Foreign Capital, Spillovers and Export Performance in Emerging Economies: Evidence from Indian IT Firms

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Abstract

The role of foreign capital inflow, foreign direct investment (FDI) and foreign portfolio investment (FPI), on export behavior of both recipients and non-recipient competing firms in the same sector often guides economic development policy. By using panel data of Indian IT firms over 2000–2006, we show that FDI reduces the sunk costs of entering foreign markets and therefore positively effects both the decision to export and the export propensity of recipient firms. Foreign portfolio investment has no effect on the decision to export, but it does marginally increase the volume of exports. Further, these positive FDI and FPI recipient effects do not spill-over to non-recipients.

1. Introduction

Since the liberalization of the 1990s, foreign direct investment (FDI) in India has increased from US$237 million in 1990 to US$23.7 billion in 2010 and exports rose from US$33,470 million in 1997 to US$225.4 billion—in 2010. Indian policy makers intended to pursue a program of liberalization and attraction of foreign capital as a means of improving overall economic growth. Much of the enthusiasm for such policies stems from the expectation that foreign capital investment in a particular sector of the economy transforms not only the recipient firms, but also spills over, affecting the behavior of other firms in the sector. However, given the high expectations, is it really likely that foreign investment can generate these anticipated levels of growth and, to be fully successful, increase exports of non-FDI recipient firms as well? In this paper we focus on the direct and indirect effects of foreign capital inflow, in particular—FDI. Specifically, we ask whether there are links between FDI and export behavior and whether there are spillover effects, i.e. is there a link, direct or indirect, between FDI and the export activities of other non-recipient firms in the same industry? Further, we note that foreign capital inflows in general, both FDI and foreign portfolio investment (FPI), may generate similar effects. Therefore, we also consider the potential effects of FDI and FPI flows on export behavior separately.

International policy makers have long advocated that developing countries should attract “the right FDI” to “tap into the new international production systems of transnational corporations (TNCs).” “Export-platform” FDI exhibits two distinctive characteristics. First, low transportation costs, e.g. in certain industries such as information technology and pharmaceuticals, allows fragmentation in production and differences

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in factor costs across economies which are more readily captured (Arndt and Kierzkowski, 2001). Second, policy makers in small economies explicitly seek access to international technology for “export-driven” growth. Multinational enterprises (MNEs) then utilize low cost factor resources and use the host country as the export platform to cater to demand in foreign markets. Export platform firm level FDI may exert two positive effects on exporting: (1) the MNE FDI enables a domestic firm to overcome the initial sunk costs of entering foreign markets and thus will export (which is arguably good for the economy), and (2) other firms in the same industry will begin exporting, or if they already are exporting, will export more.

Standard trade theory suggests that exports will flow from sectors with a comparative advantage, and exogenous FDI inflows, to exploit local-cost conditions, will be to these industries and overall productivity will be enhanced. Indeed, firms that export generally show high productivity growth and contribute to increasing the overall productivity of the host country (Kimura and Kiyota, 2006), thus justifying host country policies to attract such FDI. For emerging market economies there is substantial evidence that foreign firms contribute significantly to aggregate export performance of the hosts (Bhaduri and Ray, 2004; Rasiah, 2003), *inter alia,* all find a strong effect of FDI in host country export performance. For India, there is a clear abundance of low-cost labor, but since 2000, also a relative abundance of information-technology-aware human capital that provides a potential comparative advantage in the service sector, partly because these resources are largely underutilized (Zaheer et al., 2009). Both would contribute to high rates of growth in the information technology (IT) service sector.

