact of financial constraints on the exporting behavior of Indian manufacturing firms while also focusing on the link between exchange rate movement and exports. We find that there is a strong degree of persistency in the exporting behavior of Indian manufacturing firms, reflecting the high fixed costs of entering foreign markets for Indian firms. A firm with a higher amount of net cash flows and smaller debt-to-asset ratios is more likely to become an exporter, indicating that a firm tends to self-finance its exporting without relying too much on external finances. Internal funds are especially important for firms that are not incumbent exporters to become exporters, and also for firms that do not enjoy technical advancement and high levels of productivity. When we divide the sample period into several subperiods, Indian firms have become less reliant on internal cash in recent years, but new exporters still rely on cash holdings to enter foreign markets. Over all, recent financial liberalization in India still does not allow the financial system to meet the stronger demand for funds by firms, especially small ones, though part of the stronger demand for funds are increasingly met by funds provided by foreign institutions. Based on our findings, improving the functionality of financial markets is an urgent issue to remove financial constraints that hinder Indian firms from entering export markets.

I. Introduction

There has been a strong emphasis on export promotion for economic development in the policy making community, especially in developing countries. While many observers view the economic success of the countries in East Asia, most notably the People's Republic of China (PRC), as convincing evidence that an economy with a strong export sector can achieve successful economic development, some extend the argument and focus on the merits of intervening in the foreign exchange market to bring about competitive currency values as one of the important ingredients of export-led growth. In this context, the possible downside of export promotion leading to misallocations of resources and macroeconomic mismanagement is often neglected.

Although very few policy makers question the positive link between currency depreciation and (net) exports, the academic literature is more of a mixed bag; some studies find a statistically significant correlation while others find no significant relationship (such as Duttagupta and Spilimbergo 2004).

The weak empirical evidence has been debated by economists and somewhat reconciled by adding two more variables in the discussion. The first is the impact of the fixed cost of entering a foreign market. Dixit (1989) argues that exchange rate uncertainty can affect the fixed cost of becoming an exporter, i.e., when the level of uncertainty is high, a firm can delay its decision of entry or exit from an export market since it waits for a more favorable exchange rate to arise.[1] Roberts et al. (1995) and Roberts and Tybout (1997) find sunk cost hysteresis in market entry and exit using Columbian manufacturers' data. More recently, Bernard and Wagner (2001) or Bernard and Jensen (2004) find hysteresis in the export status of German and American firms, respectively. These findings are interpreted as evidence for the fixed cost of entering the export market. Besides exchange rate uncertainty, the needs for additional market research, modifications in the production process for localized products, and any other regulatory and sociocultural difficulties to enter a foreign market can make high fixed costs for export market entry highly plausible. All these high fixed costs blur the link between fluctuations in currency value and performance of exports, and can help explain the J-curve effect in the macroeconomic context.

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[1] In Dixit's view, a firm has an "option" of deciding to enter the export market today (incurring corresponding entry costs) or to wait for another period. If it decides to wait, the firm will again observe a realization of the exchange rate and then decide whether to enter the market. Applying a standard option theory in financial economics, Dixit shows that the value of the option (of whether to enter the export market) increases with the degree of exchange rate uncertainty.

The other factor, closely linked to the previous one, is the impact of financial development, or conversely, the existence of financial constraints. To overcome high market entry costs to become exporters, firms need financing from the capital market. In a country where financial markets are repressed, or where potential borrowers cannot effectively obtain necessary funds at reasonable prices from the financial markets (due to government regulations, administrative meddling, etc.), firms would be discouraged to enter the export market even when relative prices change in favor of their products. Financial constraints can be more important for firms in the industry that is more reliant on external finances (Rajan and Zingales 1998). Chaney (2005) develops a theoretical model to predict that firms' exporting behavior can be affected by their productivity and liquidity, and finds that liquidity constraints can prevent productive firms from entering the export market.[2]

In this study, we will empirically investigate the impact of financial constraints on the exporting behavior of Indian manufacturing firms and also examine how these affect the link between exchange rate movement and exports. We will use comprehensive firm-level data on Indian manufacturing firms available in a database called "PROWESS" (Centre for Monitoring Indian Economy Pvt. Ltd. 2011), which contains a record of accounting and financial information for more than 6,000 firms operating in India. Using this dataset, we will examine how financial conditions of Indian firms affect the probability of their entry to the export market and their export volume. For the theoretical foundation for the estimation, we will follow Campa (2004) who examined the link between firms' exporting behavior and the exchange rate movement using the firm-level data of Spanish manufacturing firms, but we will make an important modification by adding variables that reflect financial conditions facing Indian firms.

Investigating Indian firms' corporate finance and exporting behavior is a good case study of how financial development can affect exporting behavior, where export promotion is often a priority in their national economic policy agendas. Many researchers have pointed out that corporate finance in developing countries is highly reliant on funds generated internally because financial resources are often difficult to obtain in repressed financial markets. The same generalization applies to India.[3] At the same time, since 1993, India has implemented a series of financial reforms and developed its financial markets significantly, which coincided with a series of trade liberalization policies and the policy of floating the India rupee. All these policies have contributed to a dramatic rise in the country's exports in the 2000s. Thus, India provides an interesting natural experiment that may present how Indian firms made optimal decisions to respond to dynamic changes

[2] Greenaway et al. (2007) examine the links between firms' financial health and their export market participation decisions using a panel of manufacturing firms in the United Kingdom over the period 1993–2003. Stiebale (2008) shows that financial conditions affect firms' decisions to enter foreign markets based on a firm-level data set from the European Union area. Both studies find evidence for the negative impact of financial constraints on export participation decision.

[3] Allen et al. (2009) show that 78% of Indian firms are owned by individuals or family members while the same figure for firms in the People's Republic of China (PRC) is 21% and 51% (30%) for medium (large)-size firms in their sample of emerging market countries (excluding India and the PRC).

in their surrounding environment. By shedding light on the Indian experience, this study should provide some lessons for other developing countries.

By looking into the interactive effects of financial factors and exchange rate movement on Indian firms' exporting behavior, this study makes several important contributions to the literature.

Firstly, this study is innovative since it investigates the link between financial development and exports and the link between exchange rate movement and exports jointly, while many studies look into each of the links individually. Chaney (2005), Greenaway et al. (2007), and Manova (2009) among others have looked into the link between financial or liquidity constraint and exporting behavior, whereas Campa (2004) and many others as discussed above have examined the impact of exchange rate movement on exports in the context of the hysteresis hypothesis. However, only few have looked into the two links jointly.[4]

Secondly, while many studies have used firm-level data from industrialized countries due to data availability to examine the determinants of exporting behavior, this study looks into a developing country. The findings from this exercise should provide indicative lessons for other developing countries.[5]

Lastly, as far as we are aware, only few studies have looked into the macroeconomic questions relevant to Indian firms despite wide use of the PROWESS database. Both Bhaduri (2005) and Ghosh (2006) investigate the impact of financial liberalization and financial constraint on Indian firms, but focus on the investment supply function. Around the same time as we worked on this paper, Srinivasan and Archana (2009) investigated the determinants of the exporting behavior and trade flows of Indian firms. However, they do not focus on the effect of the exchange rate movement.

In Section II, we will briefly review Campa's model, which will be our theoretical foundation to describe firms' behavior with regard to exporting. Section III introduces the PROWESS database and presents some summary statistics pertaining to the variables of our focus. We present our basic empirical model in Section IV, followed by discussions on the estimation results. We will make concluding remarks in Section V.

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[4] Berman and Berthou (2009) investigate how the lack of financial development can affect the link between exchange rate movements and exports using data for 27 industrialized and developing countries. They find that for countries with credit constraints, currency depreciation could lead to a smaller increase or even a decrease in exports. This study, however, uses country-level data and therefore, as the authors admit, may mask the complex micro-level interactions between firms' exports and their determinants such as firms' productivity levels and financial conditions.

[5] Li and Yu (2009) examine the impact of productivity and credit constraints using firm-level data for manufacturing industries in the PRC, but do not investigate the impact of exchange rate movement.

II. Theoretical Foundation

A. Theoretical Framework

For our estimation exercise, we follow Campa's (2004) dynamic discrete choice firm model, which is based on the model of export market participation and export supply.[6] This model allows us to incorporate the fixed or sunk cost of entering and exiting a foreign market. Here, let us present the theoretical framework of Campa (2004) with some modifications following Guillou (2008), who applied Campa's method to French manufacturing firms, as the theoretical basis for our estimation exercise.

Firm *i* maximizes the expected revenue (R_{it}) given the information set Ω_{it} while determining whether to serve the export market—here, the indicator variable I_{it} takes the value of 1 if firm *i* exports at time *t*, and 0 otherwise—and how much to export (γ_{it}) if it exports.[7] The objective function of firm *i* can be described as:

$$V_{it}\left(\Omega_{it}\right) = \max_{I_{it},\gamma_{it},Q_{it}} E_t\left[\sum_{j=t}^{\infty} \delta^{j-t} R_{ij}(I_{ij},\gamma_{ij},Q_{it}) \,\middle|\, \Omega_{it}\right] \tag{1}$$

where δ is the one-period discount factor and Q_{it} is the total production of firm *i* at time *t*.

When we define the fixed cost of entry to the export market as F_i and the fixed cost of market exit as G_i, then the net revenue from exporting can be expressed as:

$$R_{it}\left(I_{ij},\gamma_{ij},Q_{it}\right) = \pi_{it}^{d}\left[\left(1-\gamma_{it}\right)Q_{it}\right] + I_{it}\left[\pi_{it}^{x}\left(\gamma_{it}Q_{it,}e_{kt}\right) - F_i\left(1-I_{it-1}\right)\right] - G_i I_{it-1}\left(1-I_{it}\right) \tag{2}$$

where π_{it}^{d}, π_{it}^{x}, are the gross profits from production for the domestic and export markets, respectively, and e_{kt} is the exchange rate for industry *k* at time *t*. The revenue depends upon whether the firm exported last period or not (i.e., whether I_{it-1} = 0 or 1).

Applying the Bellman equation to equation (1), the firm's behavior will be determined by:

$$V_{it}\left(\Omega_{it}\right) = \max_{Ii_j,\gamma_{ij},Q_{ij}}\left[R_{it}\left(I_{it},\gamma_{it},Q_{it}\right) + \delta E_t\left(V_{it+1}\left(\Omega_{it+1}\right)\right) \,\middle|\, I_{it}\right]. \tag{3}$$

The first order condition based on this equation yields the following export participation rule. That is, firm *i* will decide to enter the export market only when the following is true:

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[6] Campa (2004) follows the theoretical framework by Roberts and Tybout (1997).

[7] We focus on the share (γ_{it}) of production that will be exported in the export supply function instead of export volumes by the firm as Guillou does because export volumes are difficult to obtain at the firm level for the estimation exercise. We define export intensity as the ratio of sales from exports to total sales where our measure of "exports" will be the sum of "earning from exporting goods" and "earning from exporting services."

$$\pi_{it}^{d}\left[\left(1-\gamma_{it}\right)Q_{it}\right]+\pi_{it}^{x}\left(\gamma_{it}Q_{it},e_{it}\right)+\delta\left[E_t\left[V_{it+1}\left(\Omega_{it+1}\right)|I_{it}=1\right]-E_t\left[V_{it+1}\left(\Omega_{it+1}\right)|I_{it}=0\right]\right] \geq F_i-\left(F_i+G_i\right)I_{it-1} \quad (4).$$

A firm's decision to enter or exit the foreign market is affected by both the current value of the exchange rate, which is assumed to represent the future exchange rate, and its volatility; while the volume of the exports, which we capture as export intensity, should be affected by primarily the exchange rate movement, not its volatility.

