Picking Winners or Creating Them?

Revisiting the Benefits of FDI in the Czech Republic

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Abstract:

We examine whether publicly-traded Czech firms that received foreign direct investment (FDI) before the end of 1995 had higher levels of total factor productivity during 1995-8. Preliminary data analysis reveals that, as restructuring occurred, many Czech firms left the sample during 1995-8 and that the recipients of FDI tended to be larger firms. We show that failing to tackle the associated sample attrition and selection problems substantially biases the estimated effects of FDI—as does pooling observations across industries (a common practice in the literature). Interestingly, taking account of only a subset of these concerns yields at best mixed results for the effects of FDI. In contrast, taking account of all of these econometric concerns produces a coherent pattern across industries of estimates of substantial benefits to firms that receive FDI.

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1. Introduction

The previous decade saw considerable foreign direct investment (FDI) in developing economies. Such investments were thought to raise the productivity of those firms receiving FDI ("direct effects") and those local firms in the same industries or geographic location as the firms who received FDI ("spillover effects.") Recent firm-based evidence has called into question the strength of the latter[4], suggesting that FDI does not create externalities and, in so doing, casts doubt on the case for promoting inward flows of FDI.

In this paper we employ data on publicly-traded Czech firms to estimate the sign and magnitude of the direct effects of receiving FDI. Case study evidence[5] documents the benefits of technology transfer from overseas investors to recipient firms, improvements in management techniques, and enhanced contacts abroad which follow from partnering with foreign firms—all of which suggest that the direct effects should be positive. However, an alternative explanation for any observed (partial) correlation between FDI receipt and firm performance is that overseas investors "pick winners," rather than creating them. And, indeed, some but by no means all firm-based econometric studies correct for this selection bias and have still found positive direct effects of FDI.[6]

[4] See, for example, Haddad and Harrison (1993), Aitken and Harrison (1999), and Djankov and Hoekman (2000). Hanson (2001) reviews the empirical studies on spillover effects from FDI and draws out their policy implications.
[5] Discussions of the case study evidence can be found in Caves (1995), Moran (1998, 2001), and Graham (2000).
[6] See Djankov and Hoekman (2000), whose paper is of particular relevance to us as they employ a different sample of Czech firms than we do.

Selection is, however, not the only econometric concern that might bias the estimates of these direct effects. Leading studies in this literature pool observations across industries, effectively imposing common coefficients on the factors of production across different industries. What is more, few papers consider the consequences of sample attrition. Such attrition is often sidestepped by the creation of balanced panels. Fortunately, techniques[7] are available to systematically account for the fact that exiting firms may well be unrepresentative of the entire sample, perhaps sharing a common characteristic such as lower productivity. These techniques may be of especial value in settings where a large number of firms exit—as might be expected in a transition economy undergoing considerable restructuring which, after all, accurately characterizes the Czech Republic during 1994-8 (the years covered in our sample.)

The econometric considerations are not merely quibbles. If, for example, we found that after taking these considerations into account the estimates of the direct effects are statistically insignificant, and similar findings emerged in other studies, then the benefits of inward FDI would look particularly weak.[8] This would call into question one of the most consistent pieces of policy advice given to developing economies throughout the 1990s. Careful consideration of these econometric concerns might also shed light on the direction of biases introduced

[7] One such technique was introduced by Olley and Pakes (1996).
[8] This is especially in light of research (mentioned earlier) which suggests that there are few positive spillovers created by inward FDI.

by existing empirical strategies, which may help in assessing current and future research.

But what do we actually find? First, preliminary data analysis reveals that the selection issue might be very important in our sample. This is because, with the exception of publishing, FDI recipients in all of the other nine sectors in our sample have on average larger capital stocks and produce more value added. Second, many firms exit our sample, and most of the exiting firms did not receive FDI and may well be the lower productivity firms. Third, a very mixed pattern of estimates of the direct effects of FDI emerges when one or two of the following econometric concerns are addressed: selection, pooling across industries, and accounting for non-random exits from the sample. Fourth, and most constructively, when all of these concerns are addressed a coherent pattern of positive direct effects of FDI emerges. In sum, this paper confirms an important qualitative finding in the existing literature—namely, that the direct effects of FDI are positive, but does so using a very different empirical strategy than is typically employed.