FDI, through various channels, provides a means for local producers to overcome the financial obstacles to entering foreign markets. Roberts and Tybout (1997) emphasize that there are significant costs that are an obstacle to exporting. While these costs may take many forms Engel and Stiebale (2014, forthcoming) and Stiebale (2011) examine financial constraints or inability to access financial markets as a barrier that the firm must overcome in order to enter foreign markets. Foreign investment, FDI or FPI, may be a means of overcoming this obstacle for the recipient firm. There is some evidence that even non-foreign investment recipients may also share in this ability to enter foreign markets. For example, there may be location-specific external economies which facilitate export by firms that are not recipients of FDI. Aitken, Hanson and Harrison (1997) argue that these firms may employ transportation infrastructure and access to information about foreign consumers that MNEs or FDI recipients bring with them. They find evidence of this type of spillover in Mexican manufacturing.

It is important to note that there is no general agreement on the effect of foreign capital inflows, FCT hereinafter, on aggregate growth and export behavior at the aggregate level, because the conversion of capital inflows into actual investment is not assured. These inflows may be broadly categorized as either FDI or FPI, and certainly FDI is immediately converted into investment and expanded output. FPI, however, is often of a short term nature and may or may not be converted into actual investment expenditures. Of course, if they are not, then it is unlikely that they will affect export activity.

The majorities of studies use aggregate data or concentrate on the manufacturing sector *in toto,* while we approach the problem from a different perspective by focusing specifically on information technology, a growing service sector. The IT sector provides an ideal case for analyzing the potential spillover export activity. Being a knowledge based sector, IT should attract export platform FDI which takes advantage of
low cost labor and human capital and the insignificant transportation costs. Then with very mobile labor, the knowledge of production techniques and foreign consumers may be transferable to non-MNE producers. The large panel dataset on IT firms we employ allows pursuit of questions using cross sectional analysis, like most of the studies above, can not address.

We address two questions. First, using this IT industry firm-level panel data, we examine the determinants of the export decision: in particular, does foreign investment enable firms to overcome the initial costs of entering foreign markets and therefore become more export oriented? We approach this by estimating a random effects Logit model. Second we then ask: after deciding to export how does foreign investment influence the volume of exports? In particular, does it increase export propensity? To answer this question, we estimate a random effects Tobit model. Our results show that as a firm attracts foreign capital, in particular—FDI, its exports clearly increase, while controlling for other factors. The effect of FDI on the exporting decision is positive and significant as well. Point estimates for the regional spillover effect, however, are consistently negative, but statistically insignificant, i.e. to the extent there is spillover there is some evidence of crowding out other domestic firms. Our results are consistent with Roberts and Tybout (1997) in that MNE FDI removes the sunk costs of entering foreign markets as a barrier to exporting for recipient firms and also with Stiebale (2011) in that for non-recipients there is still a financial constraint present owing to underdevelopment of the financial sector or insufficient public programs to overcome the sunk costs of market entry. We also perform two robustness checks by comparing random effects Logit and Tobit results with the corresponding fixed-effects ordinary least squares (OLS) models. All the methods support our finding that foreign capital inflow in the form of FDI positively influences the export decision and the propensity. However, when we isolate the potential effects of FPI we find that there is no statistically significant effect of FPI as a determinant of the decision to export, but in some specifications it does increase the propensity. This suggests that FPI does not allow the firm to overcome the sunk costs of exporting, which would require capital inflows of at least 10% or more, but once exporting, the firm attracts foreign investment that enables an expansion of exports.

In the next section we specify the testable hypotheses and the empirical model. Section 3 describes the data and section 4 presents the econometric results. Finally, section 5 concludes the study.