This framework allows us to incorporate the financial conditions that firms face. Campa's model is a heterogeneous firm model, wherein firm *i* chooses the export share γ_{it} to maximize its overall profit based on its characteristics included in its information set Ω_{it}. Here, we assume that firms' accessibility to finances can be embedded or included in the information set Ω_{it}. Hence, the financial conditions should affect both the export market participation decision and the share of exports in the firm's production in the same manner that the exchange rate movement affects the firm's decisions.[8,9]

In this framework, if financial markets are free of any constraint, that is, there is no financial repression or no government antimarket intervention, the conditions of the financial markets are homogeneous to the firms, which means that financial market conditions do not affect the firms' optimization process. However, in a financially constrained market, the accessibility to funds can be capricious for each firm. Some firms can secure access to financial resources while some others cannot. The latter may try to finance themselves by resorting to their own cash holding or retained profits. If firms are able to borrow from financial markets or to self-finance with cash flows or retained profits, they can maximize profits while potential competitors are being kept out of the foreign markets due to the inability to finance the sunk cost. In this case, the larger the fixed or sunk costs of entering a market, the more credit constraints would matter. Or, in an industry that technologically requires high volumes of capital in nature, the accessibility to financial resources matter more (Rajan and Zingale 1998). Hence, if a firm is financially constrained, exchange rate movement as well as its volatility may not matter because financial conditions of the firm may not allow it to take the advantage of changes in their price competitiveness.

[8] There is a vast literature on how financial development affects firms' output. Levine (2005) summarizes the literature on the finance–growth link and also presents a review on the link at the firm level.

[9] Another way of modifying the model is to endogenize the fixed cost of entering (and exiting) the export market. See Li and Yu (2009) for a model that makes financial accessibility as one of the factors for the cost function.

B. Theoretical Predictions of the Variables

Based on the above discussion, we review theoretical predictions of each of the variables that can be included in the information set Ω_{it} that can affect the decisions of firms regarding whether and how much to export.

(i) Export market participation in the previous year (t – 1), or I_{t-1}

When a firm's decision on export market participation is found to be persistent, this should mean that entering the export market involves a relatively large amount of fixed cost. A significantly positive estimated coefficient on export market participation in the previous year, I_{t-1}, indicates the Dixit (1989) type of fixed cost of entering the export market.

(ii) Cash holding

Firms in financially repressed markets (due to government regulations or other anticompetitive policies) find it difficult to get funds from financial markets, which is often the case in developing countries, therefore, they tend to rely on their own cash holdings. As a result, heavy reliance on internal finance, which is often measured by net cash flows or retained earnings in the empirical literature, can be a significant factor for firms' decision making, which can be interpreted as firms being self-financing and facing financial constraints. Many studies have found similar evidence for firms' decision on investment, including Ghosh (2006) for Indian firms and Chan et al. (2010) for the PRC.

(iii) Debt-to-asset ratio

The debt-to-asset ratio generally reflects the extent of borrowing capacity of a firm. That is, a higher ratio usually means the firm of concern faces low borrowing capacity. Conversely, a lower ratio should make it easier for a firm to borrow from financial markets, and therefore, can contribute to increasing the probability of becoming an exporter as well as the volume of exports. However, the interpretation of this variable may not be straightforward. In a market where external finance is relatively easily accessible, a firm can find it easier to get funds from the financial market, or to get highly leveraged when entering a foreign market or meeting changes in the demand for its exporting product, thus blurring the negative correlation between the ratio and the probability of entering foreign markets or the volume of exports. In this context, if the estimate on this variable is found to be negative, a greater magnitude of the estimate in absolute values may indicate a higher degree of risk averseness.

(iv) Firm size

A larger firm can internally share risks and therefore may be able to make a risky decision such as entering a foreign market. It may also be able to make the use of scale economies so that it can make the sunk cost of entering a foreign market smaller in relative terms (Bernard and Jensen 2004). Thus, one can expect a positive correlation between firm size and the probability of entering the export market and the volumes of exports.

(v) Firm age

Older firms usually hold a stock of business know-how and network of connections, both of which may facilitate entry to new markets. However, older firms may also have more established customer base in the domestic market, so they may be less inclined to take risks and enter new markets. Hence, the expected sign of this variable is ambiguous.

(vi) Profitability

The profitability of a firm should positively affect the decision to enter the export market as well as the volumes of exports in the same way profitability affects its decisions on investment. Also, higher profitability may function as collateral for financing through increased present values of future income flows. Furthermore, higher profitability may also help increase internal earnings that can be used as internal finances.

(vii) Productivity

Productive firms should be competitive in terms of providing innovative products and lowering production costs, both of which may allow them to penetrate into foreign markets. As was the case with profitability, firms may collateralize future income that arises from their innovative products, management, and production processes.[10]

(viii) Foreign borrowing

Borrowings from foreign firms or financial institutions can make it easier for a firm to obtain not only funds for exploring foreign markets but also managerial knowledge, know-how pertaining to particular foreign markets, and network of business connections useful for marketing, all of which can contribute to greater export incentives. This can be more directly applied to firms that are owned by foreign firms.

[10] Muúls (2008) presents a theoretical model in which both productivity and financial constraints are incorporated in the firm's decision making on entering a foreign market. He also finds empirical evidence consistent with theoretical predictions using Belgian firm-level data.

(ix) Industrial group

The network effect can be also obtained from industrial groups or conglomerate a firm belongs to. In India, several industrial groups exist and are major players in some industries, as is the case in the Republic of Korea (*chaebols*) and Japan (*keiretsu*). Industrial groups may also alleviate the financial constraints on their member firms through cross-subsiding group member firms.

III. Data and Summary Statistics

A. Data

We use the comprehensive database on Indian firms called PROWESS. This database is maintained by the Center for Monitoring Indian Economy (CMIE), and includes financial statements data for about 9,000 companies since the late 1980s. Careful analyses on the firms included in this database can be found in Allen et al. (2009), Oura (2008), and Shah et al. (2008).

From this database, we extract data on firms from eight industries: food and beverages, chemical, metal, machinery, textiles, fuel, "miscellaneous," and "nonmetallic mineral." Appendix 1 lists the compositions of the eight industrial categories. Although the original data are available since 1989, mainly due to data availability of explanatory variables, our sample starts in 1996, which allows us to focus on the period in the aftermath of the comprehensive financial reforms in 1993. In order to exclude obvious outliers and unrealistic observations, we follow the steps specified in Appendix 2 to construct the sample for the estimations.

After removing the outliers and unrealistic observations, we have 43,209 firm-years with 5,220 firms for the period 1996–2008. The numbers of the firms included in the sample for each of the five industries are shown in Table 1.

For other data, the consumer price index is retrieved from the International Monetary Fund's International Financial Statistics. The industry-level trade data are extracted from the United Nations' Comtrade database. More details on the data definitions and sources can be found in Appendix 1.

Table 1: Firms in the Sample, 1994–2008

Sample	Chemicals	Machinery	Fuel	Food and Beverages	Metals and Metal Products	Textiles	Nonmetallic Mineral Products	Miscellaneous Manufacturing
Firm-year	11,468	6,787	371	6,866	5,557	6,542	2,173	2,726
Number of firms	1,684	1,009	47	1,133	881	1,044	265	334
Total assets as of 2008 (Rs crore)	844,885.5	242,984.9	235,957.5	138,739.2	440,484.4	117,501.5	123,878.3	83,947.4
Total sales as of 2008 (Rs crore)	1,176,432.0	215,769.4	101,488.3	166,430.8	319,734.8	84,958.1	106,415.4	68,442.2
Total exports as of 2008 (Rs crore)	185,111.8	27,220.5	13,961.4	20,474.8	54,747.0	22,243.8	24,591.3	6,084.5
Export participation	0.684	0.722	0.542	0.381	0.556	0.601	0.679	0.680
Export intensity as of 2008	0.180	0.127	0.192	0.099	0.132	0.202	0.221	0.121
Dependence on external finance	3.38	0.91	0.78	0.53	0.44	0.19	0.00	-0.20

Rs = rupees.

Note: Total: 48,140 firm-years and 6,649 firms. The degree of dependence on external finance is based on Oura (2008). The degree of dependence for "Machinery" is the average of the values for "Machinery" and "Electronics" from Oura. "Miscellaneous" is the average of "Wood", "Fabricated metal", and "Paper"; "Chemical" is the average of "Chemical" and "Rubber". See Appendix 2 for the composition of each industrial category.

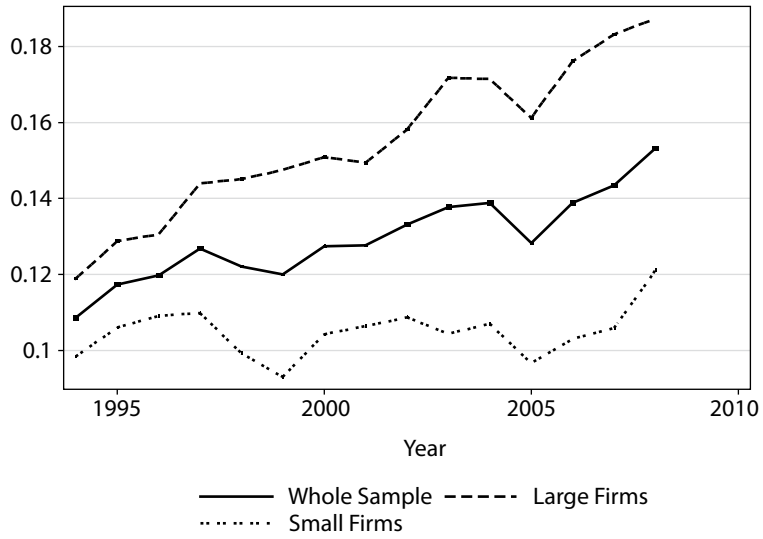
Sources: Oura (2008), authors' calculation.

B. Summary Statistics

Because Allen et al. (2009), Oura (2008), and Shah et al. (2008) conduct comprehensive and up-to-date analyses on the Indian firms included in the PROWESS database, we will focus on the summary statistics of several variables relevant to the exporting behavior of Indian firms.

We measure the extent of export intensity as the share of earnings from exporting goods and services in the total sales. Figure 1 illustrates the development of the export intensity ratios for the full sample as well as the subsamples of "large" and "small" firms, where large firms are those whose assets are greater than the median in a given year.[11] As a whole, more and more Indian firms have been exporting since the early 1990s, though the tendency is more noticeable among large firms. Among different industries in our sample, according to Figure 2, textile and nonmetal mineral industries have been the largest exporting industries where about 20% of total sales are from exports. Meanwhile, chemical, metal, fuel, and machinery industries have been on the rising trend. The food and beverages industry, on the other hand, reduced its export share in the late 1990s and has since been stable. The fuel industry appears to be cyclical, possibly highly correlated with the world energy demand.

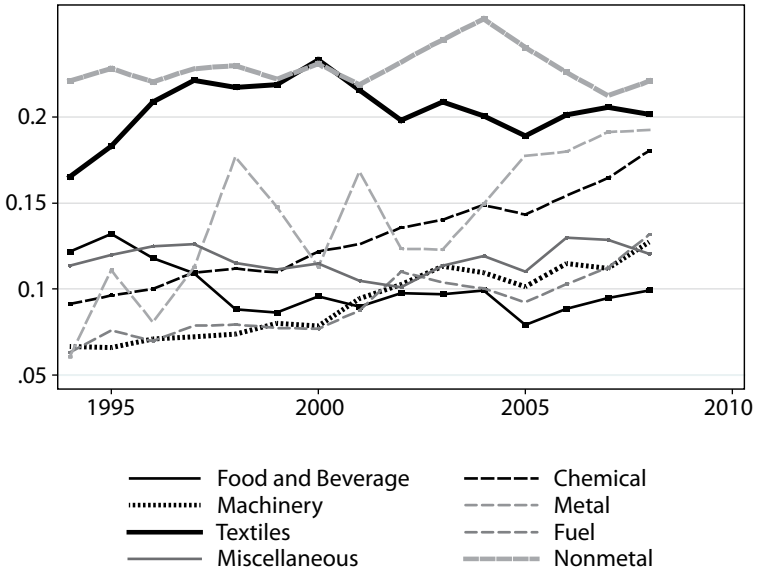
Figure 1: Export Intensity (exports/sales)



Source: Authors' calculation.