This paper is organized as follows: the next section describes the data used, it's origins, and motivates why selection and sample attrition may well be important concerns. The third section describes our econometric strategy and results. Caveats and concerns (and there are many) are discussed in the last section.

2. Data employed

A private survey firm was engaged by the World Bank to collect financial data on as many publicly-traded Czech firms as possible since 1992. One advantage of examining firm performance in the Czech Republic is that her firms have conformed to international accounting standards since 1992, earlier even than some of the industrial countries in Western Europe. Firms could report either a "short form" with limited financial information or a "long form" which in principle has far more information. We assembled the largest possible sample of firms that reported sales, inventories, employment, capital stock, and material costs for the years 1994-6, and where possible we tracked these firms through the 1998 financial year. That is, firms were included in the sample even if their financial information was not available in 1997 or 1998. In total, our sample comprised 1004 firms.

The firms were sorted into ten different economic sectors, which include traditional manufacturing sectors (such as electrical and electronic equipment), utilities, and one service sector (publishing) for which considerable data was available.[9] As Table 1 makes clear, firms in the primary metal, electrical, and textile sectors are well represented, as are utility firms. There is also considerable delisting of firms throughout the mid-to-late 1990s. Over a quarter

[9] The ten sectors are: textiles, leather, and apparel; wood products; publishing; chemical, rubber, and plastic; glass and ceramics; primary metal and fabricated metal products; electrical and electronic equipment; transportation equipment; a category for all other manufacturing firms; and utilities.

of the firms in the glass and ceramic, in the primary metal, and in the electrical equipment industries left the Prague stock exchange in 1997-8 (see Table 1, column 4.) In part, this reflects a shakeout that followed the mass privatization of Czech enterprises (through voucher schemes and sales to "strategic" investors, which included foreigners), which had occurred in two phases beginning in October 1992 and ending in October 1994.[10] Subsequent delistings reflected a number of eventualities: bankruptcy, mergers and acquisitions, and transfers to overseas stock markets (where obtaining funds was thought to be cheaper.) This shakeout resulted in the Prague stock exchange's market capitalization falling from 35 percent of Czech GDP in December 1995 to 23 percent at the end of 1998, the last year of our sample (*Economist Intelligence Unit*, 2001). Slower economic growth rates may have exacerbated this shakeout too. Real GDP growth rates fell from 5.9 percent in 1995 to -2.2 percent in 1998. In addition, the percentage increase in the GDP deflator fell from 21.0 percent in 1993 to 7.2 percent in 1997, before rising to 10.2 percent in 1998 (*World Development Indicators*, 2001).

The survey firm was also instructed to collect press announcements of foreign investments in Czech firms since 1990. Those announcements were matched up with the financial information described above, enabling us to identify which publicly-traded Czech firms had over 10 percent of their equity owned by foreigners (the standard threshold for determining that a domestic firm has

[10] See Coffee (1996) and Claessens and Djankov (1999) for accounts and analyses of this mass privatization scheme.

received foreign investment.) Our sample includes 205 such firms (see Table 2), with a heavy concentration in the glass and ceramics, chemical, primary metal, and electrical industries, and in the utilities sector. With the exception of publishing, the mean size (as measured by value added, capital stock, and material expenditures) of an FDI recipient is larger than a non-recipient.[11]

The final observation about the FDI recipients is that some do exit the sample in 1997 and 1998 (see Table 1, column 6). In half of the sectors considered here, at least one FDI recipient delisted from the Prague stock exchange, and in the chemicals sector such departures accounted for over 40 percent of all delistings. Later, it will be interesting to see if the departing firms that had received FDI have appreciably lower TFP levels than firms that remain listed on the stock exchange.

3. Econometric strategy

Our objective is to estimate the effect of receiving foreign direct investment on firm performance, as measured by total factor productivity. We also seek to establish the consequences for the estimated effect of FDI on TFP of ignoring selection matters and non-random exits from the sample, as well as from pooling across industries. One preliminary manner concerns the timing of a firm's receipt of FDI. Unsurprisingly, not all the firms received in the same year. Nevertheless, 203 out of 205 of our FDI recipients obtained overseas investment before or

[11] However, the (unreported) standard deviations of each of the three measures of size in Table 3 are so large that they swamp the difference between the FDI and non-FDI recipients in the means of each size measure

during 1995. Consequently, in all that follows we examine whether there is any effect on firm performance from 1995 onwards of FDI receipt before the end of 1995.