2. Methodology

We are interested primarily in the role of FDI and secondarily of FPI as a determinant of exports and potential spillover effects, controlling for the most common other determinants of exporting. First, we examine the role of foreign capital, in toto, FCT, as a determinant of export behavior and propensity to export. We follow the general framework of Roberts and Tybout (1997) which derives an export equation from a theoretical model in which the firm maximizes gross profits, which varies depending on whether the firm is exporting or not and the increment as a result of exporting is a function of state variables specific to the firm (such as capital stock and location) and market level variables that the firm takes as exogenous (such as foreign market demand and exchange rates). These are elements of the vector $Z$ below. The gross profit function must be augmented by the sunk costs of foreign entry (or re-entry). In Roberts and Tybout (1997) these sunk costs are represented by an indicator variable reflecting the firm’s export status or history. Thus, an important question is, given the
firm’s gross profits does exporting history explain current export status (export decision) or export volume (export propensity)? If so, then export history (lagged exports) or a proxy should appear in the export equation. However, export history is not the only way to represent the sunk-cost constraint on exporting. Being an FDI recipient obviously alleviates the sunk costs constraint and should be included directly in the export equation. It is an open question whether FPI does the same. So first we begin with FCT and then decompose it into FDI and FPI to see whether the type of foreign capital matters. Our main question goes one step further by asking whether FCT (or FDI and FPI) alleviates the sunk costs constraint for non-recipients. In order to do so, we construct a measure of this potential spillover.

Our basic specification for the export equation isolates the role of FCT and potential spillovers controlling for other determinants of exports and may be written as:

$$\text{Exports}_{it} = \alpha + \beta \cdot \text{FCT}_{it} + \gamma \cdot \text{Spillover}_{it} + \theta \cdot \text{Exports}_{it-1} + \delta \cdot Z_{it} + \varepsilon_{it}$$

(1)

where the dependent variable, Exports, is the ratio of firm i export sales to its total sales. Our main interest is in FCT, a measure of foreign ownership and Spillover. As is common in the literature, we measure FCT, as well as its components—FPI and FDI—as dummies. Thus, we construct FCT as a dummy variable that takes the value 1 if the foreign equity ownership is positive and zero otherwise. FPI and FDI equal 1 when the foreign equity ownership is between zero and 10%, and above 10%, respectively. Another key variable, Spillover, captures the relative importance of MNEs’ export activities within a region. We follow Aitken et al. (1997) and assume that the greater the importance of MNEs in the export in a given region, the higher the scope for domestic firms in that region to benefit from the positive externalities those MNEs would provide. We disregard possible region-to-region externalities. To capture this effect we define

$$\text{Spillover}_{it} = \frac{\sum_{MNE} \text{Exports}_{it}}{\sum_{MNE} \text{Exports}_{it} + \sum_{non-MNE} \text{Exports}_{it}},$$

i.e. the share of export sales of MNEs in the total export sales of the region in a given year. The range of this variable is [0,1] and higher values of Spillover corresponds to a higher share of MNE exports vis-à-vis non-MNE exports. Our primary goal is to identify the size, sign and significance of $\beta$ and $\gamma$. A positive and significant $\beta$ suggests that FCT positively affects exports. A positive and significant value of $\gamma$ indicates that there is a positive spillover effect. Further, following Stiebale (2011), we control for the previous state of firms’ export status by including $\text{Exports}_{it-1}$.

The literature also suggests other determinants of exports for which we must control and therefore include in the matrix $Z$. We consider a set of variables intended to measure firm specific characteristics and sources of comparative advantage such as productivity, factor endowments, economies of scale and financial wherewithal to overcome sunk costs of foreign market entry. The relative size of the firm (Size) can affect its exporting behavior in many ways. Larger firms have greater ability to exploit economies of scale in production and take greater risks via internal diversification (Wagner, 2007), and they can obtain financing at lower costs (Carpenter and Petersen, 2002). Thus, larger firms exhibit a larger export to sales ratio relative to smaller firms (Auquier, 1980). It has also been argued that if attaining scale economies are an objective of exporting, then larger firms, after a point, may have less of an incentive to export than smaller firms (Lall and Kumar, 1981). We measure size of a
firm as the ratio of individual firm sales to the total industry sales, i.e. it is the market share of the firm, and include size and size squared in the equation. We expect labor intensive products to be exported from India, but in this particular industry it is not only because of low cost low skill labor, but also because of relatively low cost human capital as well. Lacking a direct measure of labor intensity we follow Weiss (1990) and use the ratio of total compensation to total sales (wages). We expect the sign of the coefficient to be positive.

