Is the Impact Really That High? The Effect of FDI in Transition

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Abstract

Literature is not clear on the effect of FDI on the economic performance in hosting countries. The analysed effects include productivity, propensity to export, access to financial markets, etc. Although foreign subsidiaries usually perform better than the average of the hosting economies, sometimes the selection effect is found to be considerable. We use a unique dataset based on accounting annual reports to the statistical authorities by all medium and large Polish enterprises over a period 1997-2006. We match firms with FDI entry and to a control group of non-foreign owned companies to disentangle the effect of self-selection and FDI entry. We also distinguish explicitly between foreign ownership and privatisation through a foreign investor.

We find strong support of the view that foreign ownership increases access to financing. Evidence suggests also that although FDI enters more frequently companies who already participate in the international trading networks, while approximately 20% of the export intensity may be consistently on average attributed to the treatment effect. On the other hand, we were not able to confirm large effects on efficiency not profitability, while the size of the effects are different for greenfield investment and private acquisitions as opposed to privatisation.

Key words: FDI, transition, propensity score matching, Poland, firm-level analysis

JEL Codes: P45, P52, C14, O16

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1 Introduction

In a recent study Denisova, Eller, Frye and Zhuravskaya (2009) suggest that privatisation is still a matter of game between market forces and states, while depending on the form of a state (autocratic *versus* democratic) the public support for revisiting the question of whether or not allow foreign ownership may be a complementarity or a substitute to the market institutions. On the other hand, in most of the transition countries, a shift from a centrally-planned to market-oriented economy is virtually over. Most of these processes are indeed irreversible. What needs to be revisited, on the other hand, is the question of whether the transition projects are in general successful.

Firms' responses to liberalisation are likely to be heterogeneous. Technologically more advanced enterprises are potentially more apt in adapting by further increasing investment in new technologies and production processes. On the other hand, firms lagging behind may witness more state support in a form of strategic investments by the government before privatization. Similarly as in Girma, Greenaway and Wakelin (2001) and Greenaway, Sousa and Wakelin (2004), it has been frequently confirmed in the literature that this response may actually occur before FDI entry, while the uncontrolled selection bias may be responsible for the previously found strong effects of FDI entry. This bias may even be stronger in the context of privatisation. Megginson and Netter (2001) provide an extensive overview of the empirical literature on privatisation and marketisation, pointing to the relevance of internal processes in the companies foreseeing privatisation. Indeed, DeWenter and Malatesta (2001) demonstrate that the profitability of the state-owned firms increases *before* privatization.

Therefore, there are strong grounds to inquire the timing of the effect as well as disentangling the self-selection and the treatment effects. We aim to contribute to this strand of literature in two major ways. Firstly, we apply the propensity score matching technique, which allows to compare the performance of foreign owned companies to otherwise identical "statistical twins". Consequently, we may decompose the generally observed differential in performance into a part attributable to self-selection and a part attributable to the foreign ownership spillovers. Unlike studies that use Heckman (1979) correction, we are able to demonstrate the economic relevance of self-selection. Recently, also Chari, Chen and Dominguez (2009) applied this technique to evaluate the post-acquisition performance of publicly traded U.S. firms that have been acquired by owners from emerging markets over the period 1980-2007. Secondly, this paper examines separately the effects of foreign ownership and privatisation through a foreign investor. This distinction proves to be decisive for the overall evaluation of the FDI impact on the hosting economy.

Contrary to a majority of previous studies for Central and Eastern European (CEE) countries, we use a large and representative data set. Instead of survey data - as customary in the literature - we use a panel of all medium and large enterprises over a decade of 1997-2006 in Poland. The data comes from the balance sheets and financial reports gathered consistently by the Central Statistical Office from all firms employing over 49 workers, which gives us a panel of over 20 000 different companies over the period of ten years. Thanks to the size of the data set we are able to control for both industry-specific and individual heterogeneity.

The conclusions are consistent with the previous findings of the literature. Similarly to developed economies, FDI increases access to financing and - albeit to a much lesser extent - foreign trading networks. We found no evidence in support of the higher profitability of foreign owned companies, but this may be a result of corporate policies geared towards shifting profits to the mother company. Finally, contrary to what has been claimed in most of the transition literature, we were not able to find positive treatment effects on the efficiency, as most of the observed productivity differential is attributable to the self-selection.

The paper is structured as follows. In the next section we provide a brief literature review, focusing on studies exploring the CEECs transition. Data set and empirical strategy are outlaid in section 3, while in section 4 the initial results are accompanied by additional estimations of the timing effects as well as some contextual justification of the findings. Section 5 concludes with some suggestions for further research.

2 Literature review

Girma et al. (2001) were about the first to actually ask the question of whether there indeed are positive effects of FDI entry into an economy. Their analysis started from the contention that although there is strong evidence of wage differential between home and foreign owned firms (analyses based on both industralised and transition countries), less may be said about the productivity differential. Controlling for foreign entry into sectors of economy at a very disaggregate level, they find that although level and growth effects may be confirmed (foreign owned companies have higher productivity and productivity growth than the locals), there is no evidence supporting the spillover hypothesis. Therefore, Girma et al. (2001) argue that the response to FDI presence may be heterogenous, for some companies positive, for other negative - and on average undetermined. Also Görg and Greenaway (2004) argue that the empirical evidence in support of the positive spillovers hypothesis is rather mixed and provide some policy context why such effects despite theoretical underpinnings may not be confirmed.

However, the issue of existence of FDI-related spillovers has been frequently revisited in the literature. The empirical advances in the field have been carefully reviewed by Crespo and Fontoura (2007), but few studies should be recalled here, as they provide foundations for our approach. First, Greenaway et al. (2004), using UK firm-level data, have demonstrated that national companies learn how to export from the multinationals, while the authors consider competition channel to be the driving force behind these processes. Girma (2005) approaches the question of whether there are threshold effects in the externalities spillovers, while absorptive capacity has also been at the core of study by Gorodnichenko, Svejnar and Terrell (2007) focusing on 17 transition economies. Both for developed and for the developing countries, the studies seem to confirm the presence of both spillovers and threshold effects.

Aghion, Burgess, Redding and Zilibotti (2005) argue basing their findings on Indian data, that reducing barriers to entry to foreign products and firms, has a more positive effect on economic performance for firms and industries that are initially closer to the technological frontier[1]. Using a different set of countries (mostly CEECs and Rusia), Sabirianova Peter, Svejnar and Terrell (2004) demonstrate that at the beginning of the transformation processes the productivity gap to the global efficiency frontier actually increases despite foreign entry and privatisation (which may not be suprising as the effects of FDI entry and technology spillovers can take time to materialise). Using UK data Aghion, Blundell, Griffith, Howitt and Prantl (2009) find similar evidence, showing that liberalisation benefits more those who were closer to the efficiency frontier. On the other hand, Bartelsman, Haskel and Martin (2008) and Gorodnichenko et al. (2007) provide perhaps relevant ground for potential dismissal of these findings, suggesting that effects differ depending on the definition of the efficiency frontier - there is catching up to the national one, while the global may indeed be "running away".