3.1 Benchmark case: balanced panel with all sectors pooled together

To establish a benchmark we formed a balanced panel comprising those firms whose financial data is available during each year 1995-8. Furthermore, we pool data across ten sectors, yielding a panel of four annual observations on 797 firms. Assume for the moment that each firm produces the same homogenous good with a Cobb-Douglas technology, given by the following production function:

$$y_{it} = \beta_i + \beta_k k_{it} + \beta_l l_{it} + \beta_m m_{it} + \eta_{it}$$

where y_{it} is the logarithm of the output of firm *i* in year *t,* and $k_{it}, l_{it},$ and m_{it} are the logarithms of firm *i's* capital stock, labor force, and materials use, respectively, in time *t*.[12] With perfectly competitive factor markets and cost minimization by firms, we can write

$$y_{it}^{*} = \beta_i + \beta_k k_{it} + \beta_l l_{it} + \eta_{it}$$

[12] In our sample the empirical counterpart for output in year *t* is the sum of the firm's sales in year *t* and the change in the firm's inventories during the same year. The reported value of a firm's capital stock and expenditures on materials are used for k_{it} and m_{it} respectively. Unfortunately, in these financial statements firms only indicate which range their employment levels fall between. These ranges were used to form an indicator, with higher values associated with a large reported employment range. This indicator is our proxy for the labor input l_{it}. All nominal expenditures were converted into real quantities by using the Czech GDP deflator for the appropriate year. Unfortunately, sectoral price deflators were not available.

where y_{it}^{*} is output net of expenditures on materials. (The significance of netting out material expenditures will become apparent in later sections, when we correct for the consequences of non-random exit.) From now on, however, when we refer to output we mean y_{it}^{*} not y_{it}.

Our benchmark case involves using the balanced panel to estimate $\hat{\beta}_i, \hat{\beta}_k$, and $\hat{\beta}_l$. We recover a measure of productivity, $y_{it}^{*} - \hat{\beta}_k k_{it} - \hat{\beta}_l l_{it}$, that is output purged of the contribution of each factor of production. Denote this estimate of productivity by $\hat{TFP}_{it}$. To estimate the contribution of FDI to $\hat{TFP}_{it}$ we run a regression on year dummies for 1996, 1997, and 1998 and a dummy variable that picks up whether a firm *i* ever received FDI. The year dummies are intended to pick up common macroeconomic shocks, leaving the FDI dummy to estimate the difference in mean TFP of those firms who received FDI and those that did not. The results from this benchmark case are reported in Table 3. The estimated TFP parameter is 0.0882, implying that FDI recipients had TFP levels that were on average 9.2 percent higher than other firms.

The next step is to correct for selection using the generalized Heckman two-step procedure (Amemiya 1984). We use the firms' 1994 financial data (which notice was not employed in estimating the TFP effects above) to analyze the determinants of foreigners' investment decisions. In our case, this amounts to running a probit on whether or not firm *i* ever received FDI on three factors: the

value added of firm *i* in 1994 (an indicator of pre-tax profitability), firm *i*'s profits as a share of sales (an indicator of reported per unit profits), and firm *i*'s capital stock, expressed as a share of the capital stock of the largest firm in firm *i*'s sector. The latter term is a measure of the size of a firm relative to others in it's sector. Value added and per unit profits turn out to be surprisingly uncorrelated, indicating perhaps that tax evasion or avoidance depresses the latter. The (unreported) estimates from this first step regression are used to form an additional regressor in the second step estimation of TFP on the FDI dummy and the year dummies. Again, Table 3 reports the estimated effect of FDI on TFP once a correction for selection is made. The parameter estimate on the TFP term is 0.3582 and is precisely estimated (with a p value less than 0.01). This estimate implies that receiving FDI increases TFP by more than 43 percent, a much larger estimate than when no correction was undertaken.