Another measure of both potential productivity advantages as well as the ability to access financial markets is the share of fixed assets in net worth (Net Assets). This may also be a measure of factor intensity and there is some evidence that firms with greater levels of foreign ownership are more capital intensive than domestic firms. This variable is generally positively related to exports. However, IT has relatively low levels of fixed assets vis-à-vis other sectors. Therefore, exports from this sector are more likely to embody relatively more labor and human capital inputs rather than physical capital inputs. Thus, we expect the coefficient to be negatively related to export sales, or insignificant.

A clear measure of the firm’s ability to overcome sunk costs of foreign market entry and continuing ability to export is the profitability of the firm. Therefore, we include a measure of after tax profits relative to sales (Net Profits). Profits after tax is defined as total income and change in stock of finished and unfinished goods net of total expenses. In the early stage of growth, small firms’ profitability is low and such firms lack funds needed to expand to international markets. As those firms grow in the domestic market, profitability increases. They then use retained earnings to expand internationally (Kumar and Siddharthan, 1997). Thus, we expect a positive relationship between export performance and net profits.

Another indirect measure of financial wherewithal or the development of the financial sector is research and development expenditures, because continuing innovation is necessary for exporters to remain competitive and continue globalizing. Thus, we include the share of R&D expenditures in total expenses (R&D Ratio), both to capture the innovative capacity of the firm and as an indirect measure of financial sector development. We expect a positive relationship between the export behavior and R&D.

Finally, although foreign demand is typically assumed exogenous, advertising expenditures may increase the demand for a particular firm’s output, or brand, and therefore should be positively correlated with exporting. Therefore, we include the share of advertising costs in total expenses (Advertising). We expect advertising and exports to be positively correlated.

3. Data

We employ annual Indian IT-sector firm level panel data, from 2000 to 2006. Among firms in the database, 756 are registered as IT firms on the stock exchange. After excluding those that report zero income from sales and those that exit and re-enter the database after a long gap, the sample size for our analysis is reduced to 462 IT firms.

Table 1 below provides a comparison between domestic firms and firms that received FPI (foreign capital between 0 and 10%) and FDI (foreign capital>10%). Firms with FDI are larger on average than those receiving less foreign investment and domestic firms by every measure, size, wage ratio and net fixed assets ratio. Indeed, firm size expressed in terms of individual firm sales over total industry sales is 0.80 for
the FDI recipients vs 0.1 for the domestic firms, on average, from 2000 to 2003, and 0.53 for FDI recipients and 0.01 for domestic firms from 2004 to 2006. Firms with FDI are also more export oriented, 0.72 and 0.74 in 2000–2003 and 2004–2006 respectively, vs 0.35 and 0.43 for domestic firms in the same respective periods. They also invest more in research and development. With regard to profitability, firms reporting no foreign ownership appear most profitable in both sub periods. Firms with FPI, are less profitable than domestically owned firms and those that have a larger, controlling, share of foreign ownership (FDI) are even less so. This suggests that where the profits are reported may be dependent on ownership structure with profits being reported by the foreign owner rather than the domestic foreign investment recipient firm.

4. Empirical Analysis

The choice of an appropriate estimating technique for equation (1) is not unequivocal. First, the dependent variable, Exports, is left-truncated, meaning that non-exporting firms have their exports recorded as being a zero when they decide not to engage in international trade. Second, equation (1) includes the lagged dependent variable, Exports_{i-1}. This imposes restrictions on the models we could potentially use.