[11] This means that a firm can become a large or small firm over different years.

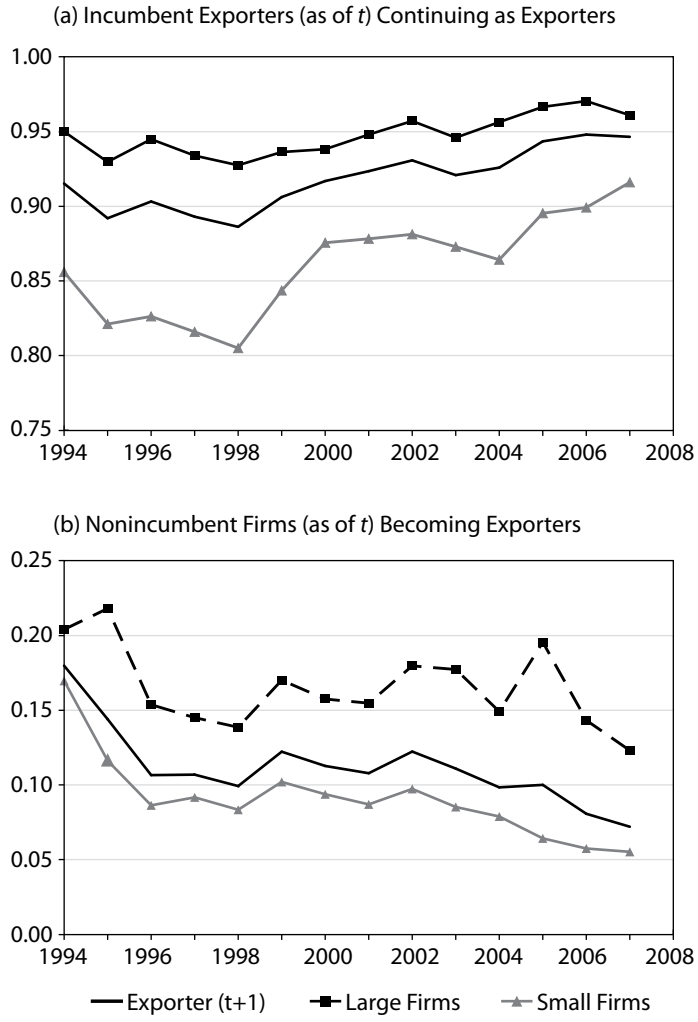
Figure 2: Export Intensity among Industries



Source: Authors' calculation.

While entering a foreign market is not an easy thing for many firms, mainly due to the high fixed cost of market entry as we have discussed in the theoretical section, once a firm becomes an exporter, it tends to continue to be one. Figure 3 highlights the highly persistent exporting behavior of Indian firms. Panel (a) shows the transition rates for time *t+1* of the incumbent exporters as of time *t* ("incumbent" meaning those that are exporters as of time *t*) while Panel (b) shows the nonincumbent exporters. In the figure, we can see that the persistency in the exporting behavior has been increasing for incumbent exporters in recent years; in the last 3 years, about 95% of incumbent exporting firms tend to remain in the export market in the following year while less than 90% of them remained as exporters in the mid-1990s. In most of the sample period, only 10% of the firms that are not exporters become exporters and its rate has been significantly declining in the last few years. These figures signify the difficulty of entering foreign markets and thereby suggest the significant role the fixed cost of foreign market entry plays in the decision making process of Indian manufacturing firms.

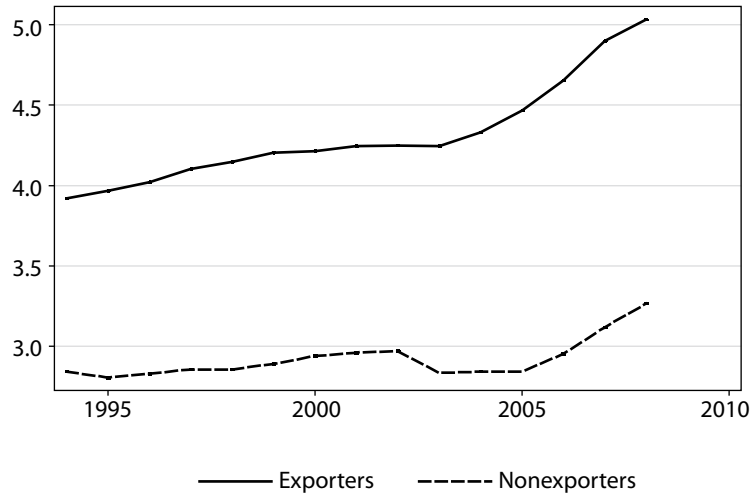
Figure 3: Firm Transition Rates in Export Markets



Source: Authors' calculation.

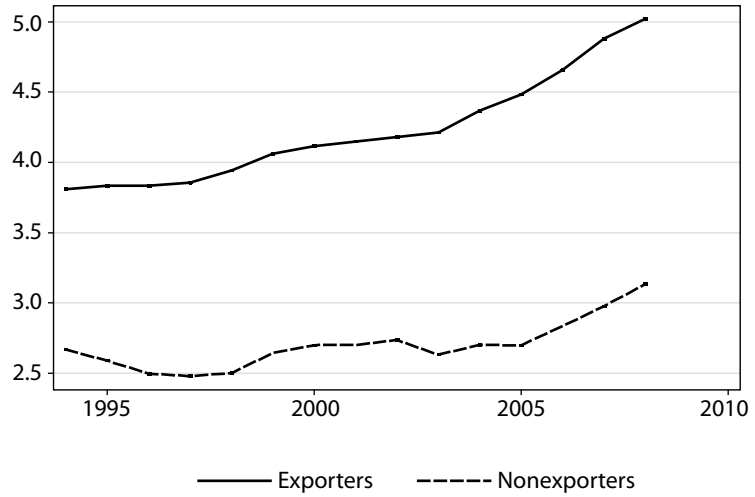
Given the high hurdle to become exporters, exporters and nonexporters should be facing different economic and financial conditions. Figure 4 shows that the size of total assets for exporters is much greater than that of non-exporting firms. Furthermore, the asset size of exporters has been expanding more rapidly in recent years. A similar trend can be observed for the respective sales of exporters and nonexporters (Figure 5). The profitability of exporting firms has been rising in recent years after some retrenchment in the late 1990s, which must be correlated with rising export intensity (Figure 6).

Figure 4: Total Assets—Exporters versus Nonexporters (in log)



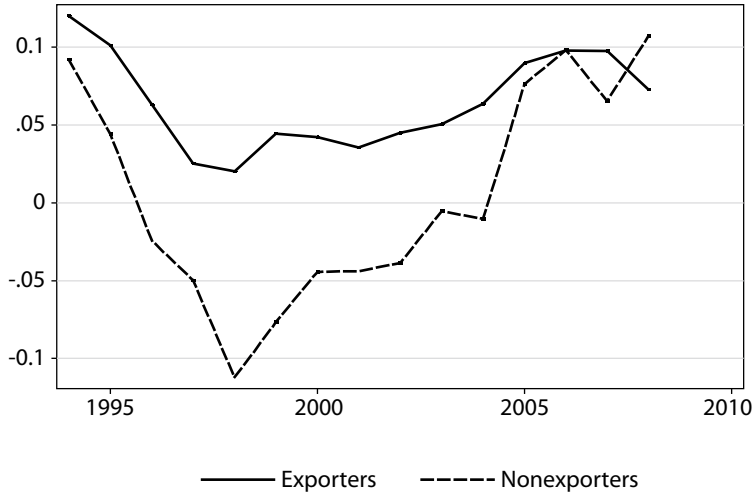
Source: Authors' calculation.

Figure 5: Sales—Exporters versus Nonexporters (in log)



Source: Authors' calculation.

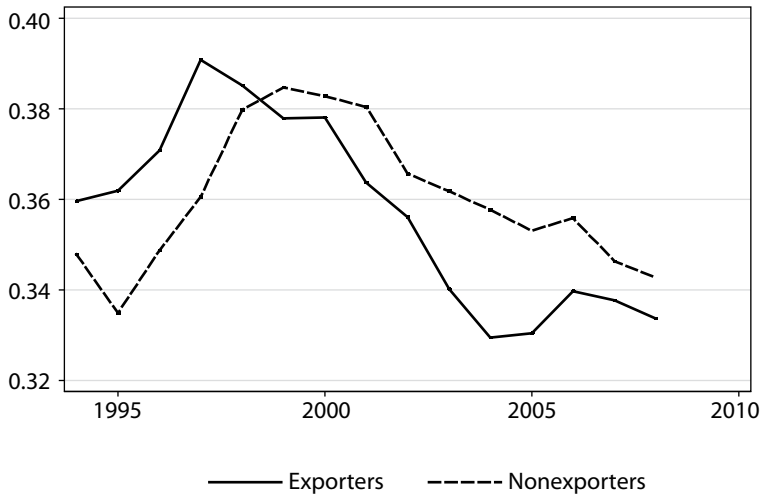
Figure 6: Profitability (PBIT/Assets)—Exporters versus Nonexporters



Source: Authors' calculation.

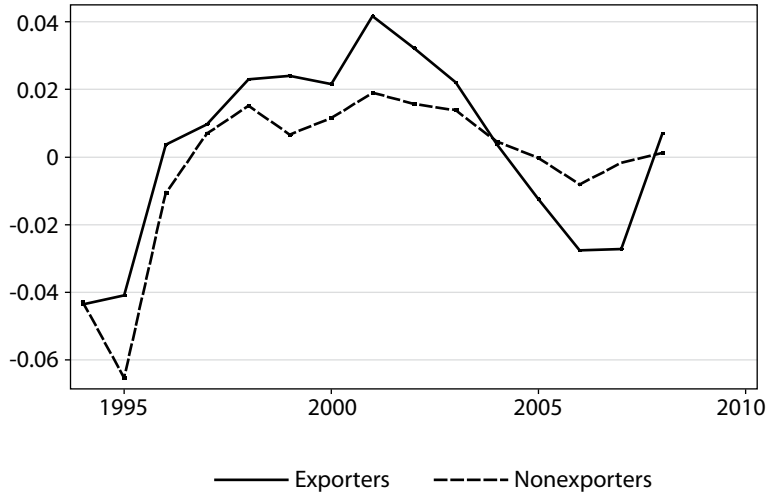
A number of other financial conditions differ between exporters and nonexporters. According to Figure 7, the debt-to-asset ratios are much higher for nonexporters, possibly indicating that firms with more severe borrowing constraints are discouraged to export. The lack of financial development can make firms more sensitive to the extent of leverage. In such an environment, again, firms are prone to rely on internally available funds. However, Figure 8 shows that there is not much difference between exporters and nonexporters in terms of amount of cash holding, though in Figure 9, exporters seem to retain more profits than nonexporters.

Figure 7: Debt-to-Asset Ratios—Exporters versus Nonexporters



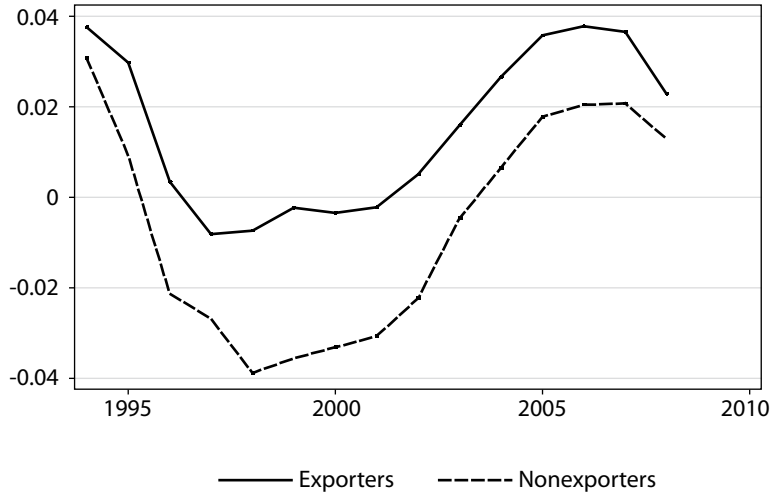
Source: Authors' calculation.