3.2. Balanced panels estimated for each sector

Our first departure from the benchmark case is to perform the above regressions on a sector-by-sector basis. That is, to form a balanced panel for each sector and to estimate the FDI parameter with and without selection. Table 4 (columns 2 and 3) reports the parameter estimates for the labor and capital coefficients. Table 5 (columns 2-7) presents the parameter estimates for the selection equations and Table 6 (columns 2-6) presents the measures of fit for the selection equation. The principal estimates of interest—those of FDI on TFP—are reported in Table

7 (columns 2,3,8, and 9). Without selection only four sectors have both positive estimates for the FDI parameter and p values less than 0.05. Worse still, once one corrects for selection only one sector has such a positive and statistically significant FDI parameter—and four sectors actually have negative and significant estimates for the FDI parameter. Had we stopped here, our findings would have further called into question the merits of inward FDI in the Czech Republic. Pooling across sectors appears to yield a very distorted view of the effects of FDI on firm performance.

3.3 Unbalanced panel estimated for each sector

We saw in section 2 that a non-trivial number of Czech firms delist during 1997 and 1998, and would have been excluded by construction from the balanced panels employed above. Without having to examine the characteristics of the firms who left the sample, we could nevertheless replicate a similar estimation strategy for an unbalanced panel (which takes into account how long a firm remains in the sample, see Greene (1997) for details). The estimates comparable to the balanced panels are presented in Tables 4-7. From Table 4, we see that moving from a balanced to an unbalanced panel tends to depress the parameter estimate on labor and raise the estimated coefficient for capital. This implies that the estimated TFP levels, $\hat{TFP}_{it}$, are higher for more capital intensive firms in the unbalanced panels than in the balanced panels. Comparing parameter estimates in Table 7, the biggest difference between the unbalanced

and panel estimates occurs when the correction for selection is made. Unlike FDI's miserable performance in the balanced panels, with the selection correction the unbalanced panel results in four sectors have positive and significant parameter estimates. Having said that, two sectors also have huge negative and statistically significant estimates for the effects of FDI on TFP. On the basis of these results, one would have to conclude that the direct effect of FDI on firm performance is at best mixed.

3.4 Non-random exit

The Czech Republic is said to be a "transition" economy for a reason—its economy is undergoing restructuring, moving towards a regime in which market signals and firm budget constraints define the allocation of resources. We might, therefore, expect that some of the firms which delist are doing so because they are no longer economically viable as restructuring takes place. The probability that a firm delists is unlikely to be uniform across firms. In fact, a firm with below average levels of current productivity may be more likely to delist (or exit) in the future. Olley and Pakes (1996) proposed techniques that enables a correction to be performed to offset the potential bias introduced by non-random exit and by any correlation between the levels of input usage and innovations to TFP.[13] They show that permanent innovations in TFP will induce changes in investment and

[13] As Marschak and Andrews (1944) pointed out long ago, the theoretical dependence of input choices on TFP levels has long plagued the estimation of production functions. One of the contributions of Olley and Pakes (1996) was to show that, in certain circumstances, that this simultaneity problem can be overcome. Levinsohn and Petrin (2001) recently proposed another solution to this problem.

that, under some circumstances, investment levels can effectively proxy for TFP. Their procedure also involves estimating a survival equation with the estimated parameters used to compute additional terms—which are added as independent variables to the production function equation.[14]

We implement the Olley and Pakes procedure on a sector-by-sector basis for the years 1995-8, using the 1995 financial data to estimate the survival equation and associated survival probabilities. Our implementation differs in one respect from Olley and Pakes in that we use expenditures on materials, rather than investment, to generate proxies for TFP. In a Cobb-Douglas production function, higher levels of TFP will ceterius paribus lead to lower levels of materials usage. Tables 4 and 7 summarize the estimates which result from this procedure.

As Table 4 makes clear, compared to the unbalanced panel, the estimated capital coefficients are lower when non-random exits are taken into account. In contrast, the estimated labor coefficients are higher (but not as high as the balanced panel estimates). In general, the coefficients estimated using the Olley and Pakes procedure lie between those recovered from the regressions on the balanced and unbalanced panels. Turning to the FDI estimates in Table 7, there are major differences with the findings reported earlier. When a correction for selection is undertaken, nine out of 10 sectors are found to have positive and statistically significant estimates of the effects of FDI on TFP. The remaining

[14] Levinsohn and Petrin (2001) provide a straightforward account of Olley and Pakes' procedure, in particular on the latter's use of investment as a proxy for TFP.

sector (publishing) generates an insignificant effect. Another interesting difference is that in almost every sector where the Olley and Pakes procedure results in a statistically significant FDI parameter, the magnitude of that parameter is larger than in comparable estimate for the unbalanced and balanced panels. In sum, correcting for non-random exit and selection results in a coherent pattern of larger effects of FDI receipt on firm performance.