| Variable          | Year       | Mean   | Std. Dev | Mean   | Std. Dev | Mean   | Std. Dev |
|-------------------|------------|--------|----------|--------|----------|--------|----------|
| Export Ratio      | 2000–2003  | 0.72   | 0.38     | 0.44   | 0.39     | 0.35   | 0.43     |
|                   | 2004–2006  | 0.74   | 0.33     | 0.46   | 0.44     | 0.43   | 1.15     |
| Size              | 2000–2003  | 0.80   | 0.93     | 0.23   | 0.37     | 0.1    | 0.31     |
|                   | 2004–2006  | 0.53   | 0.68     | 0.12   | 0.20     | 0.07   | 0.25     |
| Wage Ratio        | 2000–2003  | 0.77   | 1.01     | 0.12   | 0.26     | 0.1    | 0.36     |
|                   | 2004–2006  | 0.93   | 1.35     | 0.12   | 0.19     | 0.11   | 0.45     |
| R&D ratio         | 2000–2003  | 0.14   | 0.49     | 0.10   | 0.40     | 0.008  | 0.12     |
|                   | 2004–2006  | 0.07   | 0.30     | 0.02   | 0.09     | 0.001  | 0.01     |
| Advertising Ratio | 2000–2003  | 0.09   | 0.24     | 0.22   | 0.46     | 0.22   | 0.68     |
|                   | 2004–2006  | 0.19   | 0.64     | 0.15   | 0.38     | 0.2    | 0.69     |
| Net Fixed Assets Ratio | 2000–2003 | 0.05  | 0.08     | 0.04   | 0.10     | 0.01   | 0.05     |
|                   | 2004–2006  | 0.04   | 0.08     | 0.03   | 0.06     | 0.01   | 0.06     |
| Profitability Ratio | 2000–2003 | 0.003 | 0.04     | 0.03   | 0.08     | 0.2    | 0.91     |
|                   | 2004–2006  | 0.002  | 0.05     | 0.01   | 0.17     | 0.14   | 0.57     |

**Notes:** Average number of firms for the three foreign ownership categories are calculated for the time period of our data from 2000–2006. Export Ratio: Ratio of export sales to the total sales for each firm. Size: Ratio of sales of firm to total sales of industry, times 100. Wage Ratio: Compensation to the employees as a share of sales. R&D Ratio: Share of R&D expenditures to total expenses. Advertisement Ratio: Share of Advertising expenses in total expenses. Net Fixed Assets Ratio is given by the ratio of net fixed asset to net worth, divided by 100. Profitability Ratio: firm profit after tax relative to total sales, divided by 100.
The Export Decision

With only 7 years of observations, using fixed effects linear models with a dynamic panel could lead to biased estimates. Fixed effects are also inapplicable with non-linear panel analysis, such as Logit or Tobit. To cope with this problem, we follow Stiebale (2011). First, we investigate what causes the firm to engage in international trade and whether FCT (and then FDI and FPI separately) has any effect on it by defining Exports, the dependent variable in equation (1) as a binary dummy variable “Export status,” equal to 1 if the firm exports and 0 if it does not. We estimate the resulting equation using random effects Logit, and the results are presented in Table 2.

The first interesting result regards the impact of FCT on the export decision. Even though in specification (1) of Table 2 the estimated coefficient is positive and significant at the 10% level, it becomes insignificant when we add the wage ratio (and other variables) as controls. The point estimates, however, remain positive. This result suggests that foreign capital per se may allow the firm to finance the sunk costs of foreign market entry and engage in exporting, but this also may coincide with other attributes of the firm. Indicators of export history, lagged exports and export status in 2000, in contrast, are significant in all specifications. Firms that have previously overcome the sunk costs constraint continue to export.

With regard to the control variables themselves, the estimated coefficient of Size is positive in all specifications and statistically significant in specification (1), indicating that as a firm gets larger, the chances it will start exporting also increase. The quadratic term of Size, while remaining insignificant, is negative, showing potential decreasing returns to scale. Other variables are insignificant as well, thus leaving export history as the main determinant of the current decision to export.

Volume of Exports, or Export Intensity of Output

Our next question is whether FCT induces firms to export more. The estimation is done using the random effects Tobit model. The results are presented in Table 3.