The reasons for this state of matter have been found twofold. First of all, absorptive capacity is associated with the ability to innovate and imitate. Should it be too low, participation in the global trends may be hindered, therefore preventing catching up. On the other hand, Javorcik-Smarzynska and Saggi (2004) argue that foreign affiliates that have a higher level of technology tend to be wholly owned, rather than joint-ventures, in order to protect their competitive position. A joint-venture arrangement may increase the risk for undesired leakages of the mother company technology and know-how as the domestic partner may use the inside information in the production of other goods for which it does not cooperate with the foreign partner. In other words, foreign investors naturally prefer arrangements that prevent spillovers.

Indeed, Zukowska-Gagelmann (2000) finds negative spillovers for Poland while Jarolim and Zemplinerova (2001) confirm the same for the Czech Republic. Controlling for technological capability, Konings (2001) finds for Eastern European transition economies that the market stealing effect dominates at the initial stages of transition, which implies a negative spillover effect. Specifically, Konings (2001) finds no spillovers for Poland and negative spillovers for Romania and Bulgaria. On the other hand Barrell and Holland (2000)

[1] A large body of empirical studies analysing Indian and Indonesian data may be found in Lipsey and Sjöholm (2004).

analyse the effects of FDI in 11 manufacturing sectors within Hungary, Poland and the Czech Republic and find contrasting evidence that FDI has increased labour productivity levels in most manufacturing sectors. In more recent studies, Sabirianova, Svejnar and Terrell (2005) as well as Gorodnichenko et al. (2007) find that some spillovers exist, but the response of the local firms is indeed heterogenous in most of the transition countries[2]. Kolasa (2005) finds strongly positive productivity effects for Polish manufacturing firms, Hagemejer and Kolasa (2008) argue the same for the whole economy, while Bijsterbosch and Kolasa (2009) find that the impact of FDI on productivity in CEECs depends crucially on the absorptive capacity of the recipient countries and industries, which is clearly heterogenous across firms.

To sum up, there seem to be three main strands of the literature approaching the effects of FDI entry on hosting environment. First, the emergence of positive spillovers depends crucially on the response of inherently heterogenous firms. In some cases, especially in transition economies, privatisation as such is perceived to be an important discriminating factor. On the other hand, most of these studies justified finding the effect only in a cross-sectional setting by the contention that, so to say, spillovers take time. Consequently, they may emerge only with a delay to the initial entry event. Finally, there is a growing recognition for the self-selection consequences for the quality of the estimates, but still only few studies actually control for this factor.

We attempt to combine these research guidelines in a coherent framework. This paper resorts to non-parametric techniques - propensity score matching - not only to control for the potential self-selection effects, but also to provide reliable estimates of their size. Secondly, although we do not address the problem of spillovers directly, we compare the performance of foreign and local firms across time. Should we find decreasing disparities, especially controlling for the self-selection bias, empirical support for existence of spillovers would be provided. Finally, we address the privatisation issue explicitly. We analyse the effect of foreign ownership on enterprises that were at a any point in time state-owned and were privatised to a foreign investor. We compare their performance to the reference group of companies that were privatised either to a local investor or not privatised at all. If anywhere - benefits of FDI should be strongest visible in this context.

3 Data and empirical strategy

Typically in this strand of literature, survey based data sets are employed[3], which happens both for the sake of cross-country comparison as due to the fact that usually other data sets are not available. The data set used in this study comes from financial reports and balance sheets of all enterprises employing 49 employees or more and covers the period of 1998-2006 and was collected on the annual basis. These forms are gathered consistently by the Polish Central Statistical Office as of 1993, but the methodological changes prevent extending the analysed period beyond 1998. The total number of observations (in raw data) exceeds 200 000. To the best of our knowledge, this is the first time these non-survey data are used for this type of analysis (however, they have been extensively used in other firm-level studies including those of Kolasa and Hagemejer, 2008).

3.1 Data description

The firms covered by our sample constitute a significant part of the economy: they employ roughly 29% of the total working population of the national economy and 42% of all persons employed on a contract basis. The choice of the sampling period is determined by the data availability.

[2]Gorodnichenko et al. (2007) provide also an extensive overview of the empirical findings concerning the horizontal and vertical spillovers across countries.

[3]Konings (2001), Schoors and Van Der Tol (2002), Sabirianova Peter et al. (2004), Sabirianova et al. (2005), like the majority of other studies, use Amadeus data set, Gorodnichenko et al. (2007) use Business Environment and Enterprise Performance Survey, while Bartelsman et al. (2008) uses ICOP database.

The database comprises all enterprises from the manufacturing sector (sections C, D and E) and from market services (sections G, H, I and K), employing at least 50 persons, full-time equivalent. Apart from the financial information, the data set allows to determine the form of ownership. In particular, the data set shows whether a firms is state owned, private or has a share of foreign ownership (alternatively, it may be completely owned by a foreign entity, which is also coded in the data set). Unfortunately, it is not possible to determine the share of foreign ownership (forms are categorised but detailed ownership data are not reported). We define a firm as foreign affiliate if majority of equity is owned by non-residents. Moreover, the data set contains the information about the total employment in every firm.

3.2 Variables definition

The original data set contains standardised balance sheets and profit statements, which implies we have at disposal - among others - revenues and revenues from exports, raw materials costs, energy costs, assets, own capital, investment levels. In addition, we have variables denoting end-of-year employment and the form of ownership.

Using the categorical variables describing the form of ownership, we are able to identify cases of firms where foreign direct investment is present. We are also able to specify state ownership - either as "state-owned" or the so called "sole shareholder company of the State Treasury" (a usual transitory form of ownership post-commercialization and pre-privatization of many SOEs). Furthermore, observing the entreprises across time we are able to observe changes of the ownership form. For the purpose of this analysis we consider firm privatised whenever the ownership type changes from to these two forms of ownership to any private one. Intersecting these two dimensions (companies with foreign owner at each point in time with companies "ever" state owned) we are able to diagnose the privatisation to a foreign investor.

We have also decided to define additional variable measuring the efficiency of particular enterprise. With the use of the stochastic frontier in a panel version we have estimated time dependent technical efficiency scores for each of the companies in the sample. Revenues were the output variable, while employment, energy, raw materials constituted inputs. Estimations were performed controlling for industry (frontier estimated separately for sections) using time-varying decay model, the Battese and Coelli (1995) parameterization of time-effects. The assumption of constant returns to scale was strongly rejected for each industry and each year.