The Olley and Pakes survival equations are based on the pretty reasonable assumption that firms with lower levels of current TFP are less likely to survive in the future. Having recovered the TFP levels of each firm for each year that they are in the sample, we can check whether firms that exited in 1997 (1998) had on average lower TFP levels in 1996 (1997), the year before they left. Table 8 compares the TFP levels of departing and remaining firms, differentiating between FDI and non-FDI recipients. Of the 26 possible comparisons, 19 involved exiting firms have lower productivity levels than firms who remained. However, in nine cases the opposite was true, suggesting that other factors may well have determined delisting decisions. Overall though, exiting firms tended to be the lower productivity firms.

4. Summary, caveats, and concerns

Now that the beneficial spillover effects of inward FDI have been called into question, much more of the case for liberalizing national FDI regimes falls on the magnitude of the estimated direct effects of FDI receipt on subsequent firm performance. We have revisited this matter using data on publicly-traded Czech firms during the years 1994-8, a period which followed substantial privatization and foreign investment.

We have attempted to demonstrate the importance of estimating the effects of FDI at the industry or sector level, of taking account of the fact that firms exit samples for systematic reasons, and of taking account of the selection by foreign companies of the very domestic firms that they invest in. Consistent with another recent study of Czech experience (Djankov and Hoekman, 2000), we started by showing that pooling across sectors results in small positive estimates of the effects of FDI on TFP. Correcting for selection raises the parameter estimates further, giving the impression of sizeable benefits from FDI. Unfortunately, we went on to show that these findings are undermined the moment one estimates separate FDI parameters for each sector. A coherent pattern of positive estimates for FDI does emerge, however, once one takes account of the selection issues and the fact that lower productivity firms tend to exit the sample. There does seem, therefore, to be a payoff to using more sophisticated

econometric techniques—which has policy relevance given the latter yield much larger estimated benefits from FDI than standard techniques.

A number of caveats are in order. First, a question arises of how representative of Czech firms in general are the publicly-traded firms that we use in our sample. The latter are likely to be larger and, perhaps, therefore more likely to receive FDI in the first place. Furthermore, the publicly-traded firms that report the most financial data are likely to be ones with more transparent corporate governance practices that also makes them more attractive to overseas investors. However, one source of bias—namely that larger firms are probably large because they have higher productivity levels—is unlikely to be significant in the Czech case, compared to a market economy. This is because most Czech firms were previously state-owned with soft budget constraints, and size may well have had less to do with productivity levels and more to do with the extent of state support. Nevertheless, care must be taken in inferring that results from samples of publicly-traded companies carry over to privately-held firms.

Second, our sample is more likely to pick up the benefits of foreign portfolio investment rather than Greenfield FDI. In fact, the latter form of FDI would only be found in our sample if a foreign investor decided to buy more than 10 percent of a Czech firm and set up a new production facility with its Czech partner or subsidiary. Even so, this paper's results do suggest that portfolio FDI can be beneficial.

Third, the estimated effects of FDI in some sectors are probably implausibly large. When correcting for selection and non-random exit, the smallest positive and statistically significant parameter (for wood products) implied that TFP rose 83.1 percent. This type of increase is unlikely to be solely due to improvements in production methods (unless there was a huge waste of inputs.) Instead, shifts in the product mix to higher value added products and better marketing are more likely to account for such sizeable increases in TFP. Even so, some of the parameter estimates are troublingly large.

Fourth, one difficulty we experiences throughout was finding economic variables that can adequately account for the foreigner's choice in investments in Czech firms. The parameter estimates in Table 5 and measures of fit in Table 6 indicate that the selection equations have not performed terribly well, which is a source of concern given the central role that selection plays in the estimation strategy and results. This is clearly an issue deserving more refinement and analysis.

To conclude, we have found evidence which suggests that the benefits of foreign direct investment to recipient firms are sizeable, widespread, and robust. However, we should not be too pleased with ourselves. After all, we have not identified the channels through which FDI offers such large benefits, nor have we located for the firm-specific and sector-specific factors that account for the wide range of estimated positive effects of FDI. Further research along the lines would

offer a richer picture of the consequences of FDI in transition and developing economies.