These results strongly underscore that FCT increases export volume—when a firm receives foreign investment, its share of exports in total sales, “Export ratio,” goes up. The effect is very robust and highly significant in all specifications. Replacing current values of the financial variables with their lagged counterparts does not change the results. Also firms with a history of exporting will export more, since both the lagged export ratio and export ratio in 2000 are positive and significant. The spillover effect is never significant, with point estimates being negative in all specifications. This suggests that perhaps significant domestic non-MNE exporters are crowded out of the export market, which is now being dominated by MNE exporters.

Robustness Check

To ensure the robustness of our results, we perform several checks, available by request. First, we revisit the question of what causes a firm to start exporting, and re-estimate equation (1) with fixed effects OLS. To address the endogeneity question, we replace foreign capital with lagged foreign capital as a determinant of the decision to export. The results suggest that there is no effect of foreign capital inflow on the decision to export. At best, the decision to export and foreign capital presence are contemporaneously determined. Second, we also re-estimate the propensity equations
using fixed effects OLS with and without lagged foreign capital, restricting the sample to exporting only firms. Similar to random effects Tobit results, foreign capital and export history remain highly statistically significant determinants of the propensity to export.

**The Role of Foreign Portfolio Investment**

All of the results reported above examine the role of foreign capital in general, but the fact that FPI is very fluid and some may not be fully converted into productive investment is problematic. Therefore, we decompose FCT into its two components, FDI and FPI, and re-run the random effects Logit model for the export decision and

| Variables                  | (1)    | (2)    | (3)    | (4)    | (5)    | (6)    |
|----------------------------|--------|--------|--------|--------|--------|--------|
| Foreign Capital            | 0.944* | 0.875  | 0.842  | 0.801  | 0.552  | 0.603  |
|                           | (0.532) | (0.560) | (0.561) | (0.568) | (0.650) | (0.637) |
| Export Status (t – 1)      | 2.348***| 2.552***| 2.598***| 2.514***| 2.911***| 3.111***|
|                           | (0.330) | (0.350) | (0.354) | (0.362) | (0.419) | (0.407) |
| Export Status in 2000      | 2.356***| 2.449***| 2.321***| 2.476***| 1.542** | 1.386**|
|                           | (0.588) | (0.652) | (0.646) | (0.677) | (0.704) | (0.660) |
| Regional Spillover         | −0.36  | −1.599 | −1.479 | 0.33   | −3.722 |        |
|                           | (2.156) | (2.377) | (2.361) | (2.736) | (3.250) |        |
| Size                      | 5.545** | 4.451  | 4.25   | 4.568  | 3.786  | 3.602  |
|                           | (2.669) | (2.757) | (2.765) | (2.907) | (4.036) | (4.014) |
| Size-Squared              | −1.507 | −1.408 | −1.374 | −1.414 | −1.893 | −1.85  |
|                           | (1.023) | (1.178) | (1.187) | (1.218) | (1.677) | (1.703) |
| Wage Ratio                | 5.446  | 5.359  | 4.869  | 14.239 | 13.742 |        |
|                           | (4.511) | (4.390) | (4.534) | (10.535) | (10.855) |        |
| Profitability Ratio       | −0.288 | −0.289 | −0.238 | −0.207 | −0.238 | −0.207 |
|                           | (0.306) | (0.313) | (0.321) | (0.317) |        |        |
| R&D Ratio                 | −0.584 | −1.055 |        |        |        |        |
|                           | (4.682) | (4.612) |        |        |        |        |
| Advertising Ratio         | −0.626 | −0.748 |        |        |        |        |
|                           | (0.596) | (0.634) |        |        |        |        |
| Net Fixed Assets Ratio    | 2.995  | 4.412  |        |        |        |        |
|                           | (5.573) | (5.446) |        |        |        |        |
| Panel Variance            | 1.156***| 1.179***| 1.131***| 1.243***| 0.952  | 0.709  |
|                           | (0.377) | (0.411) | (0.422) | (0.415) | (0.602) | (0.649) |
| Region-Specific Time Trends| No    | No     | No     | Yes    | Yes    | No     |
| Time Dummies              |        |        |        |        |        |        |
| Regional Dummies          | Yes    | Yes    | Yes    | Yes    | Yes    | Yes    |
| Firm Dummies              | No     | No     | No     | No     | No     | No     |
| Sample size               | 1242   | 1154   | 1154   | 1154   | 823    | 823    |