3.3 Data properties

The initial sample contained over 200 000 observations for over 40 000 enterprises present in the panel for - on average - 4.8 years. Unfortunately, this data set is not flawless and contains some erroneous observations (*eg.* negative values of revenues, material costs or employment), which had to be eliminated. Subsequently, we have inspected each of the key variables to observe if the data set contained outliers. Since profits (expressed both in relation to the assets and to overall employment) exhibited few considerable outliers, we have cut 0.5% from both tails of the distributions. The resulting data set contains 188 691 observations for 40 152 enterprises over 4.7 years on average. All computations (including the technical efficiency estimation) were conducted on a reduced data set. Data properties are presented in Table 1.

Visibly, foreign owned enterprises have on average lower employment, higher revenues, capital, exports share as well as share of exporters. On the other hand, former state-owned enterprises still exhibit employment overhang and high dependence on energy. Although due to the large size of the sample most of these averages could be proven to be in a statistically significant way different one from another - standard errors of these averages are considerable, pointing to large heterogeneity of the firms in the sample. Detailed characteristics taking into account the industrial composition of the sample are provided in the Data Appendix.

Table 1: Data properties

Variable	Full Sample	Foreign owned firms	Privatised firms
Revenues	53 121.68	145 273.6	174 726.6
	(344 804.5)	(468 378.6)	(1 171 342)
Energy costs	1 231.14	1 898.97	4 598.81
	(9 719.079)	(11 210.05)	(25 393.46)
Raw materials	16 380.69	45 064.28	22 613.24
	(140 037.1)	(252 065.5)	(232 392.8)
Employment	197.72	304.10	451.47
	(1 282.76)	(796.83)	(1 477.35)
Assets/Employment	194.04	330.90	267.07
	(1 102.35)	(1 337.53)	(1 127.48)
Own capital	22 516.04	44 031.44	82 610.53
	(204 890.7)	(235 929.9)	(619 074.7)
% of Exporting SOE	.0926	.0426	.7232
	(.29)	(.20)	(.45)
Technical efficiency	.2003	.2075	.0736
	(.29)	(.30)	(.16)
% of Exporters	.4486	.7996	.7232
	(.49)	(.40)	(.44)
% of Formerly SOE	.2034	.0567	
	(.40)	(.23)	
Share of exports in revenues	.1105	.3362	.1651
	(.29)	(.37)	(.22)
% of foreign owned	.1092		.1753
	(.31)		(.38)
% of privatised	.0339	.0545	
	(.18)	(.23)	
Observations	188 691	20 606	6 406

Note: SOE denotes state-owned enterprises. All monetary values expressed in current Polish zloty. Own calculations based on F-01 data sets. Standard deviations in the parentheses.

3.4 Empirical strategy

Propensity score matching is a relatively new technique. It is typically applied to estimate causal treatment effects (*eg.* the effectiveness of labour market policies, pharmaceutical research or profitability of particular marketing solutions or the effect of institutions on economic development). Caliendo and Kopeinig (2008) discuss in detail the recent development in the area, as well as guide through the process of adequate construct of this approach. The critical element in propensity score matching lies in the conditional independence assumption. In other words, for the reliability of the results it is important that the selection is solely based on observed characteristics and that all variables that influence belonging to the shadow economy and potential earnings are simultaneously observed. In practice it implies that there should be no other sources of systematic (i) selection and (ii) outcome.

With propensity score matching, the quality of estimation depends much on the data availability. In the case of this study, the pool for matching (the size of the control sample in the relation to the size of the analysed sample) is relatively large, so there is no need for sampling with replacement. We apply kernel estimates of propensity scores with the nearest neighbour matching, following Heckman, Ichimura, Smith and Todd (1998). Alternatively, we could have used the oversampling technique. However, the choice of the oversampling magnitude is always arbitrary, while tenfold oversampling (as feasible in our sample) should not differ from the kernel approach in terms of statistical quality.

Although the set of variables is limited in this study, we believe relying on the cost structure as well as revenues, size of own capital, size of employment and individual characteristics (industry dummy interacted with the above variables) may be sufficient for the stability of propensity score matching approach and conformity with the conditional independence assumption. We verify this approach empirically by the use of t-tests, as suggested by Rosenbaum and Rubin (1983).

In particular, we perform a matching procedure based on the following variables: size (measured by

assets), employment, costs structure (measured by the costs of energy and raw materials), capital intensity (measured by own capital) and industry. In principle, for all continuous variables, decimal group categorical variables have been generated. Subsequently, all of the above listed variables were interacted for the purposes of higher efficiency in the matching procedure. After completing the matching procedure we estimate two first moments for the control group the treated group and the matched untreated group with respect to the following variables: (i) profits over assets, profits over employment, investment over assets, investment over employment, share of exports in revenues as well as technical efficiency parameter. These moments are estimated separately for each year. Finally, we decompose the initial differentials into self-selection and treatment components by comparing the moments for the matched untreated and treated to the size of the gap between the unmatched untreated and treated.

4 Results

We define several structural indicators that help us characterise the performance, foreign market orientation and capital intensity of firms under consideration. We define the $Profits/Assets$, $Profits/Employment$ and $Technical\ Eficiency$ variables. While the two former variables are self-explanatory (we use the net profits as indicated by the profit-loss accounts and assets as indicated by the balance sheet together with the average yearly employment), the technical efficiency variable is obtained through the estimation of the the stochastic frontier. The other variables are related to investment intensity ($Investment/Assets$ and $Investment/Employment$) and the outward orientation ($Exports/Revenues$). It has to be noted however, that export revenues cover only direct exports (and not exports through other local firms), which may underestimate export value. The variables under consideration are summarized in the Table 4.

Table 2: Performance indicators

Variable	Full Sample	Foreign-owned firms	Privatised firms
Technical Efficiency	.1358	.1526	.0464
	(.2597)	(.2694)	(.1122)
Assets/Employment	214.1212	359.7071	282.0088
	(1108.703)	(1374.605)	(1175.66)
Inwestment/Employment	13.5333	28.182	17.5266
	(79.3861)	(138.7417)	(81.8772)
Investment/Assets	.0795	.0909	.0673
	(.2521)	(.1137)	(.08)
Profits/Employment	10.1211	24.958	11.1696
	(145.1214)	(186.2487)	(105.3916)
Profits/Assets	.0513	.0589	.007
	(.1734)	(.1435)	(.1244)
Export/Revenues	.1211	.3432	.1669
	(.3481)	(.3662)	(.2291)
Observations	125958	15546	5356

Note: Own calculations based on F-01 data sets. Standard deviations in the parentheses.