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Table 1: Sample composition across sectors and exits

Sector	Number of firms present in sample…		Number of firms that exit during 1997 or 1998	Number of firms that received FDI…		Of those firms that exited in 1997 or 1998, what percentage had received FDI?
	…during years 1995 and 1996	…during each year 1995-8		…and stayed in sample throughout	…and exited in 1997 or 1998	
Textile, leather, and apparel	120	99	21	13	0	0.00%
Wood products	53	40	13	8	3	23.08%
Publishing	42	33	9	7	0	0.00%
Chemical, rubber, and plastic	113	96	17	17	7	41.18%
Glass and ceramic	97	73	24	29	6	25.00%
Primary metal and fabricated metal products	169	122	47	22	5	10.64%
Electrical and electronic equipment	146	110	36	19	5	13.89%
Transportation equipment	67	55	12	12	0	0.00%
Other manufacturing	83	68	15	7	0	0.00%
Utilities	114	101	13	45	0	0.00%

Table 2: FDI recipients tend to be larger on several dimensions

Sector	1995										
	FDI recipients				Non-FDI recipients				Ratio of FDI to non-FDI recipients		
	Number	Mean value added	Mean capital stock	Mean materials expenditure	Number	Mean value added	Mean capital stock	Mean materials expenditure	Mean value added	Mean capital stock	Mean materials expenditure
Textile, leather, and apparel	13	181116	749273	426831	107	96105	337599	198640	1.8846	2.2194	2.1488
Wood products	11	338478	1746291	748915	42	118229	504901	398419	2.8629	3.4587	1.8797
Publishing	7	36180	100746	75820	35	59350	248226	157229	0.6096	0.4059	0.4822
Chemical, rubber, and plastic	24	369092	1468550	1064929	89	212349	1049956	740390	1.7381	1.3987	1.4383
Glass and ceramic	35	311421	1482592	546127	62	89265	282103	129884	3.4887	5.2555	4.2047
Primary metal and fabricated metal products	27	530857	2129120	1718761	142	95522	301860	267503	5.5574	7.0533	6.4252
Electrical and electronic equipment	24	130567	521460	358976	122	64525	208121	129425	2.0235	2.5056	2.7736
Transportation equipment	12	667648	4329149	3350542	55	148603	660851	327044	4.4928	6.5509	10.2449
Other manufacturing	7	134217	526482	579466	76	56255	174318	143027	2.3859	3.0202	4.0514
Utilities	45	1155743	5981860	2550792	69	162804	1355853	510149	7.0990	4.4119	5.0001
Total number of firms	205				799						

Table 3: Balanced panel and pooling across industries (the benchmark case)				
Independent variable	Balanced panel			
	Without selection correction		With selection correction	
	Parameter estimate	p value	Parameter estimate	p value
Constant	5.4394	0.0000	5.4129	0.0000
FDI dummy	0.0882	0.0000	0.3582	0.0083
Dummy for 1996	0.0665	0.0049	0.1047	0.0001
Dummy for 1997	0.1177	0.0000	-0.2036	0.0005
Dummy for 1998	0.1239	0.0000	-0.0723	0.8104
N=3188				

Table 4: Labor and capital parameter estimates

Sector	Factor of production											
	Capital						Labor					
	Balanced panel		Unbalanced panel		Non-random exits		Balanced panel		Unbalanced panel		Non-random exits	
	Parameter estimate	p value	Parameter estimate	p value	Parameter estimate	p value	Parameter estimate	p value	Parameter estimate	p value	Parameter estimate	p value
Textile, leather, and apparel	0.3134	0.0000	0.8074	0.0000	0.2581	0.0006	0.8891	0.0000	-0.0045	0.8181	0.1782	0.0000
Wood products	0.9782	0.0000	0.8066	0.0007	0.7257	0.0000	0.1850	0.0000	0.0622	0.0896	0.1018	0.0050
Publishing	0.3113	0.0239	0.3906	0.0119	0.0704	0.6727	0.7368	0.0000	-0.1390	0.0001	0.0074	0.8949
Chemical,rubber, and plastic	0.0665	0.7071	0.9333	0.0000	0.1158	0.2843	1.0658	0.0000	-0.0803	0.0145	0.0788	0.0220
Glass and ceramic	0.1545	0.4264	0.6391	0.0000	-0.0266	0.8165	0.5731	0.0001	-0.0991	0.0009	0.0507	0.1648
Primary metal and fabricated metal products	0.1109	0.1924	0.8913	0.0000	0.3590	0.0001	1.3379	0.0000	-0.0017	0.9439	0.1310	0.0000
Electrical and electronic equipment	0.2785	0.0000	0.5908	0.0000	-0.0050	0.9375	0.7191	0.0000	-0.0439	0.0492	0.2278	0.0000
Transportation equipment	0.2434	0.2990	1.0617	0.0000	0.5607	0.0010	1.0837	0.0000	0.0647	0.3183	0.1787	0.0059
Other manufacturing	0.1623	0.0516	0.2838	0.0023	0.1670	0.2216	0.8777	0.0000	-0.0094	0.7039	0.1846	0.0000
Utilities	0.3758	0.0000	0.5643	0.0000	-0.0667	0.2307	0.6393	0.0000	-0.0048	0.8339	0.2023	0.0000

