THE EFFECT OF FOREIGN OWNERSHIP ON PRODUCTIVITY IN LITHUANIA

By
Deimante Morkunaite

Submitted to
Central European University
Department of Economics

In partial fulfillment of the requirements for the degree of Master of Arts

Supervisor**: Professor Álmos Telegdy**

Budapest, Hungary
2008

ABSTRACT

This paper analyzes the effect of foreign ownership on productivity using firm level data from Lithuania during 1995-2005. Data allows studying separately the effects of foreign acquisition and divestiture. Fixed effects specification confirms the existence of positive impact of foreign acquisition on productivity – a 13% increase is observed. Dynamics of productivity in post-acquisition period shows gradual improvement in performance. Foreign divestiture does not produce any effect on productivity. Foreigners sell companies when their productivity is similar to ever domestic companies' performance. The comparison between the estimates of Ordinary Least Squares and Fixed effects specifications provides evidence of considerable selection bias.

TABLE OF CONTENTS

1. INTRODUCTION

The quantitative evaluation of the impact of foreign direct investment (FDI) on the performance of domestic companies in the transition economies was restricted by the short time span of foreign presence in the countries and data availability problems. However, during the last decade, research became more feasible and some evidence of positive effects is coming from papers (e.g. Brown et al (2006) and Javorcik (2004)). They conclude that foreign participation in the market results in higher levels of productivity and also have a positive indirect impact on domestic companies through the knowledge spillovers. Such results should demonstrate the policymakers what advantages of FDI could be expected, and encourage local governments to put more effort in attracting FDI.

This paper documents the effect of foreign ownership on productivity, focusing on the econometric problems behind the estimation procedure, namely selection and simultaneity issues. I provide estimates of the overall average effect of foreign presence in the company on its performance, as well as estimated coefficients for foreign acquisition and divestiture separately. By this means, I intend to verify if foreign presence improves the performance of acquired companies. With respect to foreign divestitures, I hypothesize to observe slight improvement in productivity of divested companies before ownership change.

I use a panel of Lithuanian firms running from 1995 to 2005. It was collected particularly for this analysis, and thus was never used in previous research (unless for shorter time period). It gives an exceptional possibility to study the performance of

companies with foreign capital starting before the period of significant inflow of FDI into the Lithuanian economy began. To my knowledge, there is no previous research on this topic performed using Lithuanian micro-level data, and thus it is a first attempt to asses the impact of FDI on company-level performance and compare the results with similar research outcomes from other transition economies.

I estimate two-factor Cobb-Douglas production function allowing for industry-specific labor and capital elasticities. The estimated average effect of foreign acquisition is equal to 56% and 13% in accordingly Ordinary Least Squares (OLS) and Fixed Effects (FE) specifications. The estimated dynamics of foreign acquisition effects is showing gradual rise in the level of productivity. Further, according to OLS estimates, companies in the pre-divestiture period are on average 68% more productive than domestic firms, while FE design does not show any difference between the two groups. The comparison between OLS and FE coefficients shows that investors choose companies which are better than the rest, demonstrating the "cherry-picking" behavior.

The structure of the paper is as follows. In the next chapter I present a review of theoretical background explaining the existence of Multinational Enterprises, together with an empirical evidence of their presence on the performance of the domestic companies. I also summarize different methods researchers developed to deal with the two problems associated with empirical research on this topic – simultaneity and selection biases. Then, chapter 3 briefly describes the overall economic situation in Lithuania from the beginning of transition period to the present, keeping focus on the foreign involvement in the country. Chapter 4 describes the dataset used for the analysis.

Chapter 5 presents estimation strategy employed in the paper. Results and their interpretation are provided in chapter 6. Last chapter concludes.

2. OVERVIEW OF THEORETICAL AND EMPIRICAL RESEARCH

In this chapter I briefly present theoretical implications of change in the ownership on the performance of domestic countries, as well as empirical research conducted on this topic. Then, I introduce the major two problems encountered in the empirical work on production function estimation and foreign ownership effects, and present solutions proposed to solve these problems.

2.1 Evidence from Previous Research

A decision to own a company in a foreign country has several grounds in theoretical models explaining the existence of Multinational Enterprises (MNEs). A model by Helpman et al (2004) links the choice of a company to engage in foreign ownership to its level of productivity. From a pool of heterogeneous (with respect to productivity) companies, the less productive ones choose to serve the domestic market only, while the more productive companies enter the foreign market in the mode which again depends on their productivity. The possible modes of entering the foreign market are exporting or investing into foreign company. The two options involve different cost: exporting has smaller fixed costs, while FDI is associated with lower variable costs. Firms split between the modes according to their productivity: the more productive ones choose to invest in foreign companies, while the less productive firms export. The authors also provide empirical support for their model using data for U.S. companies. As a result, judging from their model's implications, foreign ownership can be anticipated to have a positive impact on the performance of the domestic company.