The matching procedure was run twice with respect to two different analyses of treatment. The first approaches directly the effect of foreign ownership, with treatment defined by the presence of foreign ownership, while the reference group consists of all companies without foreign ownership in each year[4]. In the latter, we focus on the effect of privatisation through FDI. In this case too treatment follows from the presence of foreign owner, but the reference group consists of companies that were ever state owned, but in a particular year have no foreign ownership. This comprises both previously privatised but without foreign

[4]Consequently, the same foreign owned company may be matched to two different "statistical twins" in two separate years. However, with the sample size, oversampling is so strong that this potential drawback of the procedure should have no impact on the results.

investor and not yet privatised enterprises[5]. Consequently two analyses differ both in the nature of the treatment and in the control group composition.

Propensity score matching procedure requires testing the balancing of the matching procedure. Due to the method of matching chosen and the multiplicity of variables, it would not be possible to report the direct balancing properties[6]. However, one may compute the percentage of the bias reduction thanks to matching. In Table 3 we report the bias reduction and the number of treated units with respect to each analyse for each year in the sample.

Table 3: Bias reduction due to matching

	1999	2000	2001	2002	2003	2004	2005	2006
	Foreign ownership							
Average % of bias reduction	96.6%	95.4%	97.2%	97.6%	98.5%	97.3%	98.3%	98.4%
Smallest % of bias reduction[a]	88.9%	86.9%	63.8%	63.1%	88.1%	5.5%	54.6%	14.6%
No of treated units	929	1 004	1 167	1 192	1 220	1 378	1 504	1 582
No of all units	10 609	10 389	10 076	9 700	9 476	9 561	9 766	10 093
	Privatisation through FDI							
Average % of bias reduction	94.8%	95.2%	94.7%	95.4%	95.8%	98.1%	98.3%	96.5%
Smallest % of bias reduction[a]	42.3%	74.1%	54.9%	41.4%	74.3%	89.1%	97.1%	80.3%
No of treated units	67	77	102	119	130	143	149	146
No of all units	2 365	2 126	1 924	2 188	2 056	1 984	1 905	1 835

[a] - reduction w.r. to the least balanced dimension. *Note:* Own calculations based on F-01 data sets. Unweighed averaging applied to compute the average % reduction in the selection bias.

For the graphical representation of the results[7] we used the following output. First, for each of the analysis, we have separate treated group, the control group and the reference group, as presented in Table 4. For the purpose of analysis six major measures of performance were chosen, as presented in Table 4. By computing the moments for each of the groups and each of the "output" variables we were able to define (i) the levels for unmatched untreated as opposed to the levels of treated at each point in time and (ii) decompose the differential to disentangle the effect of selfselection and the effect of treatment. This was obtained through computing the following ratios:

$$\begin{aligned} Outcome_{Treated} - Outcome_{Unmatched} &= (Outcome_{Treated} - Outcome_{Matched}) \\ &+ (Outcome_{Matched} - Outcome_{Unmatched}) \\ &= Treatment + Selection \end{aligned} \quad (1)$$

We call the former term in the brackets the "treatment" and the later "self-selection". Since the size of differentials differ across variables and across time, at each point in time we have scaled it by the combined effect of "self-selection" and "treatment" (i.e. $Outcome_{Treated} - Outcome_{Unmatched}$). Naturally, these differentials do not need to be positive - negative contributions signify that either "treatment" or "self-selection" were detrimental to the performance.

We present the results for the FDI entry and for the privatisation through FDI separately. We have analysed the differences in the evolution across time of (i) profits, (ii) investment, (iii) productivity and (iv) the propensity to export comparing firms with foreign ownership and those who are locally owned. Figure 1 presents the results for the effect of foreign ownership (results underlying these graphs is reported in the Data Appendix).

Inspecting the performance in terms of profits, one may observe that the superior results of foreign owned enterprises fade out in time (the solid line approaches the dashed line), unlike in the case of the UK enterprises analysed in - among others - Greenaway et al. (2004). However, taking into account

[5]Please note that here a potential problem emerges, namely that after privatisation to a local investor, a then private company may be eventually acquired by a foreign investor. Unfortunately, we are unable to control for this path of privatisation.

[6]Detailed logs are available from authors upon request.

[7]Detailed statistics available upon request.

Table 4: Control and reference groups composition

	Analysis	
Group composition	FDI	Privatisation through FDI
Treated group	All foreign owned companies in a particular year	All formerly state owned companies privatised to a foreign investor in a given year
Reference group (unmatched untreated)	All local enterprises in a particular year	All formerly and/or still state owned enterprises
Control group (matched untreated)	Statistical twins from the local enterprises pool matched to the foreign owned companies	Statistical twins from the "state ever" enterprises pool matched to the companies privatised to the foreign investors

the contributions, the effect of foreign ownership on profit-to-assets ratio actually seems to be negative throughout almost the entire period. Per employer profitability on the other hand shows no evidence of convergence between foreign and local entreprises. Neither does there seem to exist a clear division as to which of the contributions is augmenting and which is detrimental to the overperformance of foreign owned enterprises. In five out of eight years the foreign ownership seems to negatively affect the differential, while all of it may be attributed to the selfselection. Detrimental contribution may be justified by corporate strategies (extracting profits by the mother companies), but lack of convergence suggests that indeed there is little support for the hypothesis of positive spillovers, as previously argued by Zukowska-Gagelmann (2000).

Similarly to profits, also investments only exhibit convergence when benchmarked to company size. When expressed in a per employer basis, there is clear edge foreign companies enjoy over their local counterparts. Decomposition analysis suggests that foreign enterprises are definitely less constrained in access to finance, a large impact of treatment ranging between 60% and 90%. On the other hand, comparing investment intensity, foreign enterprises are still privileged, but majority of the differential is attributable to self-selection. Namely, identical companies without foreing ownership invest at approximately 70% of the foreigners levels, in one year even overperforming them. Larger access to capital accounts for roughly 30% of the observed differential. This suggests that local enterprises are actually relatively successful in obtaining and mobilising resources.

Finally, export share exhibits lack of convergence, while there seems to be a clear divergence pattern in technical efficiency evolutions. For the former, both components have positive contributions, while foreign ownership believed to be a crucial mean for accessing the global trading networks creates as little as roughly 20% of the observed differential. The rest of the discrepancy should be attributed to the internal potential of the analysed firms. Importantly, we do not analyse the *propensity* to export, but actual export shares in revenues, which reflects more the presence in the global trading network than access to them. For technical efficiency, the effect of foreign ownership is responsible for roughly less than 50% of the overperformance. This implies that domestically-owned matched enterprises fall short only half of the observed macro-level differential.

Summarising, we find that there is some effect of foreign ownership, but in some cases it is actually fading out over time, with local companies eventually reaching the levels achieved by foreign subsidiaries in terms of ROA and investment-to-assets ratios. However, despite relatively long period of time, FDIs still outperform local enterprises in terms of efficiency (the gap seems to be widening) and ability to export (here the gap is fairly constant across time), but the majority of the effect is attributable to self-selection.