Figure 8: Cash Flow/Assets—Exporters versus Nonexporters



Source: Authors' calculation.

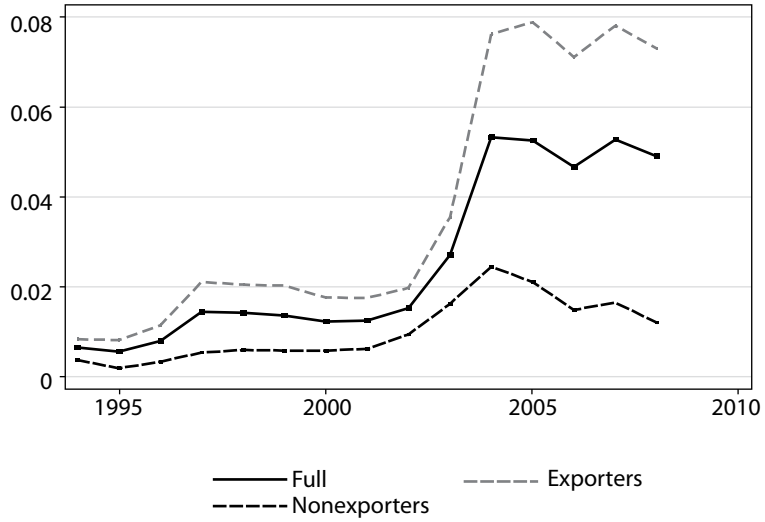
Figure 9: Retained Profits/Assets—Exporters versus Nonexporters



Source: Authors' calculation.

Recent financial liberalization policies may have given Indian firms a new source of funding: foreign borrowing. Borrowings from foreign firms or financial institutions provide not only funds for exploring foreign markets but also managerial knowledge, know-how pertaining to particular foreign markets, and networks of people useful for marketing, potentially making it easier to penetrate into the export market. Figure 10 illustrates how exporters increased foreign borrowing significantly after 2004, while nonexporters did not.

Figure 10: Foreign Borrowing/Debt—Exporters versus Nonexporters



Source: Authors' calculation.

IV. Estimation

The informal analysis we just made only gives us some ideas about unconditional correlations between firms' exporting behavior and their potential determinants. To shed more light on the determinants, we need to conduct more formal analysis. For that, we again follow the estimation approach by Campa (2004).

A. Estimation Models

For the estimation exercises, we will implement the Heckman (1979) model—because we need to avoid selection bias that could arise—by simply estimating the export volumes on potential determinants. Instead of excluding the firms that self-select not to export, we first apply the maximum likelihood estimations to the probit model with random effects to estimate the probability of export participation.[12] That is, the system of equations we estimate are:

$$I_{it} = \begin{cases} 1 & \text{if } \pi_{it}^{d}\left[\left(1-\gamma_{it}\right)Q_{it}\right] + \pi_{it}^{x}\left(\gamma_{it}Q_{it}, e_{it}\right) + \delta\left[E_t\left[V_{it+1}\left(\Omega_{it+1}\right)|I_{it}=1\right]\right] \\ & \qquad - E_t\left[V_{it+1}\left(\Omega_{it+1}\right)|I_{it}=0\right] - F_i + \left(F_i + G_i\right)I_{it-1} \geq 0 \\ 0 & \text{otherwise.} \end{cases} \tag{5}$$

[12] Because the error term v_{it} must be the sum of a firm-specific component and a white component, both of which are normally distributed, it is appropriate to estimate with random effects. See Campa (2004) for more discussions on the error term. For the dynamic probit estimation with random effects, refer to Wooldridge (2005).

where the revenue is implicitly determined by:

$$R_{it} = Y_{it}'\mathrm{B} + \varepsilon_{it}. \tag{6}$$

The vector Y_{it} includes firm-specific characteristics such as firms' financial conditions, cash holding, productivity; profitability; whether or not they belong to industrial groups; ownership (i.e., foreign-owned, government-owned, or private-owned); export participation in the previous period; and industry-specific characteristics such as industry-level effective exchange rates (EER), their volatilities, and other characteristics that can be captured by industry dummies. Since it includes the lagged dependent variable in the right-hand side, it is a dynamic probit estimation with random effects.

We then estimate the second equation using ordinary least squares (OLS) after controlling for the probability of firms' self-selecting into exporting. That is, we estimate export intensity γ_{it} of exporter *i* at time *t* as:

$$\gamma_{it} = \begin{cases} \alpha_0 + \alpha X_{it} + v_{it} & \text{if } I_{it} = 1, \\ 0 & \text{otherwise} \end{cases} \tag{7}$$

where I_{it} follows equation (5). The vector X_{it} includes almost the same set of variables as in the information set Y_{it}. The only differences are that X_{it} (the vector of explanatory variables in the second stage) includes the export intensity from the last period γ_{it-1} instead of the last period export participation indicator I_{it-1} and the Mill's ratio from the probit estimation to take account of the selection bias, though the exchange rate volatility is not included. We control for environmental changes that affect the Indian economy at the national level by including year dummies in both stages of estimations.

In the following estimation exercise, we will place the main focus on the variables that account for financial conditions of the firms and those pertaining to the exchange rate movement.

Among the variables for financial conditions, we will include the debt–asset ratio, net cash flows (excluding cash flows from financing activities), and net cash flows from financing activities. We particularly focus on the variable for net cash flows because we treat it as a proxy for financial constraint. While it is a difficult task to come up with a variable that would reflect the conditions of financial constraint or repression facing firms, researchers in the literature often use a variable that represents either cash holding or retained profits as a proxy for financial constraint. The basic idea is that if a firm faces some difficulty in getting finances from the (formal) financial markets, it tends to hold more cash or some sort of internally generated income as a main financing means. This is especially

prevalent among developing countries where financial markets are constrained (Allen et al. 2009). However, because net cash flows obtainable from the cash flow statement include cash flows from financing, using that variable as a proxy for financial constraint is not appropriate for our analysis.[13] Hence, we subtract cash flows from financing from the (total) net cash flows and use the remaining, that is, nonfinancing cash holding, as a proxy for financial constraint.[14] We do also include the cash flows from financing as a separate explanatory variable, hoping that it captures the effect of financing from the (formal) financial markets.[15]

As an alternative variable to net cash flows, we also use retained profits (as a ratio to total assets) as a proxy for financial constraint. In the following sections, we will mainly report results from the estimations for which we use nonfinancing net cash flows as a proxy for cash holding while also controlling for cash flows from financing. We do also estimate the models that include retained profits separately as robustness checks. In most cases, the estimation results with retained profits are quantitatively and qualitatively very similar to those with net cash flows though statistical significance varies occasionally.

For the variables that reflect the exchange rate movement, we include the industry-level effective exchange rate (in natural log) and its volatility (as the annual standard deviations of the monthly rates of depreciations). To construct these variables, we find the top 70% trading partners for the exports in each industry and use the shares of the trading partners as the weights to calculate the effective exchange rate. By construction, a higher value of the effective exchange rate indicates an appreciation of the Indian rupee for the particular industry. While the volatility variable is included in the first-stage dynamic probit with random effects, it is not included in the second stage estimation.

B. Estimation Results

1. Basic Estimations

The results from the first-stage dynamic probit estimation with random effects are reported in columns 1 and 2 of Table 2 and show that there is a strong degree of persistency in the decision of export market entry. When the explanatory variables take the mean values and the random effects are zero, the marginal effects indicate that once a firm becomes an exporter, it tends to remain in the export market with a probability of about 75%. Such persistency in the exporting decision reflects the fixed costs of entering foreign markets.

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[13] In the cash flow statement, net cash flows are composed of cash flows from operations, cash flows from investing, and cash flows from financing.

[14] When we use only "cash flows from operations" as the variable for cash holding, we also get quantitatively and qualitatively similar results.

[15] This variable accounts for the difference between the outflow of cash from issuing debt and equity and the inflow of cash from receiving dividends, repurchasing shares, or repaying debt.

Table 2: Estimates of Export Market Participation (Probit model with random effects)

	Full (1)	Full (2)	Large Firms (3)	Small Firms (4)
Exporter (t-1)	2.312	2.325	2.305	2.388
	(0.027)***	(0.027)***	(0.039)***	(0.031)***
Cash flow/assets	0.573		0.235	0.846
	(0.233)**		(0.341)	(0.310)***
Retained profits-to-asset ratio		0.538		
		(0.105)***		
Cash flows from financing	0.603	0.110	0.117	1.008
	(0.237)**	(0.099)	(0.345)	(0.320)***
Debt-to-asset ratio	-0.256	-0.163	-0.405	-0.173
	(0.052)***	(0.055)***	(0.086)***	(0.061)***
Foreign borrowing/debt	0.492	0.489	0.589	0.374
	(0.104)***	(0.103)***	(0.138)***	(0.157)**
Assets (ln)	0.264	0.257	0.211	0.248
	(0.012)***	(0.011)***	(0.020)***	(0.020)***
Age (ln)	0.016	0.015	0.031	0.004
	(0.016)	(0.015)	(0.024)	(0.019)
Profitability	0.057	0.040	0.064	0.055
	(0.016)***	(0.018)**	(0.025)***	(0.020)***
Foreign-owned	0.295	0.299	0.315	0.240
	(0.059)***	(0.059)***	(0.078)***	(0.087)***
Government-owned	-0.771	-0.742	-0.757	-0.533
	(0.082)***	(0.082)***	(0.101)***	(0.164)***
EER (ln)	0.265	0.302	0.004	0.507
	(0.287)	(0.287)	(0.437)	(0.376)
Volatility of EER	-7.438	-7.507	-7.319	-6.765
	(3.706)**	(3.709)**	(5.098)	(5.351)
Ratio of total wages to sales	-0.472	-0.394	-0.617	-0.389
	(0.090)***	(0.090)***	(0.169)***	(0.101)***
Ratio of investment to assets	0.576	0.450	0.427	0.729
	(0.158)***	(0.158)***	(0.222)*	(0.224)***
Conglomerate	-0.042	-0.038	-0.079	0.116
	(0.062)	(0.062)	(0.077)	(0.103)
N	42,494	42,406	20,970	21,520
Number of firms	6,397	6,395	3,216	4,321

* significant at 10%; ** significant at 5%; *** significant at 1%.

EER = effective exchange rate.

Note: Industry and year dummies are included in the estimation, but their results are not reported, neither are those of the constant term. Higher values of EER indicate appreciation of the Indian currency against the basket of currencies of trading partners at the industry level.

Source: Authors' calculation.

The significantly positive coefficient on the cash holding variable (nonfinancing net cash flows as a ratio to total assets) means that a firm holding a larger amount of cash is more likely to become an exporter. In terms of the marginal effects, a 10 percentage point increase in the ratio of cash holding would lead to a 2.2 percentage point increase in the probability of a firm entering the export market, suggesting that self-financing is important for a firm that wants to become an exporter, and that Indian firms face financial constraints.[16]

While highly indebted firms are less likely to become exporters, firms that can borrow from foreign firms tend to become exporters, possibly benefiting from closer ties with foreign firms and/or better access to information on foreign markets. For similar reasons, foreign-owned firms tend to enter export markets, with the probability of foreign-owned firms' entering the export market being greater than that of domestic counterparts by 11 percentage points. But government-owned firms are much less likely to become exporters, with the probability of government-owned firms entering the export market being lower than nongovernment-owned firms by as much as 30%. Firms with higher labor productivity and those with higher investment intensity are more likely to become exporters, supporting the hypothesis that firms with higher levels of productivity are more prone to export. Belonging to a conglomerate does not seem to help a firm to become an exporter. This may be explained by the tendency of conglomerates to focus on the domestic market just as government-owned firms, and to have a more established presence and more market power through their industrial network.[17]

Among the exchange rate-related variables, the volatility of the effective exchange rates is found to be significantly negative, representing higher costs in entering a foreign market because of higher degrees of exchange rate uncertainty.[18] However, the EER as a level is not significant and has a wrong sign; currency appreciation, i.e., higher EER, encourages firms to enter export markets.