Table 5: Estimated parameters in the selection equations

Sector	Balanced Panel						Unbalanced Panel and non-random exit					
	Value added		Profits/Sales		Capital		Value added		Profits/Sales		Capital	
	Parameter estimate	p value	Parameter estimate	p value	Parameter estimate	p value	Parameter estimate	p value	Parameter estimate	p value	Parameter estimate	p value
Textile, leather, and apparel	-0.1055	0.3952	1.9195	0.1337	1.1479	0.3043	-0.3594	0.1581	1.5157	0.2299	2.7349	0.0268
Wood products	2.1296	0.0555	-9.0133	0.1081	-5.8581	0.2497	1.4915	0.0619	-0.5657	0.2082	-5.8697	0.1369
Publishing	0.3875	0.3673	-4.6172	0.2002	5.2201	0.3083	-0.1918	0.4190	1.3368	0.4288	-1.7953	0.3285
Chemical,rubber, and plastic	0.9893	0.0648	-4.1980	0.1123	-6.5201	0.0211	0.7264	0.1120	-0.4395	0.0854	-2.5794	0.1768
Glass and ceramic	-1.1567	0.0282	25.5733	0.0022	-4.0112	0.0456	-1.4448	0.0061	-2.9908	0.0657	31.4684	0.0003
Primary metal and fabricated metal products	-1.9199	0.1082	20.0336	0.0754	-1.1550	0.1173	-1.4460	0.1576	-0.9688	0.1489	17.0415	0.0969
Electrical and electronic equipment	0.2674	0.1405	-0.3698	0.4209	-2.5625	0.0526	0.0630	0.3867	-0.1673	0.4369	1.2153	0.2193
Transportation equipment	0.1414	0.4642	7.2252	0.2373	0.3293	0.3619	-0.2373	0.4375	0.3476	0.3566	8.8349	0.1914
Other manufacturing	-1.4798	0.0508	9.9868	0.0161	5.8062	0.2096	-1.1936	0.0623	4.1082	0.2425	8.9785	0.0164
Utilities	5.6045	0.0055	-41.5857	0.0119	-0.7123	0.2346	6.3326	0.0024	-0.6491	0.2079	-42.8982	0.0065

Table 6: Measures of fit for the selection equations

Sector	Balanced panel					Unbalanced panel and Olley-Pakes regressions				
	unrestricted likelihood	restricted likelihood	likelihood ratio index	likelihood ratio test	p value	unrestricted likelihood	restricted likelihood	likelihood ratio index	likelihood ratio test	p value
Textile, leather, and apparel	-0.4036	-0.4327	0.0673	4.4879	0.2134	-0.3539	-0.3872	0.0860	6.1252	0.1057
Wood products	-0.3941	-0.5342	0.2622	8.6838	0.0338	-0.4488	-0.5548	0.1911	7.8464	0.0493
Publishing	-0.3426	-0.3983	0.1398	2.4494	0.4845	-0.3296	-0.3576	0.0785	1.4598	0.6916
Chemical,rubber, and plastic	-0.3984	-0.4397	0.0938	6.1888	0.1028	-0.4743	-0.5035	0.0581	5.2040	0.1575
Glass and ceramic	-0.4122	-0.6865	0.3996	33.4720	0.0000	-0.3947	-0.6708	0.4116	41.9721	0.0000
Primary metal and fabricated metal products	-0.4394	-0.5004	0.1219	10.9830	0.0118	-0.4192	-0.4660	0.1005	11.1455	0.0110
Electrical and electronic equipment	-0.4502	-0.4931	0.0871	6.6123	0.0853	-0.4621	-0.4797	0.0368	3.4255	0.3306
Transportation equipment	-0.4522	-0.5060	0.1064	5.2765	0.1526	-0.4128	-0.4597	0.1019	5.4353	0.1426
Other manufacturing	-0.2389	-0.3446	0.3066	11.6227	0.0088	-0.2088	-0.2984	0.3003	12.1901	0.0068
Utilities	-0.6184	-0.6924	0.1069	11.6969	0.0085	-0.6086	-0.6921	0.1206	14.3576	0.0025