We also used the same procedure to inquire, whether FDI had a beneficial effect in the context of privatisation. Namely, we narrowed our sample to enterprises that were state owned at any point in time and once again estimated the effect of foreign ownership. The results suggests that while there is a clear distinction in performance between firms privatized through FDI and all remaining firms, a large part of it is related to the fact that FDI is directed to firms that have, on average, better characterstics while there

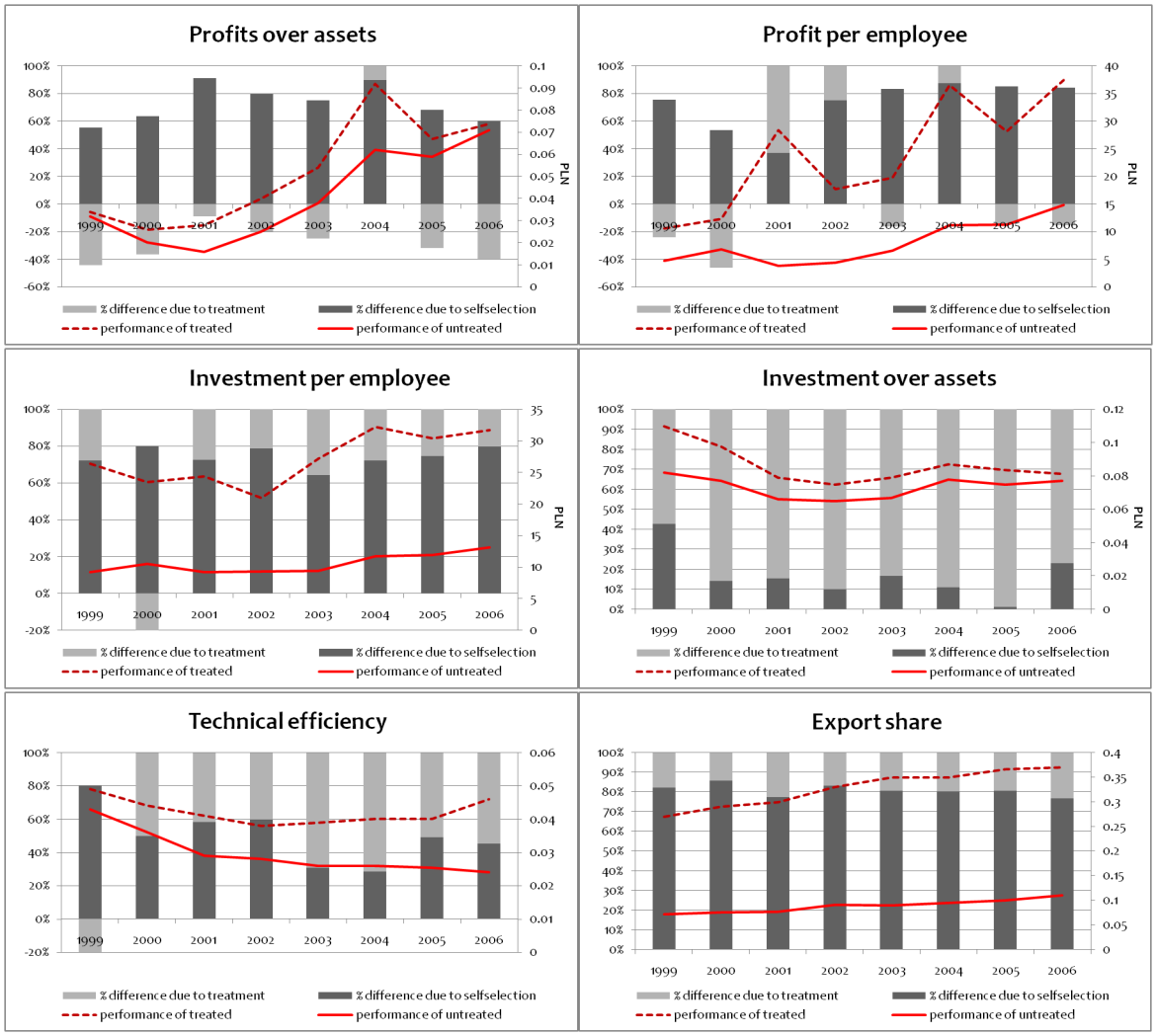

Figure 1: The effect of FDI on firm performance

is only limited evidence that it actually affects performance.

As far as probability of privatized firms is concerned, at the beginning of the time period under consideration, there is no visible difference between the performance of privatized *versus* non-privatized firms measured by the profits to assets ratio. The difference seems to appear later on. However, while at the beginning of the period a large part of the performance premium of FDI-privatised firms can be attributed to privatization, the self selection seems to be more important towards the later years. Similar pattern emerges in the case of profits per employee.

Firms privatized through FDI tend to invest more per employee than other firms, however where investment is related to assets, there is no significant difference (this may be attributed to the fact that those firms tend to be more capital intensive). Decomposing the differences to those attributed to treatment and self-selection, we see that the investment per employee premium can be attributed to privatization through FDI only early in the sample . Towards its end, the selection effect takes over, leading to the conclusion that foreign investors prefer firms where investment intensity is high (or relative employment is low).

The difference in technical efficiency between the FDI-privatised and remaining firms is increasing over time but only a small part or none of the effect can be attributed to treatment - in fact, in some periods the effect turned out to be negative. As far as the export share is concerned, entreprises privatized with