In the OLS estimation where we estimate the export intensity of the Indian firms, most of the variables that affect firms' decision to enter foreign markets are found to affect the volume of exports as well.[19] Those firms with ample cash holdings tend to export more once they enter the export market. In addition, older firms tend to export less, indicating that older firms may have an established base in the domestic market while younger firms

[16] Many studies have found similar evidence for firms' decision on investment, including Ghosh (2006) for Indian firms and Chan et al. (2010) for the PRC.

[17] This is confirmed by the negative coefficients on the conglomerate variable in the OLS export intensity estimations shown in Table 3.

[18] A 1 percentage point increase in the annual standard deviations of the monthly rate of depreciation would lead to a drop in the probability of becoming an exporter by 2.8 percentage points.

[19] Because the second-stage estimation model includes the lagged dependent variable, one should be concerned about serial correlation. Hence, we also estimated the second-stage regression using the feasible generalized least squares model. The results of all the explanatory variables turn out to be intact, except that the level of persistency is found to be greater in the FGLS model. Due to the intactness of the results and also to conserve space, we only report the OLS results.

are possibly more active in taking the advantage of the recent liberalization in the Indian economy. Again, no significant and reasonable effects are found on the exchange rate variable.

When we use the variable for retained profits as a ratio to assets to represent firms' cash holding (column 2 of Tables 2 and 3), we do not observe any changes in the behavior of other explanatory variables both qualitatively and quantitatively. These results also bolster the evidence that firms tend to rely upon their internal finances.

2. Does the Firm Size Matter?

The extent of getting financed externally from the capital market or raising funds internally can be a function of firm size. Many studies have shown that financial constraints affect different sizes of firms differently. As Love (2003) and others have found, smaller firms may face greater transaction costs relative to their size, and their smaller scale may expose them to greater information asymmetry. Smaller firms may not benefit from political connection or connections through industrial conglomerates either. We group our sample firms into two subsamples depending on whether their total asset size is above or below the median of the total assets in each year.

Columns 3 and 4 in Table 2 show that the effect of cash holding in small firms is much larger both in magnitude and statistical significance compared to large ones, indicating that small firms do face more severe financial constraints than larger ones. Further, the variable for cash flows from financing is found to be significantly positive (with a much larger magnitude and statistical significance) for small firms compared to large firms, suggesting that once a small firm has access to funds from financial markets, it is more likely to become an exporter. The magnitude and statistical significance of the estimated coefficients on the debt-to-asset ratios are larger in absolute values for large firms than for small firms, letting us surmise that improving financial health can lead to a higher probability of entering the export market for large firms than for small firms. All these empirical findings can be interpreted as smaller firms facing tighter financial constraints than large ones.

Lastly, the volatility of the effective exchange rate seems to matter but only marginally for large firms' decisions to become exporters while the effective exchange rate as a level does not seem to matter for both large and small firms. We can interpret these findings as weak evidence that large firms are more able to respond to exchange rate movements than small firms.

Table 3: Estimates of Export Intensity (ordinary least squares)

	Full (1)	Full (2)	Large Firms (3)	Small Firms (4)
Export intensity	0.897	0.897	0.907	0.881
(t-1)	(0.004)***	(0.004)***	(0.005)***	(0.007)***
Cash flow/assets	0.027		0.014	0.047
	(0.013)**		(0.014)	(0.023)**
Retained profits-to-asset ratio		0.039		
		(0.006)***		
Cash flows from financing	0.045	0.022	0.021	0.075
	(0.014)***	(0.006)***	(0.014)	(0.025)***
Debt-to-asset ratio	-0.008	-0.002	-0.010	-0.011
	(0.002)***	(0.003)	(0.004)**	(0.003)***
Foreign borrowing /debt	0.026	0.025	0.021	0.039
	(0.005)***	(0.005)***	(0.005)***	(0.011)***
Assets (ln)	0.001	0.001	0.001	0.003
	(0.000)***	(0.000)***	(0.001)	(0.001)***
Age (ln)	-0.003	-0.003	-0.004	-0.002
	(0.001)***	(0.001)***	(0.001)***	(0.001)**
Profitability	0.005	0.003	0.005	0.004
	(0.001)***	(0.001)*	(0.002)***	(0.002)***
Foreign-owned	-0.002	-0.001	-0.003	0.004
	(0.002)	(0.002)	(0.002)	(0.004)
Government-owned	-0.010	-0.009	-0.013	0.002
	(0.002)***	(0.002)***	(0.003)***	(0.004)
EER (ln)	0.010	0.012	0.018	-0.001
	(0.016)	(0.016)	(0.020)	(0.025)
Ratio of total wages to sales	-0.001	0.003	-0.004	-0.001
	(0.005)	(0.005)	(0.009)	(0.006)
Ratio of investment to assets	0.027	0.019	0.023	0.033
	(0.008)***	(0.009)**	(0.011)**	(0.014)**
Conglomerate	-0.003	-0.003	-0.004	0.003
	(0.002)	(0.002)	(0.002)	(0.005)
Mills ratio	-0.003	-0.003	-0.000	-0.005
	(0.001)***	(0.001)***	(0.001)	(0.001)***
Adjusted R2	0.83	0.83	0.85	0.81
N	42,490	42,406	20,970	21,520

* significant at 10%; ** significant at 5%; *** significant at 1%.

EER = effective exchange rate.

Note: Robust standard errors in brackets. Industry and year dummies are included in the estimation, but their results are not reported, neither are those of the constant term. Higher values of EER indicate appreciation of the Indian currency against the basket of currencies of trading partners at the industry level.

Source: Authors' calculation.

3. Does Exporting Behavior Differ across Different Industries?

Firms' exporting behavior can surely differ among different industries owing to different industrial and market structures. Also, the effect of finance on exporting can differ because, as the seminal paper by Rajan and Zingale (1998) shows, the extent of reliance on finance differs across different industries. Using the Rajan and Zingale method and more recent data of US firms, Oura (2008) updates the degree of external finance for US industries. According to her estimates, our eight industries can be ranked in the order of higher reliance on external finance as chemical (3.38), machinery (0.91), fuel (0.78), food and beverages (0.53), metal and metal products (0.44), textiles (0.19), nonmetallic mineral products (0.00), and miscellaneous manufacturing (–0.20).[20] However, because these estimates are based on US data, we should interpret the estimates as those that can be only achieved in a relatively frictionless financial market. In other words, these estimates of reliance on external finances are based on the technological characteristics of the industries. Nonetheless, by reestimating our regressions for each of the industries, we may be able to observe how financial conditions affect our sample industries depending on different degrees of reliance on external finance.

The estimation results for each of the eight industries are reported in Tables 4 and 5 (from the farthest left to the farthest right in order of degree of reliance on external finance). The chemical industry, supposedly the most reliant on external finance, has a large estimated coefficient of the cash holding variable in terms of both magnitude and statistical significance compared to other industries, so too is its estimated coefficient on net cash flows from financing. These findings are consistent with the fact that this industry has the highest degree of reliance on external finances by far compared to other industries, but also indicate that the Indian financial system is not sufficiently funneling funds to the industry that needs external finance. Machinery, the second most reliant on external finances, also seems to rely on firms' cash holding while the nonmetallic mineral products industry relies on internal finances.

The level of export participation persistency varies across different industries, ranging from 83% in nonmetallic mineral products to 48% in the fuel industry in terms of probability of a firm remaining in the export market.[21] These results suggest that the fixed cost of entering the export market, which is represented by the export participation persistency, is not necessarily highly correlated with the degree of dependence on external finances.

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[20] The degree of dependence for "Machinery" is the average of the values for "Machinery" and "electronics" from Oura. "Miscellaneous" is the average of "Wood", "Fabricated metal", and "Paper"; while "Chemical" is the average of "Chemical" and "Rubber." See Appendix 2 for the composition of each industrial category.

[21] Again, this is based on the assumption that all the explanatory variables take the average values and that the random effects are assumed to be zero.

Table 4: Estimates of Export Market Participation among Industries (Probit estimation wwith random effects)

Degree of Dependence on External Finance	Chemicals (1) 3.38	Machinery (2) 0.91	Fuel (3) 0.78	Food and Beverages (4) 0.53	Metals and Metal Products (5) 0.44	Textiles (6) 0.19	Nonmetallic Mineral Products (7) 0.00	Miscellaneous Manufacturing (8) -0.20
Exporter (t-1)	2.183	2.148	1.283	2.385	2.260	2.526	2.774	2.180
	(0.054)***	(0.066)***	(0.353)***	(0.060)***	(0.070)***	(0.063)***	(0.093)***	(0.120)***
Cash holding/assets	1.348	0.923	-2.106	-0.003	0.061	0.006	1.719	-0.117
	(0.490)***	(0.534)*	(2.141)	(0.486)	(0.671)	(0.777)	(0.926)*	(0.953)
Cash flows from financing	1.186	0.688	-1.317	0.308	0.065	-0.038	1.690	0.437
	(0.501)**	(0.536)	(1.992)	(0.498)	(0.685)	(0.791)	(0.970)*	(0.931)
Debt-to-asset ratio	-0.276	-0.445	0.443	-0.165	-0.141	-0.237	-0.447	-0.563
	(0.109)**	(0.130)***	(0.738)	(0.113)	(0.140)	(0.131)*	(0.233)*	(0.232)**
Foreign borrowing/debt	0.548	0.225	0.606	0.390	0.549	0.612	0.552	0.511
	(0.211)***	(0.230)	(0.614)	(0.262)	(0.302)*	(0.322)*	(0.493)	(0.367)
Assets (ln)	0.308	0.230	0.299	0.205	0.269	0.335	0.182	0.347
	(0.025)***	(0.027)***	(0.118)**	(0.022)***	(0.029)***	(0.033)***	(0.035)***	(0.057)***
Age (ln)	0.028	0.110	0.622	0.010	0.129	-0.112	-0.115	-0.010
	(0.036)	(0.038)***	(0.256)**	(0.029)	(0.043)***	(0.037)***	(0.067)*	(0.072)
Profitability	0.051	0.097	-0.177	0.053	0.079	0.041	0.326	0.033
	(0.033)	(0.046)**	(0.446)	(0.036)	(0.048)	(0.049)	(0.107)***	(0.036)
Foreign-owned	0.179	0.452	1.672	0.401	0.531	0.034	0.033	0.223
	(0.117)	(0.113)***	(0.917)*	(0.130)***	(0.220)**	(0.316)	(0.162)	(0.347)
Government-owned	-0.822	-0.581	-2.182	-1.199	-0.378	-1.370	-6.912	-0.922
	(0.164)***	(0.158)***	(0.834)***	(0.410)***	(0.224)*	(0.587)**	(293,512.904)	(0.359)**
EER (ln)	-1.202	-1.645	-0.627	-1.113	0.661	1.566	0.525	-2.226
	(0.710)*	(1.212)	(1.160)	(1.070)	(0.789)	(0.777)**	(0.693)	(1.683)
Volatility of EER	-14.621	-11.502	-7.170	-8.232	-9.966	4.270	5.642	8.385
	(7.810)*	(6.400)*	(5.891)	(5.269)	(5.993)*	(5.983)	(8.994)	(8.675)
Ratio of total wages to sales	-0.934	-0.230	-1.031	-0.386	-0.260	-0.500	0.422	-0.282
	(0.213)***	(0.226)	(1.404)	(0.152)**	(0.269)	(0.266)*	(0.432)	(0.522)
Ratio of investment to assets	1.632	0.295	0.556	-0.151	0.180	1.119	-1.015	-0.052
	(0.332)***	(0.479)	(1.800)	(0.342)	(0.432)	(0.385)***	(0.679)	(0.658)
Conglomerate	-0.346	-0.095	-0.054	0.269	0.042	-0.209	0.032	0.124
	(0.183)*	(0.121)	(0.703)	(0.130)**	(0.152)	(0.188)	(0.225)	(0.275)
N	11,468	6,787	371	6,866	5,557	6,542	2,173	2,726
Number of firms	1,684	1,009	47	1,133	881	1,044	265	334

* significant at 10%; ** significant at 5%; *** significant at 1%.