**Notes:** All variables are measured as ratios (refer to section 2 and Table 1 for details). The dependent variable is a dummy, equal 1 for exporting firms and 0 otherwise. The regional dummies are “North,” “East,” “South” and “West.” Region-specific trends are their interactions with a linear time trend. Robust standard errors are in the parentheses. *p < 0.10; **p < 0.05; ***p < 0.01.
the random effects Tobit model for export propensity. These results are reported in Table 4.

For the export decision, specifications (1)–(3), FDI and export history (lagged export status and export status in 2000) are positive and highly statistically significant, while FPI is not. This clearly indicates that the presence of FPI is not relevant to the export decision. However, once the firm has decided to export the propensity to export is influenced by FPI. The export propensity equation estimates reported in specifications (4)–(6) of Table 4 indicate that FPI is statistically significant in three of the four specifications. This suggests that FPI may still enable firms to expand export volumes, or redirect production from the home market to foreign markets (or that foreign portfolio investors are attracted to known firms, those that export). FDI remains highly statistically significant in all specifications, being a major determinant of both export decision and export propensity.

5. Conclusions

Policies to attract foreign investment are based upon the belief that foreign firms’ exports and access to foreign capital increases domestic economic growth. A hin-
A large sunk cost of foreign market entry.

Foreign firms, in contrast, enter India and other emerging market economies to access the relatively low production costs.

We investigate how foreign investment, both FDI and FPI, influences the firm’s export decision and export propensity and the extent to which non-recipients may benefit. With respect to the exporting decision we find that the probability of domestic firms exporting is positively influenced by FDI. When we decompose foreign investment into FDI and FPI we find that it is FDI that effects the decision to export, not FPI. When we focus on the firm’s export propensity, we again find strong evidence of a positive impact associated with foreign investment, but now both FDI and FPI are significant.

We find that spillover effects on the export decision of the domestic firms are statistically insignificant. Because we focus this paper on the IT sector, where spillovers, if any, should be relatively high compared with other sectors, we conclude that it is unlikely for spillover to be present at all.