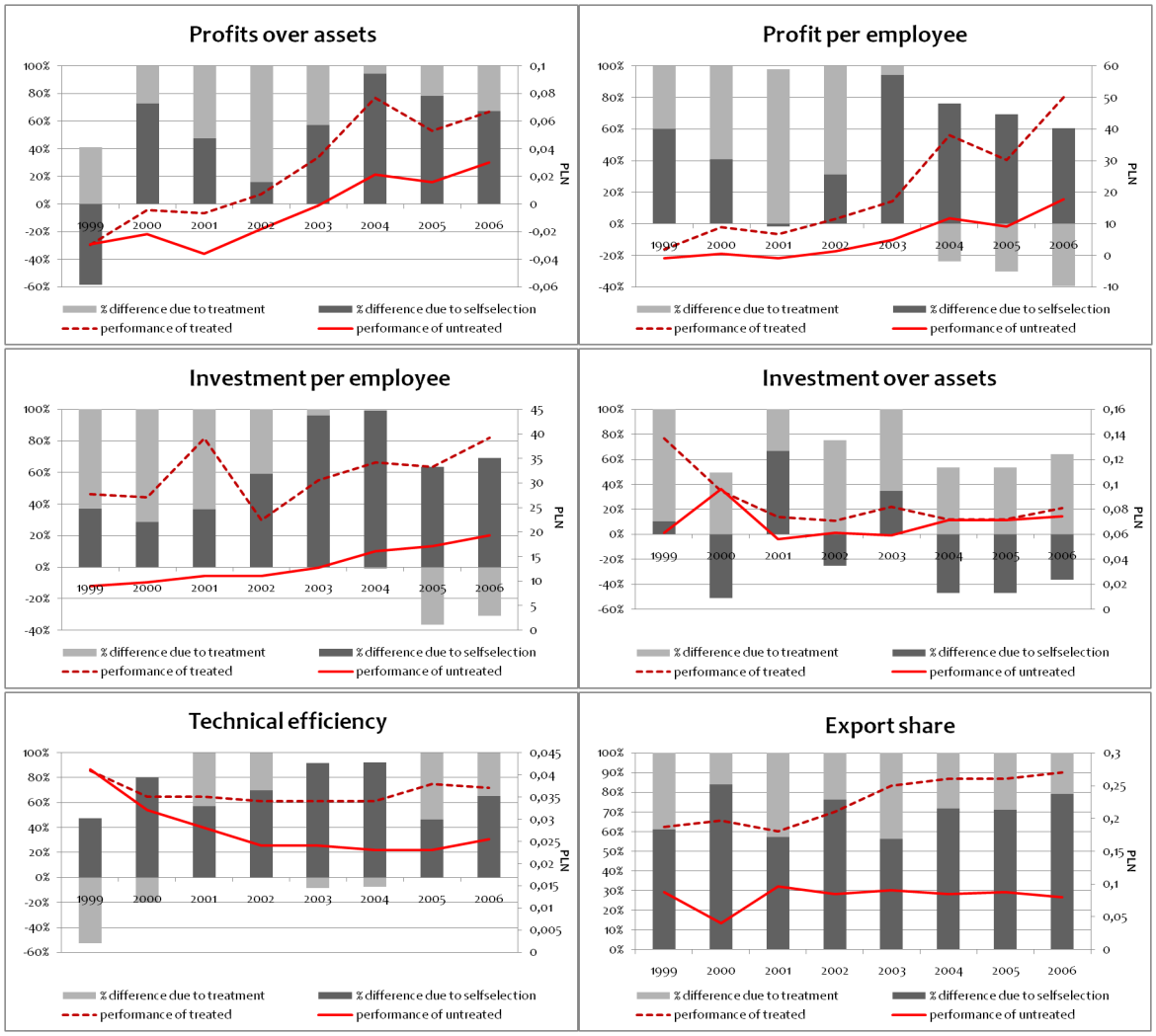

Figure 2: The effect of privatisation through a foreign investor on firm performance

involvement of foreign firms have a clear advantage over remaining firms. However, at least 60% of that effect can be attributed to selection by foreign investors. In other words, FDI chooses firms that are export-oriented but also causes the export-intensity to increase even further.

Summing up, in case of most indicators, there is relatively little evidence for the "catching up" hypothesis. These results are fairly consistent with the findings concerning developed countries, (Girma 2005), (Girma, Görg and Pisu 2008), while the literature typically found that in the context of transition the effect of foreign ownership is unequivocally positive, (Konings 2001). Taking into account the nature of FDI flowing into CEECs, higher propensity to export results from the business model of entering Eastern Europe (benefiting from lower labour costs and special economic zones as well as proximity to EU markets). In these sense these are rather firm "fixed effects" (corporate links) and not actually competitive edge in the global markets. Consequently, relatively low gap in exports share between matched local companies and foreign owned suggests the large success of Polish local enterprises in the global markets.

5 Conclusions

Does FDI foster economic growth? If it's "additional" investment (no or minimal crowding out) then in the short term it is a positive stimulus, but for a long term effect TFP schedule would need to be shifted outwards due to the FDI presence. In evaluating the effect of FDI on the performance in the hosting country a necessary precondition is to control for the self-selection of FDI into sectors of economy and firms within sector. Empirical study needs to be equipped to disentangle the fact that FDI may actually be coming to companies with already higher TFP, as a weak acquisition may constitute a viable business strategy only under rare circumstances. Therefore, one needs to resort to firm-level data and preferably control for the potential selection bias.

The firm-level studies in this field have split into a number of strands including (i) entry determinants, (ii) interactions between the FDI entry and the performance of local companies (the so-called "horizontal" and "vertical" spillovers) and (iii) form of ownership determinants as well as consequences. The performance of foreign owned firms, especially in transition economies, is usually believed to be higher than that of the local ones due to the technological spillovers and know-how transfer. In practice, this is equivalent to an implicit assumption about a considerable value added *via* the means of foreign ownership.

In this paper we revisited the effect of FDI on firm-level performance in a hosting economy using data over 1998-2006 for Polish medium and large enterprises. We encompass all these three threads albeit in a way somewhat separate from what has been accepted in the literature. We applied propensity score matching to provide basis for decomposing the performance differentials into the part attributable to the self-selection of companies with foreign ownership and a part attributable to the ownership itself. Previous studies found superior performance despite self-selection using Heckman (1979) approach, while this study allows to actually measure the role of these two effects both across time and controlling for considerable heterogeneity across firms.

Findings suggest that indeed foreign firms and previously state-owned firms differ from all remaining firms. They have higher profits, invest more, are more efficient and more export-oriented. Moreover, our results show that in many cases, there is divergence between the firms with inward FDI and other firms. However, when we decompose the FDI performance premia into effects of treatment (changes in performance induced by FDI or privatization through FDI) from selection (FDI entering firms "special" with respect to the rest), the positive impact is no longer that evident. As far as the export and technical efficiency is concerned, self-selection seems to be a very strong factor - more efficient firms and firms with established export markets attract FDI more easily than others. Notwithstanding, foreign owned firms enjoy easier access to financing, which may affect their competitiveness in a longer term horizon, beyond the time period covered in this study. Finally, relatively lower profitability may probably be attributed to tax avoidance and corporate taxing strategies, for which anecdotic evidence has been pronounced over the past years.

Our results give an important insight into the effect of foreign direct investment in countries in transition and show that previous estimates tend to underplay the importance of selection. Further analyses are required to test the robustness of these results and their applicability to other countries.

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Data appendix

Table 5: Firms with foreign capital as a share of the total number of firms

Sector/year	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Construction	2,17	2,28	2,27	2,63	2,89	2,91	3,46	3,63	4,48	4,47
Education	6,45	4,00	6,25	9,09	10,34	7,41	13,04	20,00	13,04	12,50
Health and social work	1,40	0,89	3,57	3,19	2,74	3,55	3,05	4,33	6,19	5,96
Hotels and restaurants	15,33	13,90	12,14	13,07	13,41	12,58	10,98	13,48	15,14	12,89
Manufacturing	12,93	13,51	14,62	15,67	17,31	17,95	18,98	19,78	20,69	21,10
Mining	6,85	7,64	8,05	9,59	9,79	8,82	10,57	12,07	11,11	12,17
Real estate and business	4,49	5,71	7,12	7,69	9,38	9,00	10,59	10,39	12,05	13,97
Trade and repairs	5,25	6,23	8,40	10,19	10,93	11,68	12,59	13,33	13,79	14,16
Transport and storage	6,92	7,69	7,41	7,97	9,36	9,86	10,87	13,22	12,70	12,27
Elecricity, gas etc,	0,46	0,42	0,70	0,70	2,12	3,07	4,29	4,86	5,56	5,56

Note: Own calculations based on F-01 data sets.