EER = effective exchange rate.

Note: Industry and year dummies are included in the estimation, but their results are not reported, neither are those of the constant term. Higher values of EER indicate appreciation of the Indian currency against the basket of currencies of trading partners at the industry level.

Source: Authors' calculation.

Table 5: Estimates of Export Intensity among Industries (ordinary least squares)

Degree of Dependence on External Finance	Chemicals (1) 3.38	Machinery (2) 0.91	Fuel (3) 0.78	Food and Beverages (4) 0.53	Metals and Metal Products (5) 0.44	Textiles (6) 0.19	Nonmetallic Mineral Products (7) 0.00	Miscellaneous Manufacturing (8) -0.20
Exporter intensity (t-1)	0.906	0.856	0.839	0.854	0.883	0.894	0.909	0.921
	(0.008)***	(0.015)***	(0.057)***	(0.014)***	(0.015)***	(0.008)***	(0.012)***	(0.014)***
Cash holding/assets	0.058	0.024	0.022	-0.006	0.014	0.002	0.024	0.039
	(0.026)**	(0.020)	(0.106)	(0.033)	(0.028)	(0.048)	(0.052)	(0.050)
Cash flows from financing	0.077	0.027	0.070	0.011	0.010	0.016	0.072	0.082
	(0.030)***	(0.021)	(0.122)	(0.034)	(0.030)	(0.048)	(0.056)	(0.048)*
Debt-to-asset ratio	-0.012	-0.006	0.018	0.006	-0.006	-0.016	-0.030	-0.009
	(0.005)**	(0.006)	(0.030)	(0.006)	(0.006)	(0.009)*	(0.014)**	(0.010)
Foreign borrowing/debt	0.031	0.017	0.002	0.046	0.017	0.016	0.027	0.023
	(0.009)***	(0.011)	(0.033)	(0.021)**	(0.011)	(0.016)	(0.014)**	(0.009)**
Assets (ln)	0.001	-0.001	0.012	0.002	-0.000	0.006	0.005	-0.000
	(0.001)	(0.001)	(0.007)*	(0.001)*	(0.001)	(0.002)***	(0.002)**	(0.001)
Age (ln)	-0.002	-0.003	0.035	0.001	-0.004	-0.006	-0.012	-0.003
	(0.001)*	(0.002)	(0.014)**	(0.001)	(0.002)**	(0.002)**	(0.005)**	(0.002)
Profitability	0.004	0.003	0.001	0.009	0.002	0.002	0.008	0.002
	(0.002)**	(0.003)	(0.007)	(0.003)***	(0.003)	(0.005)	(0.005)	(0.002)
Foreign-owned	-0.006	0.010	0.005	0.001	-0.001	-0.015	-0.013	-0.002
	(0.003)**	(0.004)**	(0.029)	(0.005)	(0.008)	(0.021)	(0.006)**	(0.004)
Government-owned	-0.008	-0.008	-0.101	-0.015	0.002	-0.037	0.000	-0.003
	(0.005)*	(0.004)**	(0.045)**	(0.004)***	(0.005)	(0.017)**	(0.000)	(0.005)
EER (ln)	0.037	-0.043	-0.099	0.006	-0.112	0.110	-0.035	-0.018
	(0.019)**	(0.052)	(0.066)	(0.055)	(0.030)***	(0.042)***	(0.037)	(0.056)
Ratio of total wages to sales	0.007	0.002	-0.071	-0.006	-0.016	-0.012	0.035	-0.037
	(0.010)	(0.014)	(0.031)**	(0.010)	(0.013)	(0.018)	(0.044)	(0.021)*
Ratio of investment to assets	0.065	0.054	0.096	-0.003	0.001	0.033	-0.055	-0.025
	(0.015)***	(0.024)**	(0.072)	(0.024)	(0.016)	(0.026)	(0.035)	(0.025)
Conglomerate	-0.007	0.004	0.008	0.012	-0.003	-0.014	-0.011	0.003
	(0.004)	(0.004)	(0.028)	(0.007)	(0.005)	(0.011)	(0.007)	(0.004)
Adjusted R2	0.83	0.73	0.86	0.78	0.80	0.84	0.89	0.90
N	11,468	6,787	358	6,866	5,557	6,536	2,135	2,723

* significant at 10%; ** significant at 5%; *** significant at 1%.

EER = effective exchange rate.

Note: Robust standard errors in brackets. The Mills ratio is omitted from the presentation. Higher values of EER indicate appreciation of the Indian currency against the basket of currencies of trading partners at the industry level.

Source: Authors' calculation.

The chemical industry is found to be sensitive to both the level and the volatility of the effective exchange rate while machinery and metal industries reacts only to the exchange rate volatility as theory predicts. In the case of the chemical industry, a 1 percentage point increase in the exchange rate volatility leads to a 4.9 percentage point decrease in terms of the probability of entering the export market, while a 1 percentage point currency depreciation leads to a 0.4 fall in the probability. However, Table 5 shows that currency appreciation would *increase* the volume of exports by firms in the chemical industry. Despite the somewhat contradictive result, the significant estimates on the finance-related variables, namely, cash holing, cash flows from financing, debt–asset ratios, and foreign borrowing, suggest that the volume of exports for this industry is more affected by financial conditions rather than the exchange rate movement.

4. Any Behavioral Difference between Incumbent Exporters and Nonincumbent Exporters?

Given the persistency of incumbent exporters, we suspect that different sets of factors affect the incumbent exporters and nonincumbent exporters. To examine this, we restrict our estimation to two separate subgroups of firms, one group composed of firms that are not exporters in the previous year and the other of firms that are exporters in the previous year. Columns 1 and 2 of Table 6 report the results of the probit estimation for the nonexporters and the incumbent exporters, respectively, as of the previous year, while columns 3 and 4 report the results of the OLS export intensity estimations for these subgroups.

In column (1), firms with ample cash flows are more likely to enter the export market even if they are not exporters in the previous year, again signifying that Indian firms rely on internal finances in addition to external finances (as seen from the significant estimate on cash flows from financing). However, those firms that are already in the export market do not appear reliant on internal finances to remain in the export market. Instead, the level of profitability matters for their continued presence in the export market. It also appears that having access to foreign borrowing allows both incumbent and nonincumbent exporters to become exporters in the following period. Younger nonincumbent firms tend to enter the export market though the effect is not statistically significant.

Once they become exporters, the volume of exports of the firms tends to be very persistent (column 4). Again, profitability is an important determinant of export volume. The size of debt (as a ratio to total assets) is negatively correlated with both the probability of becoming exporters and the volume of exports for the new exporters (those that were nonexporters in the previous year), though it does not appear to matter for the export volumes of continuing exporters. These findings suggest that having healthy or conservative financial conditions is more important in becoming exporters.

Table 6: Incumbent Exporters versus Nonincumbent Exporters

	Export Market Participation (Probit with random effects)		Export Intensity (OLS)		Export Market Participation (Probit with random effects)		Export Market Participation (Probit with random effects)	
	Nonexporters (t – 1)	Exporters (t – 1)	Nonexporters (t – 1)	Exporters (t – 1)	Large Nonexporters (t – 1)	Small Nonexporters (t – 1)	Conglomerate	Nonconglomerate
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Export (t-1) or export intensity (t-1)				0.897 (0.004)***			2.332 (0.138)***	2.312 (0.027)***
Cash holding/assets	1.031 (0.354)***	0.213 (0.397)	0.067 (0.029)**	0.018 (0.019)	1.008 (0.571)*	0.907 (0.465)*	1.314 (0.889)	0.525 (0.242)**
Cash flows from financing	1.309 (0.362)***	0.186 (0.403)	0.099 (0.036)***	0.034 (0.019)*	1.321 (0.576)**	1.199 (0.480)**	0.561 (0.922)	0.584 (0.247)**
Debt-to-asset ratio	-0.204 (0.085)**	-0.403 (0.095)***	-0.013 (0.006)**	-0.002 (0.005)	-0.367 (0.150)**	-0.108 (0.105)	-0.436 (0.248)*	-0.247 (0.053)***
Foreign borrowing/debt	0.423 (0.180)**	0.570 (0.170)***	0.031 (0.014)**	0.023 (0.005)***	0.787 (0.235)***	-0.089 (0.312)	0.537 (0.459)	0.474 (0.107)***
Assets (ln)	0.300 (0.017)***	0.290 (0.018)***	0.012 (0.007)	-0.004 (0.001)***	0.216 (0.036)***	0.339 (0.032)***	0.200 (0.049)***	0.269 (0.012)***
Age (ln)	-0.032 (0.026)	0.046 (0.029)	-0.005 (0.001)***	-0.004 (0.001)***	-0.061 (0.041)	-0.010 (0.034)	0.050 (0.071)	0.014 (0.016)
Profitability	0.013 (0.023)	0.174 (0.034)***	0.000 (0.001)	0.013 (0.005)***	0.031 (0.034)	0.006 (0.032)	-0.069 (0.124)	0.061 (0.016)***
Foreign-owned	0.301 (0.115)***	0.413 (0.103)***	0.007 (0.010)	-0.006 (0.002)**	0.402 (0.156)**	0.195 (0.167)		0.292 (0.059)***
Government-owned	-1.133 (0.149)***	-0.578 (0.165)***	-0.050 (0.029)*	0.001 (0.004)	-1.018 (0.178)***	-0.962 (0.318)***		-0.784 (0.083)***
EER (ln)	-0.123 (0.469)	0.640 (0.477)	0.019 (0.017)	-0.015 (0.024)	-0.643 (0.792)	0.292 (0.596)	-0.983 (1.521)	0.303 (0.293)
Volatility of EER	-3.651 (5.912)	-7.314 (5.481)			-10.606 (9.993)	0.320 (7.645)	-19.505 (14.479)	-6.394 (3.846)*
Ratio of total wages to sales	-0.398 (0.144)***	-0.794 (0.169)***	-0.011 (0.011)	0.029 (0.015)*	-0.726 (0.304)**	-0.341 (0.167)**	0.166 (0.530)	-0.485 (0.092)***
Ratio of investment to assets	0.847 (0.237)***	0.045 (0.281)	0.024 (0.021)	0.042 (0.014)***	0.468 (0.349)	1.161 (0.335)***	0.879 (0.777)	0.554 (0.162)***
Conglomerate	-0.102 (0.122)	-0.061 (0.110)	-0.008 (0.004)*	-0.001 (0.003)	-0.108 (0.152)	0.118 (0.198)		
N	18,702	23,788	18,702	23,788	5,306	13,396	1,780	40,710
Number of firms	4,278	4,032	4,278	4,032	1,500	3,317	227	6,170
Adjusted R^2			0.01	0.83				

* significant at 10%; ** significant at 5%; *** significant at 1%.
EER = effective exchange rate, OLS = ordinary least squares.
Source: Authors' calculation.

Among the nonincumbent exporters, does the size of the firm matter? Our results indicate that whether it is a large or small firm, holding ample cash appears to be equally important. However, for larger firms, if they can borrow from formal financial markets, maintain financial health, and/or borrow from foreign institutions, they are more likely to enter the export market compared to smaller firms. The estimated coefficients of the exchange rate-related variables is relatively more statistically significant with right signs for larger firms, suggesting that, relatively speaking, larger firms may be more responsive to the exchange rate movement when deciding whether or not to become exporters while there are no such signs for smaller firms. Our findings suggest that smaller nonincumbent exporters are relatively in a weaker position to become exporters compared to larger firms.