Table 7: Comparing the estimated effects of FDI across samples and different types of corrections

Sector	Without correction for selection						With correction for selection					
	Balanced panel		Unbalanced panel		Non-random exit		Balanced panel		Unbalanced panel		Non-random exit	
	Parameter estimate	p value	Parameter estimate	p value	Parameter estimate	p value	Parameter estimate	p value	Parameter estimate	p value	Parameter estimate	p value
Textile, leather, and apparel	-0.2822	0.0001	-0.0155	0.8489	0.4264	0.0008	-0.9389	0.0000	-0.2164	0.2038	1.8542	0.0002
Wood products	-0.3972	0.0056	-0.1262	0.3041	-0.1037	0.4020	-1.2484	0.0000	0.4112	0.1577	0.6050	0.0569
Publishing	0.2849	0.0029	0.0904	0.6191	-0.0130	0.9564	0.7672	0.1895	-3.9071	0.2837	-6.3455	0.2788
Chemical,rubber, and plastic	0.3043	0.0004	0.0485	0.5419	0.6196	0.0002	-0.0281	0.9362	-0.1830	0.6619	3.2498	0.0188
Glass and ceramic	0.5306	0.0000	0.3983	0.0000	1.3864	0.0000	0.8624	0.0000	0.5002	0.0000	2.4822	0.0000
Primary metal and fabricated metal products	-0.0470	0.5244	-0.1556	0.0365	0.3635	0.0001	-1.7603	0.0000	-0.8872	0.0018	1.6425	0.0000
Electrical and electronic equipment	0.0685	0.1918	0.2816	0.0009	0.6304	0.0000	0.0419	0.8113	2.8172	0.0023	6.1207	0.0009
Transportation equipment	-0.2269	0.0510	-0.5319	0.0000	0.1642	0.1666	-1.5699	0.0176	-1.2778	0.0296	1.6668	0.0000
Other manufacturing	0.0584	0.4328	0.7155	0.0000	0.7021	0.0000	-0.0169	0.8723	1.8122	0.0000	1.7500	0.0000
Utilities	0.2024	0.0000	0.8802	0.0000	1.7872	0.0000	1.5630	0.4646	2.5156	0.0997	3.4387	0.0062

Table 8: Do lower productivity firms tend to exit?

Sector	1997		1998	
	FDI recipients	Non-FDI recipients	FDI recipients	Non-FDI recipients
	Difference in the mean (log) TFP of departing firms and remaining firms	Difference in the mean (log) TFP of departing firms and remaining firms	Difference in the mean (log) TFP of departing firms and remaining firms	Difference in the mean (log) TFP of departing firms and remaining firms
Textile, leather, and apparel	no departures	-0.2915	no departures	-2.0869
Wood products	no departures	-0.5148	0.3401	-0.3585
Publishing	no departures	0.2524	no departures	-1.3986
Chemical, rubber, and plastic	no departures	2.4239	0.2869	-1.6170
Glass and ceramic	no departures	0.0674	-0.7050	-0.8547
Primary metal and fabricated metal products	0.7742	-0.2005	-1.0180	-1.4310
Electrical and electronic equipment	-4.5739	-0.0512	-2.2748	-1.5909
Transportation equipment	no departures	0.3914	no departures	-1.1250
Other manufacturing	no departures	no departures	no departures	-0.3492
Utilities	no departures	-2.2782	no departures	-2.2496

Remark: A negative value indicates that the departing firms had (on average) lower TFPs than the remaining firms.