Table 6: Firms with foreing capital as a share of total sectoral revenue

Sector/year	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Construction	3,56	4,06	6,82	9,66	12,65	16,59	23,16	22,06	25,24	24,85
Education	24,14	14,26	10,40	14,13	23,16	14,20	19,33	22,77	14,76	12,82
Health and social work	0,72	0,68	3,16	3,05	3,63	11,60	11,52	16,75	22,24	22,96
Hotels and restaurants	20,09	23,56	27,35	32,94	38,61	40,05	40,55	39,02	39,06	35,39
Manufacturing	26,40	30,40	32,53	34,52	37,65	41,45	44,00	48,80	47,84	48,78
Mining	0,47	0,75	0,88	1,52	1,36	1,50	1,75	1,65	1,32	1,16
Real estate and business	17,21	19,28	25,01	19,76	25,18	23,04	23,32	23,50	23,80	26,21
Trade and repairs	19,18	23,54	31,23	31,84	33,78	37,39	41,84	42,93	41,11	41,80
Transport and storage	4,56	4,80	4,38	4,52	5,79	5,75	7,61	9,80	25,72	23,68
Elecricity, gas etc,	0,14	0,62	0,85	0,79	3,62	5,24	7,90	12,06	10,95	11,69

Note: Own calculations based on F-01 data sets.

Table 7: Formerly state-owned firms privatized through FDI (percentage of the number of foreign owned firms)

Sector/year	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Construction	1,23	2,17	4,00	3,51	10,71	8,16	9,62	6,25	5,08	3,28
Education	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Health and social work	0,00	0,00	0,00	0,00	0,00	16,67	16,67	11,11	7,14	7,14
Hotels and restaurants	2,38	2,17	4,76	8,70	13,64	15,00	15,79	12,50	10,71	8,00
Manufacturing	3,33	6,01	5,70	6,13	7,28	7,94	7,69	8,21	7,53	7,56
Mining	10,00	18,18	25,00	21,43	35,71	41,67	38,46	35,71	23,08	21,43
Real estate and business	0,00	0,00	0,00	0,00	0,78	0,82	1,33	1,36	0,57	0,48
Trade and repairs	0,00	0,00	0,41	0,32	0,98	0,97	0,91	0,56	0,53	0,50
Transport and storage	0,00	0,00	0,00	0,00	2,99	2,94	2,53	3,03	3,09	3,16
Elecricity, gas etc,	0,00	33,33	25,00	25,00	41,67	70,59	70,83	77,78	79,31	82,76

Note: Own calculations based on F-01 data sets.

Table 8: Formerly state-owned firms privatized through FDI (percentage of revenues of all foreign owned firms)

Sector/year	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Construction	4,52	6,55	3,49	1,31	16,96	3,93	2,56	2,98	4,24	4,10
Education	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Health and social work	0,00	0,00	0,00	0,00	0,00	16,80	12,88	9,37	5,23	4,43
Hotels and restaurants	7,54	5,73	5,15	4,78	16,36	15,65	13,80	12,72	12,67	4,92
Manufacturing	12,06	18,66	15,76	14,66	17,26	16,70	16,05	21,18	19,15	18,20
Mining	22,58	37,78	49,44	29,31	69,48	75,30	74,95	67,74	48,25	45,85
Real estate and business	0,00	0,00	0,00	0,00	1,81	2,51	2,98	2,03	1,28	1,12
Trade and repairs	0,00	0,00	0,06	0,04	0,16	0,38	0,31	0,11	0,13	0,18
Transport and storage	0,00	0,00	0,00	0,00	0,42	8,12	6,76	5,49	59,06	54,51
Electricity, gas etc,	0,00	77,92	73,79	66,92	89,49	93,43	91,51	92,01	95,57	93,95

Note: Own calculations based on F-01 data sets.

Table 9: The effect of FDI on firm performance

		Profits per employee			Profits over assets			Investment per employee			Investment over assets			Export share			Technical efficiency		
		U	ATT	ATU	U	ATT	ATU	U	ATT	ATU	U	ATT	ATU		ATT	ATU		ATT	ATU
	Treated	37.32	37.43	13.34	0.074	0.075	0.073	31.67	31.65	13.60	0.0813	0.0814	0.077	0.37	0.77	0.11	0.046	0.046	0.030
2006	Controls	14.83	42.53	15.11	0.071	0.080	0.058	13.15	27.89	18.23	0.077	0.078	0.095	0.11	0.31	0.12	0.024	0.034	0.050
		***	0	0	0	0	0	***	0	***	0	0	0	***	***	0	***	***	0
	Treated	28.24	28.16	11.35	0.067	0.067	0.060	30.37	30.32	12.06	0.0837	0.0839	0.0748	0.366	0.365	0.102	0.040	0.040	0.0255
2005	Controls	11.22	31.64	10.31	0.059	0.074	0.050	11.93	25.65	14.12	0.0747	0.0748	0.0768	0.10	0.315	0.115	0.0254	0.326	0.0394
		***	0	0	***	0	0	***	0	***	***	***	0	***	***	0	***	***	0
2004	Treated	36.44	36.51	11.52	0.092	0.092	0.063	32.14	32.075	12.06	0.087	0.087	0.077	0.35	0.035	0.099	0.04	0.04	0.026
2004	Controls	11.10	33.38	14.54	0.062	0.089	0.056	11.71	26.43	14.75	0.078	0.079	0.086	0.095	0.30	0.12	0.026	0.030	0.045
		***	0	***	***	0	0	***	0	0	***	***	0	***	0	0	***	0	0
	Treated	19.71	19.80	6.92	0.054	0.054	0.039	27.12	26.99	9.83	0.079	0.079	0.066	0.35	0.35	0.096	0.039	0.039	0.026
2003	Controls	6.52	23.07	4.89	0.038	0.062	0.023	9.40	20.81	15.69	0.067	0.069	0.079	0.090	0.30	0.12	0.026	0.030	0.041
		***	0	0	***	0	0	***	0	***	***	***	0	***	***	0	***	***	0
	Treated	17.66	17.69	4.88	0.040	0.040	0.029	20.99	20.78	10.09	0.075	0.075	0.064	0.33	0.33	0.090	0.038	0.038	0.028
2002	Controls	4.33	14.38	4.46	0.025	0.045	0.0045	9.31	18.52	10.99	0.065	0.066	0.074	0.091	0.29	0.11	0.028	0.034	0.037
		***	0	0	***	0	0	***	0	0	***	***	0	***	***	0	***	0	0
	Treated	28.20	28.40	3.98	0.028	0.028	0.018	24.42	24.18	9.45	0.079	0.079	0.065	0.30	0.30	0.08	0.041	0.042	0.029
2001	Controls	3.76	12.86	5.67	0.0158	0.0293	0.010	9.17	20.22	10.18	0.066	0.068	0.064	0.077	0.25	0.092	0.029	0.036	0.048
		***	***	0	***	0	0	***	0	***	***	0	0	***	0	0	***	0	0
	Treated	12.14	12.36	6.76	0.026	0.026	0.020	23.49	23.46	10.57	0.098	0.098	0.076	0.29	0.29	0.076	0.044	0.044	0.036
2000	Controls	6.73	47.75	4.68	0.020	0.034	0.015	10.54	27.76	12.04	0.077	0.080	0.101	0.076	0.26	0.10	0.036	0.040	0.050
		0	***	***	0	0	0	***	0	***	***	***	0	***	***	0	***	0	0
	Treated	10.39	10.62	4.88	0.034	0.035	0.033	26.36	26.16	9.48	0.11	0.11	0.08	0.27	0.27	0.075	0.049	0.049	0.043
1999	Controls	4.68	13.44	6.69	0.032	0.042	0.045	9.20	21.61	12.41	0.082	0.094	0.12	0.072	0.235	0.101	0.043	0.051	0.052
		***	0	0	0	0	0	***	***	***	***	***	0	***	***	0	***	0	0