As we previously discussed, like in the case of Japan and the Republic of Korea, Indian industry is famous for having highly influential industrial conglomerates playing important roles and exerting so much influence on both the business and policy communities. Although we did not observe any significant effect of belonging to a conglomerate in the previous estimations, when we divide the subsample of nonincumbent exporters between those belonging to a conglomerate and those that do not, we do see some interesting distinctions between the two subsamples. Columns 7 and 8 of Table 6 report the estimation results for the subsamples of firms that belong to conglomerates and those that do not. For nonconglomerate firms, the variables for cash holding and cash from financing are found to be significant; however, having healthier financial conditions (i.e., lower debt-to-asset ratios) is found to be more important for nonconglomerate firms. Furthermore, having access to foreign borrowing and maintaining high profitability are significant determinants for the probability of becoming export participation for nonconglomerates, while they are not for conglomerate firms. These findings suggest that having access to various funding options is more critical for nonconglomerate firms, while that is not the case for conglomerate firms with established funding sources.[22]

C. Further Policy-Related Analyses

1. What about the Impact of Technology and Productivity?

We shall now shed different light on the exporting behavior of Indian firms from policy perspectives. First, we look into the impact of technological advancement and productivity levels of the firms.

A firm with advanced technology or high levels of productivity may find it easier to get funds from formal financial markets. As we previously discussed, firms with technological

[22] We repeat the exercise by dividing the subsamples of nonincumbent firms into conglomerate member nonincumbent exporters and nonconglomerate, nonexporters although the number of the former group becomes relatively small. The results are essentially the same as those reported in Table 6 except for the statistical significance of the model dropping significantly for the group of conglomerate nonincumbent firms because of a drop in the sample size.

superiority may be able to use its technology as collateral for borrowing funds from financial markets, and the same logic should be applicable to firms with high levels of productivity. Also, the relative ease in obtaining access to external funds may allow this type of firm to respond to the exchange rate movement compared to those firms without technological advancement or high levels of productivity. Let us repeat the estimation exercise for those firms with advanced technology and those without, as well as firms with high levels of productivity and low levels of productivity.

Before the estimation, we need to find variables that represent well the level of technological advancement or productivity. For the technological advancement, we use the ratio we can get by dividing the ratio of physical investment expenditure to total assets by the ratio of total wages to total sales, both of which are the variables we already used in our estimation. The ratio between the two variables should represent the level of capital intensity of our sample firms. We now assume firms with higher capital intensity are the ones that utilize higher technology in their production. Hence, the ratio of the two variables should be a good proxy for technological advancement.

For the level of productivity, we use the ratio of total sales to total wages (the reciprocal of which we have been using as one of the explanatory variables). Essentially, the ratio indicates how efficiently firms can earn sales out of input costs for their laborers.

The firms whose technological levels belong to the top 30th percentile are categorized as “high-tech” firms whereas those firms whose technological levels belong to the bottom 30 percentile are as “low-tech” firms. Also, the firms whose productivity levels belong to the top 30th percentile are categorized as “more productive” firms whereas firms whose technological levels belong to the bottom 30th percentile are “less productive” firms.

We repeat the above exercise for the samples of “high-tech” and “low-tech” firms as well as those of “more productive” and “less productive” firms and report the results in Table 7.

As expected, cash holing, net cash holding from financing, and maintaining lower debt ratios matters for the “low-tech” firms—note that both the magnitude and statistical significance of the variables for cash holding and cash flows from financing are much higher for “low-tech” firms—while these factors either do not matter or matter much less for “high-tech” firms. Further, profitability matters more for “high-tech” firms than for “low-tech” firms. Interestingly, the exchange rate-related variables have the right signs and lower exchange rate volatilities are an important factor for “high-tech” firms though it is insignificant for smaller firms. Thus, while more market-driven factors such as profitability and the exchange rate movement matter for “high-tech” firms, holding ample cash is important for “low-tech” firms.

Similar observations can be made for “more productive” and “less productive” firms. Thus, those firms with higher levels of technology or productivity do not have to rely on internal

cash holdings while those with lower levels of technology or productivity need to rely on internal cash. Furthermore, the firms with either higher levels of technology or productivity are able to respond to the exchange rate movement. In short, financial constraint is more severe for the firms that do not have high technology or productivity.

Table 7: Export Participation Estimation across Different Time Periods and Different Sizes of Firms (Probit estimation with random effects)

	High-Tech: Top 30th Percentile (1)	Low-Tech: Bottom 30th Percentile (2)	More Productive: Top 30th Percentile (3)	Less Productive: Bottom 30th Percentile (4)
Exporter (t-1)	2.381	2.505	2.313	2.412
	(0.037)***	(0.033)***	(0.039)***	(0.040)***
Cash holding/assets	0.372	1.717	0.291	0.800
	(0.368)	(0.615)***	(0.391)	(0.410)*
Cash flows from financing	0.627	2.016	0.612	0.854
	(0.376)*	(0.635)***	(0.399)	(0.422)**
Debt-to-asset ratio	-0.132	-0.216	0.001	-0.433
	(0.106)	(0.072)***	(0.094)	(0.080)***
Foreign borrowing/debt	0.362	0.337	0.683	0.360
	(0.171)**	(0.169)**	(0.181)***	(0.196)*
Assets (ln)	0.252	0.184	0.263	0.226
	(0.017)***	(0.013)***	(0.018)***	(0.017)***
Age (ln)	-0.013	-0.021	-0.028	-0.005
	(0.028)	(0.021)	(0.029)	(0.024)
Profitability	0.223	0.054	0.356	0.041
	(0.117)*	(0.018)***	(0.113)***	(0.016)**
Foreign-owned	0.134	0.229	-0.024	0.258
	(0.099)	(0.086)***	(0.122)	(0.089)***
Government-owned	-1.018	-0.552	-1.206	-0.651
	(0.174)***	(0.106)***	(0.230)***	(0.096)***
NEER (ln)	-0.404	-0.008	-0.738	0.258
	(0.511)	(0.504)	(0.498)	(0.545)
Volatility of EER	-14.955	4.465	-11.542	-3.679
	(5.875)**	(6.801)	(6.279)*	(6.543)
Ratio of total wages to sales	2.721	-0.651	8.663	-0.818
	(0.506)***	(0.117)***	(1.914)***	(0.116)***
Ratio of investment to assets	-0.296	21.893	-0.296	1.370
	(0.251)	(8.487)***	(0.256)	(0.309)***
Conglomerate	-0.080	0.008	-0.289	0.009
	(0.107)	(0.096)	(0.123)**	(0.087)
N	12,820	13,304	12,710	12,752
Number of firms	3,201	4,310	2,797	3,020

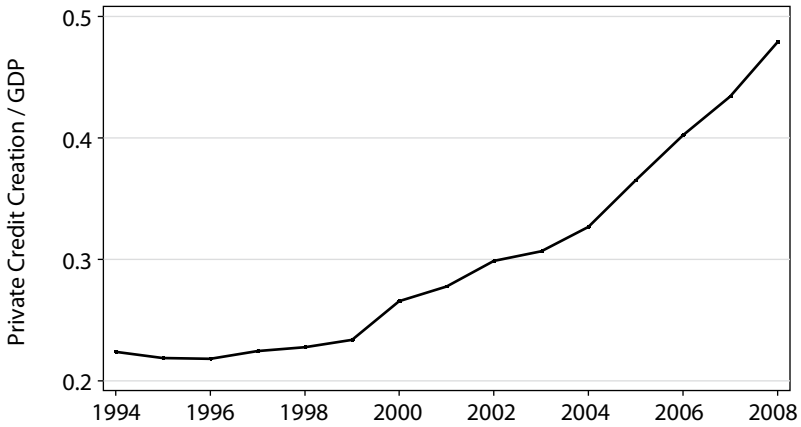
* significant at 10%; ** significant at 5%; *** significant at 1%.
EER = effective exchange rate.
Note: Industry and year dummies are included in the estimation, but their results are not reported. Neither are those of the constant term.
Source: Authors' calculation.

2. Impact of Financial Development and Liberalization

We now raise a last question that is more directly related to economic policies in India: whether recent policy development has had any impact of the stability of the explanatory variables.

Our sample period corresponds to the period when India implemented liberalization and deregulation policies in its financial system.[23] These policies aimed at relaxing policy constraints on domestic and cross-border financial transactions. In other words, the main focus of these policies is to reduce the extent of financial repression. In fact, since the end of the 1990s, private credit has become increasingly available in the Indian economy reaching close to 50% of GDP by 2008, which would make one expect that more funds are available from the financial system (Figure 11).

Figure 11: Private Credit Creation as a Ratio to GDP (percent)



GDP = gross domestic product.
Source: Authors' calculation.

Theoretically, in a frictionless financial market, internal funds, and external funds are perfect substitutes (Modigliani and Miller 1958), in which case firms' investment decision should be independent of their financing methods. However, considering that India's comprehensive financial reforms started only in 1993, financial repression must still be existent though its extent may have been gradually reduced due to financial reform policies. Hence, by reestimating our models for several subgroups of the sample period, we may be able to identify the impact of financial reform policies. For example, if financial reform policies have reduced frictions in the market over time, the extent of reliance on internal finances may have declined over time. Also, financial liberalization policies may have contributed to more foreign borrowing.

[23] See Panagariya (2008), Shah et al. (2008), and Hutchison et al. (2010) for an overview of India's financial reform and liberalization policies.

In order to examine the impact of financial reforms, we reestimate the three subsample periods of 1996–2000, 2001–2004, and 2005–2008. Given the high level of persistency in exporting behavior, we conduct only the probit estimations because we think that the analysis on export market participation is more informative. Also, because many studies have also found that the reaction to financial liberalization policies differ depending on the size of the firm (such as Ghosh 2006 and Chan et al. 2010), we reestimate the subsamples of "large" and "small" firm groups and report the results in Table 8.

First of all, the degree of persistency to remain in the export market has been increasing over years for both large and small firm groups. In 1996–2000, once a firm becomes an exporter, the probability of remaining in the export market was about 74%. But in the most recent 2004–2008 period, the probability is as high as 81%. This finding may reflect the recent success of Indian exporters.

Theoretically, one might expect a firm in a financially repressed market to become less reliant upon internal finances given that financial liberalization would make it easier for firms to get funds from the capital market. Our estimations yield results consistent with the a priori assumption; the cash holding ratio was a significantly positive contributor to export market participation in the first period, but it is no longer significant in the last two periods. The statistical significance of the cash holding variable dropped more significantly for larger firms than for smaller firms. In fact, the estimated coefficient on cash flows in the last period is much larger for the small firm subgroup in terms of both its magnitude and statistical significance than the large firm subgroup. While foreign borrowing has been a positive contributor to export market participation for larger firms, it is a significant contributor for smaller firms only in the most recent period, suggesting that financial liberalization has benefited smaller firms only recently. Also, foreign ownership of firms matters for small firms in the last period, but it is no longer an influential factor for larger firms. These findings imply that the recent financial development along with the active foreign investments in India benefit large firms through more available external finances and foreign borrowing, while foreign ownership of smaller Indian firms has become important in assisting them to become exporters.

When we focus on the impact of financial liberalization on nonincumbent exporters, we observe a somewhat different picture. The last three columns of Table 8 report the estimation results for the empirical exercises conducted for each of the three subsample periods, but only for the subsamples of nonincumbent exporters (i.e., those exporters that did not export in $t - 1$).

The estimates on the cash holding ratio are found significant in the first and last subsample periods. These findings suggest that Indian firms are facing financial constraints if they are considering to enter foreign markets. That is still the case in the last subsample period after the economy went through financial liberalization policies, and also when more firms were entering foreign markets.