Table 4. The Effects of FDI and FPI, Random Effects Logit and Tobit Models

| Variables                        | Dependent Variable—Export Status (Random Effects Logit) | Dependent Variable—Export Ratio (Random Effects Tobit) |
|----------------------------------|--------------------------------------------------------|--------------------------------------------------------|
|                                  | (1)          | (2)          | (3)          | (4)          | (5)          | (6)          |
| **Foreign Portfolio Investment**| 0.392        | 0.261        | 0.211        | 0.087*       | 0.100*       | 0.097        |
| (0.447)                          | (0.468)      | (0.482)      | (0.046)      | (0.059)      | (0.060)      |
| **Foreign Direct Investment**    | 3.134***     | 2.944**      | 2.955**      | 0.156***     | 0.195***     | 0.198***     |
| (1.120)                          | (1.153)      | (1.181)      | (0.046)      | (0.061)      | (0.062)      |
| **Export Status/Ratio (t − 1)** | 2.265***     | 2.523***     | 2.436***     | 0.638***     | 0.336***     | 0.337***     |
| (0.332)                          | (0.357)      | (0.365)      | (0.03)       | (0.04)       | (0.04)       |
| **Export Status/Ratio in 2000** | 2.523***     | 2.496***     | 2.661***     | 0.390***     | 0.650***     | 0.649***     |
| (0.603)                          | (0.663)      | (0.695)      | (0.046)      | (0.081)      | (0.081)      |
| **Regional Spillover**           | −0.606       | −1.816       | −0.044       | −0.059       | −0.158       | −0.038       |
| (2.197)                          | (2.410)      | (2.798)      | (0.284)      | (0.282)      | (0.320)      |
| **Size**                         | 4.680*       | 3.718        | 3.83         | −0.021       | −0.054       | −0.086       |
| (2.726)                          | (2.824)      | (2.974)      | (0.193)      | (0.189)      | (0.195)      |
| **Size-Squared**                 | −1.442       | −1.389       | −1.358       | −0.004       | 0.017        | 0.025        |
| (1.104)                          | (1.272)      | (1.299)      | (0.056)      | (0.054)      | (0.055)      |
| **Wage Ratio**                   | 4.943        | 4.212        | 0.049        | 0.049        | 0.051        |
| (5.005)                          | (5.175)      | (0.079)      | (0.083)      |
| **Profitability Ratio**          | −0.271       | −0.275       | −0.058       | −0.058       | −0.057       |
| (0.309)                          | (0.316)      | (0.051)      | (0.051)      |
| **Panel Variance**               | 1.208***     | 1.169***     | 1.282***     | 0.000***     | 0.345***     | 0.345***     |
| (0.371)                          | (0.418)      | (0.412)      | (0.000)      | (0.032)      | (0.032)      |
| **Over all Variance**            | 0.523***     | 0.470***     | 0.470***     |
| (0.013)                          | (0.013)      | (0.013)      |
| **Region-Specific Time Trends**  | No           | No           | Yes          | No           | No           | Yes          |
| **Time Dummies**                 | No           | No           | No           | No           | No           | No           |
| **Regional Dummies**             | Yes          | Yes          | Yes          | Yes          | Yes          | Yes          |
| **Firm Dummies**                 | No           | No           | No           | No           | No           | No           |
| **Sample size**                  | 1242         | 1154         | 1154         | 1242         | 1154         | 1154         |

Notes: See notes to Tables 2 and 3.
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Notes

1. UNCTAD (2010) and website of Department of Commerce for the Government of India, http://commerce.nic.in/ (2009).

2. Note though that foreign portfolio investments may not actually be converted into net new investment activity and is often of a short term nature. Our discussion and most earlier research continues to focus on FDI as a result, but we include FPI explicitly in the estimation equations below.

3. UNCTAD (2001), p. 5.

4. See Luca et al. (2012) for a discussion.
5. Note that Roberts and Tybout (1997) find strong support for sunk costs as a barrier to foreign market entry in a developing economy, Columbia, whereas Stiebale (2011) finds little evidence of sunk costs as a barrier to foreign market entry for a developed economy, France. Stiebale argues that the overall development of the financial sector and public programs to support export financing overcomes the sunk cost constraints for most firms. The ability to obtain financing then appears to be a critical factor in export activities.

6. The IMF defines foreign control as owning 10% or more of the ordinary shares or voting power of an incorporated firm or its equivalent for an unincorporated firm. Lower ownership of shares are simply recorded as portfolio investment. See International Monetary Fund (IMF) (1993).

7. We define the following four regions “North,” “East,” “South” and “West,” according to the geographical location of the corresponding companies.

8. For example, see Roberts and Tybout (1997, p. 548) and Stiebale (2011).

9. The Prowess database is maintained by the Centre for Monitoring the Indian Economy (CMIE). It is well documented and contains detailed financial, structural and organizational data on 15,000 Indian firms, including all companies traded on India’s major stock exchanges, central public sector enterprises and numerous other firms. The companies account for 75% of all corporate taxes and over 95% of excise duty collected by the government.

10. An appendix available upon request provides the description of all variables, including their positions in the database and the exact formulas used to compute the variables for the regressions.