Note: Own calculations based on F-01 data sets. U denotes unmatched, ATT denotes average treatment on the treated, ATU denotes average treatment on the untreated. Treated are all companies with foreign ownership in a particular year. Controls are all companies withough foreign ownership in a particular year. *** denotes statistically significant difference between the averages for the treated and the control group, 5% p-value threshold was applied.

Table 10: The effect of privatisation through a foreign investor on firm performance

		Profits per employee			Profits over assets			Investment per employee			Investment over assets			Export share			Technical efficiency		
		U	ATT	ATU	U	ATT	ATU	U	ATT	ATU	U	ATT	ATU	U	ATT	ATU	U	ATT	ATU
	Treated	50.18	50.91	32.70	0.067	0.069	0.045	39.24	39.48	26.78	0.081	0.081	0.064	0.27	0.27	0.16	0.037	0.037	0.028
2006	Controls	17.81	111.90	20.56	0.030	0.055	0.051	19.37	55.03	28.73	0.074	0.065	0.11	0.08	0.23	0.16	0.0254	0.033	0.036
		0	0	***	***	0	0	***	0	***	0	0	***	***	0	0	***	0	0
	Treated	30.29	30.14	13.34	0.053	0.053	0.027	33.25	39.48	26.78	0.072	0.073	0.066	0.26	0.26	0.12	0.038	0.038	0.023
2005	Controls	9.13	46.78	10.49	0.016	0.045	0.040	17.10	55.03	28.73	0.071	0.064	0.072	0.087	0.21	0.14	0.023	0.030	0.027
		***	***	***	***	0	0	***	0	***	0	0	0	***	0	0	***	0	0
	Treated	38.16	38.00	17.17	0.077	0.077	0.033	34.24	34.41	20.18	0.072	0.073	0.066	0.26	0.25	0.12	0.034	0.034	0.022
2004	Controls	11.86	50.21	13.91	0.0212	0.074	0.067	16.17	34.41	18.50	0.071	0.064	0.072	0.084	0.21	0.15	0.023	0.035	0.030
		***	***	***	***	0	0	***	0	0	***	***	0	***	0	0	***	0	0
	Treated	17.13	16.75	4.74	0.034	0.033	0.0051	30.54	30.69	14.92	0.082	0.083	0.055	0.25	0.25	0.11	0.034	0.034	0.024
2003	Controls	4.93	16.43	3.97	-0.001	0.019	-0.004	12.74	29.84	21.18	0.059	0.067	0.088	0.090	0.18	0.12	0.024	0.035	0.035
		***	0	0	***	0	0	***	0	***	***	***	0	***	***	0	***	0	0
	Treated	11.51	11.51	0.69	0.007	0.007	0.014	22.46	22.46	13.50	0.071	0.071	0.055	0.21	0.21	0.10	0.034	0.034	0.025
2002	Controls	1.32	4.51	3.32	-0.018	-0.014	-0.016	11.04	17.81	18.91	0.061	0.056	0.078	0.084	0.18	0.12	0.024	0.031	0.027
		***	***	***	***	0	0	***	0	***	0	0	0	***	0	0	***	0	0
	Treated	6.76	7.17	-1.16	-0.0067	-0.0067	-0.036	39.05	39.32	11.20	0.074	0.074	0.057	0.18	0.18	0.13	0.035	0.036	0.027
2001	Controls	-0.81	-0.96	-0.34	-0.036	-0.022	-0.036	11.07	21.26	13.63	0.056	0.068	0.065	0.096	0.144	0.144	0.028	0.032	0.036
		***	***	0	***	0	0	***	0	***	***	0	0	***	0	0	***	0	0
	Treated	9.02	9.26	0.39	-0.0043	-0.0040	-0.0223	27.10	26.61	9.85	0.095	0.094	0.057	0.196	0.191	0.10	0.035	0.036	0.032
2000	Controls	0.54	4.01	2.32	-0.022	-0.0091	-0.015	9.78	14.72	14.10	0.096	0.057	0.092	0.04	0.171	0.138	0.032	0.036	0.035
		***	0	***	0	0	0	***	0	***	***	***	0	***	0	0	0	0	0
	Treated	1.89	2.42	-1.18	-0.0296	-0.02898	-0.0316	27.74	28.16	9.52	0.137	0.1386	0.064	0.187	0.189	0.11	0.041	0.041	0.041
1999	Controls	-0.86	0.79	-1.92	-0.029	-0.031	-0.049	8.96	15.89	12.24	0.0611	0.069	0.115	0.087	0.148	0.237	0.0412	0.043	0.041
		0	0	0	0	0	0	***	***	***	***	***	0	***	0	0	0	0	0

Note: Own calculations based on F-01 data sets. U denotes unmatched, ATT denotes average treatment on treated, ATU denotes average treatment on untreated. Treated are all companies that changed a form of ownership from state to private foreign in a particular year. Controls are all companies that were state owned at any point in time, including the particular year. *** denotes statistically significant difference between the averages for the treated and the control group, 5% p-value threshold was applied.