Table 8: Export Participation Estimation across Different Time Periods and Different Sizes of Firms (Probit estimation with random effects)

	1996–2000, Large	2001–2004, Large	2005–2008, Large	1996–2000, Small	2001–2004, Small	2005–2008, Small	1996–2000, Non-exporter	2001–2004, Non-exporter	2005–2008, Non-exporter
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Exporter (t-1)	2.404	2.452	2.647	2.253	2.489	2.683			
	(0.045)***	(0.049)***	(0.055)***	(0.039)***	(0.045)***	(0.048)***			
Cash holding /assets	1.180	0.089	0.113	0.986	0.834	0.749	1.867	0.017	1.300
	(0.688)*	(0.607)	(0.432)	(0.515)*	(0.567)	(0.505)	(0.701)***	(0.762)	(0.580)**
Cash flows from financing	1.158	0.107	0.008	0.866	0.865	1.390	1.907	0.325	1.823
	(0.701)*	(0.619)	(0.437)	(0.538)	(0.582)	(0.518)***	(0.715)***	(0.774)	(0.591)***
Debt-to-asset ratio	-0.204	-0.496	-0.316	-0.148	-0.174	-0.138	-0.126	-0.277	-0.216
	(0.117)*	(0.118)***	(0.140)**	(0.094)	(0.100)*	(0.109)	(0.132)	(0.160)*	(0.164)
Foreign borrowing /debt	0.482	0.499	0.434	0.262	0.218	0.529	0.379	0.299	0.542
	(0.286)*	(0.207)**	(0.175)**	(0.352)	(0.240)	(0.240)**	(0.451)	(0.321)	(0.300)*
Assets (ln)	0.158	0.142	0.137	0.234	0.214	0.196	0.247	0.328	0.307
	(0.022)***	(0.025)***	(0.027)***	(0.030)***	(0.029)***	(0.027)***	(0.026)***	(0.035)***	(0.035)***
Age (ln)	0.005	0.008	-0.008	-0.005	-0.015	0.025	-0.044	-0.021	-0.019
	(0.028)	(0.032)	(0.039)	(0.025)	(0.033)	(0.039)	(0.034)	(0.049)	(0.056)
Profitability	0.080	0.114	0.027	0.131	0.080	-0.020	0.027	0.041	-0.012
	(0.040)**	(0.043)***	(0.033)	(0.033)***	(0.039)**	(0.034)	(0.040)	(0.055)	(0.039)
Foreign-owned	0.373	0.167	0.097	0.144	0.232	0.431	0.164	0.406	0.733
	(0.092)***	(0.101)*	(0.121)	(0.110)	(0.151)	(0.185)**	(0.146)	(0.207)**	(0.246)***
Government-owned	-0.515	-0.633	-0.552	-0.480	-0.519	-0.388	-0.874	-1.314	-1.332
	(0.111)***	(0.128)***	(0.139)***	(0.255)*	(0.260)**	(0.262)	(0.190)***	(0.285)***	(0.299)***
EER (ln)	-0.682	0.312	-3.096	0.409	-0.343	-5.225	0.692	-1.067	-6.653
	(0.723)	(1.768)	(4.897)	(0.645)	(1.880)	(4.577)	(0.803)	(2.348)	(6.056)
Volatility of EER	-3.083	-7.033	3.639	-5.086	-2.038	7.519	0.526	0.173	-21.733
	(10.827)	(7.017)	(11.979)	(9.889)	(8.362)	(14.574)	(12.280)	(9.428)	(27.500)
Ratio of total wages to sales	-0.318	-0.617	-0.168	-0.241	-0.222	-0.446	-0.369	-0.300	-0.462
	(0.226)	(0.230)***	(0.283)	(0.161)	(0.162)	(0.171)***	(0.231)	(0.252)	(0.268)*
Ratio of investment to assets	0.452	0.811	0.301	0.768	0.952	0.431	1.078	1.663	0.488
	(0.337)	(0.394)**	(0.322)	(0.349)**	(0.428)**	(0.357)	(0.384)***	(0.516)***	(0.432)
Conglomerate	-0.047	-0.133	0.022	0.194	-0.063	0.097	-0.029	-0.153	0.135
	(0.087)	(0.098)	(0.117)	(0.139)	(0.171)	(0.180)	(0.161)	(0.216)	(0.218)
N	7,735	6,698	6,539	7,831	6,840	6,851	6,835	6,081	5,786
Number of firms	2,290	2,269	2,143	2,800	2,799	2,591	2,745	2,688	2,366

* significant at 10%; ** significant at 5%; *** significant at 1%.

EER = effective exchange rate.

Note: Industry and year dummies are not reported, neither are those of the constant term. Higher values of EER indicate appreciation of the Indian currency against the basket of currencies of trading partners at the industry level.

Source: Authors' calculation.

When we repeat this exercise for the subsamples of nonincumbent larger firms and nonincumbent smaller firms (results not reported), the findings reported in the last three columns of Table 8 are more consistent with those for smaller firms, suggesting that smaller, new exporters are facing more severe financial constraints.

These findings indicate that smaller nonincumbent exporters are not benefiting much from India's recent financial liberalization. Or, at least, it may be interpreted that the development of the Indian financial sector is not catching up with the strong demand by potential exporters, thus giving only limited opportunities for firms and consequently forcing them to self-finance to become exporters.

As far as the effect of the exchange rate movement is concerned, the exchange rate level as well as its volatility does not seem to matter for any of the subsamples. The lack of a link between exchange rate movement and export behavior must be closely related to the availability of funds for Indian firms.

V. Concluding Remarks

This paper examined the supply-side factors affecting the exporting behavior of Indian firms while focusing on the role of financial conditions and exchange rate movement. Our estimation results suggest that the exchange rate, in terms of both its level and volatilities, plays only a limited role while financial conditions matter more for exporting behavior. We also found much evidence that Indian firms face financial constraints.

In an open-macro sense, it may be surprising to see that the exchange rate, especially in terms of its level, does not seem to matter so much in the exporting behavior of firms in India. For one thing, our study has shown that the fixed cost of entering foreign markets is so high that fluctuations of relative prices matter less for the decision making on export market entry. Although Indian firms appear to respond to exchange rate uncertainty, they do not seem to respond to changes in the relative price competitiveness of their products in terms of both entering foreign markets and adjusting the volumes of exports once they become exporters. Rather than tracking how the Indian rupee performs in the foreign exchange market, improving accessibility to financial markets or just plainly holding onto cash seems to be more important for Indian firms that attempt to expand their business abroad.

This means that even if the Indian government ever had an intention, as part of its industrial policy, to encourage Indian firms to enter foreign markets through an exchange rate policy, such a policy would hardly have any impact, unless financial conditions facing Indian firms are improved. As far as our empirical findings are concerned, improving the functionality of financial markets in Indian is the more urgent issue.

Appendix

Appendix 1: Composition of Industrial Categories

Industrial Category	Disaggregated industries
Chemicals	Aluminium and aluminium products
	Business consultancy
	Caustic soda
	Commercial complexes
	Cosmetics, toiletries, soaps, and detergents
	Drugs and pharmaceuticals
	Dyes and pigments
	Fertilizers
	Information-technology enabled services
	Industrial construction
	Inorganic chemicals
	Lubricants, etc.
	Organic chemicals
	Other chemicals
	Other construction and allied activities
	Other financial services
	Other miscellaneous services
	Other textiles
	Paints and varnishes
	Pesticides
	Plastic films and flexible packaging
	Plastic furniture, floorings, and miscellaneous items
	Plastic packaging goods
	Plastic tubes, pipes, fittings, and sheets
	Polymers
	Refinery
	Rubber and rubber products
	Soda ash
	Trading
	Tires and tubes
Food and beverages	Bakery products
	Beer and alcohol
	Cocoa products and confectionery
	Coffee
	Dairy products
	Floriculture
	Marine foods
	Milling products
	Other agricultural products
	Other financial services
	Other nonferrous metals

continued.

Appendix 1: *continued.*

	Poultry and meat products
	Processed/packaged foods
	Starches
	Sugar
	Tea
	Tobacco products
	Trading
	Vegetable oils and products
Machinery	Airconditioners and refrigerators
	Boilers and turbines
	Communication equipment
	Computers, peripherals, and storage devices
	Construction equipment
	Consumer electronics
	Domestic electrical appliances
	Dry cells
	Engines
	General purpose machinery
	Generators, transformers, and switchgears
	Industrial machinery
	Machine tools
	Miscellaneous electrical machinery
	Other electronics
	Other industrial machinery
	Storage batteries
	Tractors
	Trading
	Wires and cables
Metals and metal products	Aluminium and aluminium products
	Castings and forgings
	Copper and copper products
	Electricity generation
	Ferro alloys
	Investment services
	Metal products
	Other financial services
	Other nonferrous metals
	Pig iron
	Sponge iron
	Steel
	Steel pipes and tubes
	Trading

continued.

Appendix 1: *continued.*

Miscellaneous manufacturing	Books and cards
	Footwear
	Media—print
	Miscellaneous manufactured articles
	Other leather products
	Paper and newsprint
	Paper products
	Trading
	Wood
Non-metallic mineral products	Abrasives
	Cement
	Ceramic products
	Gems and jewellery
	Glass and glassware
	Granite
	Other nonmetallic mineral products
	Refractories
	Synthetic textiles
	Trading
Textiles	Cloth
	Cotton and blended yarn
	Information-technology enabled services
	Other textiles
	Readymade garments
	Synthetic textiles
	Textile processing
	Trading

Source: PROWESS (Centre for Monitoring Indian Economy Pvt. Ltd. 2011).

Appendix 2: Criteria for Creating the Sample

1. Include firms from the food and beverage, machinery, chemicals, metals and metal products, and textile industries.

2. Exclude financial firms.

3. Exclude outliers and unrealistic observations. The criteria for exclusion are as follows:

   a) Profitability ratio (= profits before interest and tax / total sales) < –10 or > 50

   b) Total assets < 0

   c) Tangible assets < 0

   d) Net cash flow/assets ratio < –1 or > 1

   e) Retained profits/assets ratio < –1 or > 1

   f) Debt-to-asset ratio > 1 or < 0

   g) Wage-to-sales ratio = 0, or > –1.8

   h) Investment-to-sales ratio = 0, or < 0

5. Drop a firm from the sample if the available export data are less than 3 years.

Appendix 3: Data Description

Variable	Definition
exporter_int	Export intensity calculated as ([earnings from exporting goods] + [earnings from exporting services] / [sales])
exporter	Dummy for exporting firm *i* in year *t*. If exporter_int > 0, it is assigned the value of 1, otherwise, 0
csh_asset	Cash flow/total assets
debt_asset	Debt-to-asset ratios
retprofits_asset	Ratio of retained profits to total assets
lsize	Size measured in the natural log of assets
lage	Age (natural log)
profit	Profits before interest and tax divided by total assets
foreign	Dummy for foreign-owned firms
government	Dummy for government-owned firms
eer	Effective exchange rate (2005 = 100). Higher values indicate appreciation of the Indian currency against a basket of currencies of trading partners at the industry level
Vol_eer	Volatility of EER; annual standard deviations of monthly rate of depreciation
wage_sales	Ratio of total wages to sales; measure of labor productivity
inv_sales	Ratio of investment to sales; measure of capital productivity
ind_group	Dummy for industrial conglomerate, or when a firm belongs to one of the following the industrial groups: Tata Group; Birla Group (Adhitya Birla Group, The G.P - C.K Birla Group, Yash Birla Group); Reliance Group; Thapar Group; Mahindra Group; Bajaj Group; Hero Group; Kirloskar Group; Essar Group; DCM Shriram Group; Jindal Group; Mittal Group; or Larsen & Toubro Limited

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About the Paper

Hiro Ito and Akiko Terada-Hagiwara investigate the impact of financial constraints on the exporting behavior of Indian manufacturing firms using data from more than 6,000 manufacturing firms in India for 1996–2008. The authors find empirical evidence that Indian manufacturing firms tend to self-finance their exporting without relying too much on external finances, which indicates that firms face financial constraints. Recent financial liberalization in India still does not seem to allow the financial system to meet the stronger demand for funds by firms. The country's financial system needs to develop further.

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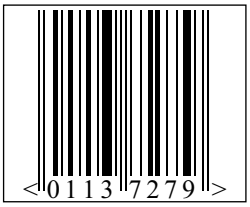

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