According to Caves (1990), successful firms are likely to possess intangible assets in the form of knowledge of technology, managerial abilities or marketing strategies. Companies could exploit these assets by selling or renting them. However, they cannot trade in these assets successfully due to the nature of the goods – the intangible assets – for several reasons. First, these assets are, at least in part, public goods and thus tend to be inefficiently priced. Second, transactions in intangibles are likely to suffer from opportunism and uncertainty because the outcome after implementing these assets in another firm cannot be completely anticipated. As a result, company cannot get the full price from the transaction in its intangibles, so it chooses to exploit them through the FDI. Based on this reasoning, one can expect a positive effect of MNEs on the productivity of the affiliate company coming from the benefits created by intangible assets.

Matching theory (Licthenberg et al (1987)) provides reasons for mergers and acquisitions in general. Specifically, the change in ownership of the company is triggered by the deteriorating levels of productivity, which signals poor match between the firm and the owner. The new owners match the company or a plant better and thus stimulate performance using their superior organizational and technological skills, also exploiting the advantage of economies of scale or scope. In this way the new owners correct the "lapses of efficiency" under the previous owners. Applied to foreign acquisitions of domestic companies, matching theory implies higher levels of productivity after the change in ownership.

Theories summarized above are in favor of foreign acquisition, because it results in increased productivity of the acquired company. However, empirical research delivers

ambiguous answers to the question of existence of positive causal effect of foreign ownership on the level of productivity.

Harris and Robinson (2002) examine the total factor productivity of UK plants after the acquisition, focusing on the origin of the acquirer and the year of change of ownership for subgroups of manufacturing sectors in 1987-1992. They estimate a Cobb-Douglas production function using the general method of moments (GMM) approach, and find evidence that foreigners "cherry picked" by acquiring the most productive plants. Post-acquisition productivity shows tendency of slight decline, though the authors abstain from making long-term conclusions about the performance in post-acquisition years.

Griffith et al (2004) compare the characteristics (labor productivity, investment per employee and intermediate inputs per employee) of domestic, British-owned and foreign-owned MNEs in the United Kingdom. The authors conclude that companies acquired by both foreign-origin and British-origin MNEs have higher labor productivity levels compared to domestic companies. They construct a difference-in-difference estimate of the effect of acquisition on labor productivity, and find that British-owned multinationals perform better than foreign-owned MNEs. Also, MNEs are making a bigger amount of research and development activities in the United Kingdom compared to domestic firms.

Benfratello and Sembenelli (2002) find no foreign ownership effect on total factor productivity in the panel of Italian manufacturing firms during the period 1992-1999. They estimate three-input Cobb-Douglas production function using GMM-System technique. The authors fail to find a positive causal effect of foreign ownership on the

productivity. In contrast, Petkova (*unknown*) reports improvements in productivity growth in Indian companies after foreign acquisition take place. She employs propensity score matching technique to form a comparison group for acquired firms from the pool of always-domestic companies. Then, the author constructs difference-in-difference estimates of the foreign acquisition effect on total factor productivity, and finds around 20% improvement in total factor productivity (TFP) three years after the change in ownership. Arnold and Javorcik (2005) use a similar estimation strategy as Petkova (*unknown*) on the panel of Indoensian firms during the period 1983-1996. Their difference-in-difference estimator combined with propensity score matching gives the dynamics of TFP for several years after the change in ownership. Across different specifications authors employ, acquired firms outperform the comparison group with respect to TFP by around 30% after three years of ownership change.

Turning to the evidence from transition economies, Frydman et al (1999) analyze if companies privatized by insiders versus outsiders achieve different productivity levels. They use FE model to estimate the effect of different owners on growth rates of performance measures, among them productivity. The authors find that outsider owners composed of domestic and foreign companies lead to higher productivity growth as well as improvements according to other performance measures. Correspondingly, Brown et al (2006) find that privatization to a foreign entity has a substantial positive effect on multifactor productivity in four transition economies. Their FE specification produces around 40% difference in multifactor productivity (MFP) between companies privatized by foreigners compared to domestic firms, while the corresponding result from the random growth model gives an average estimate of around 25%. The authors also inspect

dynamics of MFP in the years before and after the change in ownership, and they find and increasing post-privatization profile for newly-foreign firms.

2.2 Estimation Problems

There are two major problems concerning the estimation of foreign ownership effect on firm level productivity, leaving aside the difficulty of obtaining data and dealing with the measurement errors. The first one is the simultaneity issue arising from the fact that firms choose the usage of inputs taking into account their perception of shocks to productivity. To demonstrate, consider a two-input Cobb-Douglas production function:

$$y = \alpha \cdot l + \beta \cdot k + u$$

where *y* is the logarithm of output, *l* is logarithm of labor (variable input), *k* is logarithm of capital (fixed input). The last term *u* depends on the "technical knowledge, the will, effort and luck of a given entrepreneur in a given year, as can be summarized in the words 'technical efficiency' " (Marschak and Andrews (1944)). Problems arise from the fact that labor and capital inputs are not "independent" variables here, because they follow from the company's profit maximization behavior:

$$\max_l (Y - p_l \cdot L - p_k \cdot K)$$

Where p_l is the price of labor, p_k is the price of capital, the price of output is normalized to one. The demand for labor is determined by the marginal-productivity condition:

$$y = l - \ln \alpha + \ln p_l + v$$

Here v "represents all the deviations from the assumed conditions of perfect competition, perfect foresight, and absence of risk aversion, as well as the possible

measurement errors" (Griliches and Mairesse (1995)). Inserting the expression for the production function in the above condition, one can solve for the reduced-form equations:

$$l = (1-\alpha)^{-1}(\beta \cdot k + u - \ln p_l - v)$$

$$y = (1-\alpha)^{-1}(\beta \cdot k + u - \alpha \cdot \ln p_l - \alpha \cdot v)$$

It is evident that the variable input (labor) is a function of the disturbance term *u* which enters the production function, but is not observable for the researcher. Thus, if the variables summarized in *u* cannot be controlled for in the Ordinary Least Squares (OLS), the estimation results in biased and inconsistent estimates of coefficients.

The second problem associated with the estimation of foreign ownership effect on the productivity is selection bias. Foreigners are choosing where to invest from a pool of domestic companies and it is reasonable to infer that they pick the best candidates – "cherry picking" behavior. Thus, companies which end up being foreign are on average better than the rest of the pool, consequently their superior performance should not be necessarily attributed to the presence of foreign owners. The task of the researcher is to uncover if the observed superior performance is related to the presence of foreign control or the consequence of selecting better candidates for acquisition which perform better *per se*.

In practice, several econometric methods are used to solve the above mentioned problems and to uncover the true effects. Here, I discuss them briefly and explain why some of them are more suitable for my research than others.

One response is to try to eliminate the part of unobservables which could be correlated with the explanatory variables. Fixed effects (FE) technique does this job (or at

least in part). Following Griliches and Mairesse (1995), the unobservables in u can be split into three components:

$$u = e + a + \varepsilon$$

where e and a are ultimately known to the producer, but not to the econometrician, while ε is the measurement error. The e component includes the unforeseen shocks to output; e is unpredictable and becomes apparent to the producer after the labor and capital inputs for that period are determined. However, current realization of e may affect producer's expectation of a, and in this way influence future decisions of producer. The part a contains errors from misspecification of the production function made by the researcher – the omitted variables and mistakes in the functional form specification. Thus, the "intangibles, technology levels and managerial efficiency, unmeasured input quality (land, labor, and capital), unmeasured variables such as man-hours and capital-hours" (Griliches and Mairesse(1995)) are summarized in a. At least to some extent they are constant over time, and thus are averaged out during the FE estimation. Thus, FE eliminates the part of unobservables u which causes inconsistency in the estimates of labor and capital elasticities. Also, fixed time effects, such as for all firms common demand or price shocks, can be removed. However, FE method can take out only the time or firm constant parts of unobservables, the variable ones may still contaminate the results. Also, FE could aggravate another problem – attenuation bias due to the measurement errors (Griliches and Mairesse (1995)).

The random growth model, applied to the productivity analysis by Brown et al (2006), controls for the firm intrinsic growth rates by adding firm-specific time trends (on

top of the fixed effects). Authors argue that such specification eliminate the potential selection and simultaneity issues.

Another method which addresses the simultaneity problem was developed by Olley and Pakes (1996) for productivity analysis in the telecommunications sector in the United States. They exploit the fact that firm's investment is correlated to its capital stock and productivity level, and use investment as a proxy for unobserved productivity. The authors perform a two step analysis to uncover the consistent estimates of production function parameters. In practice, however, this method requires that the majority firms in the sample would report positive investment values, which was the case for the telecommunication sector Olley and Pakes analyzed. Lithuanian firm panel covers sectors in which companies do not invest every year and thus this method can not be applied in my analysis.

Levinsohn and Petrin (2000) developed a method with a similar rationale, but instead of investment they use intermediate inputs as proxies. This solves the problem of missing observations for a large part of the sample and gives the same desirable results – consistent estimates for labor and capital elasticities. But again I cannot use it for analysis, because the dataset does not contain any variable for intermediate inputs.

Selection into the foreign ownership would not be an issue if productivity levels of the same company would be observed in the two scenarios – with foreign ownership and without it. The difference-in-difference technique is intended to simulate this scenario by comparing the treated and control groups. The important issue is to choose the control group as similar to the treatment group as possible – firms in the two groups should differ just by the fact that some companies get the treatment, while others not. The

propensity score matching technique creates the control group in the following fashion. First, companies are assigned a score (a function of firm's characteristics) which gives the probability to be selected for foreign ownership. Then, on the basis of these scores, each company acquired by the foreigner is matched with a domestic counterpart. When each company has a close pair to be compared with, the Average Treatment Effect on the Treated (ATT) is computed:

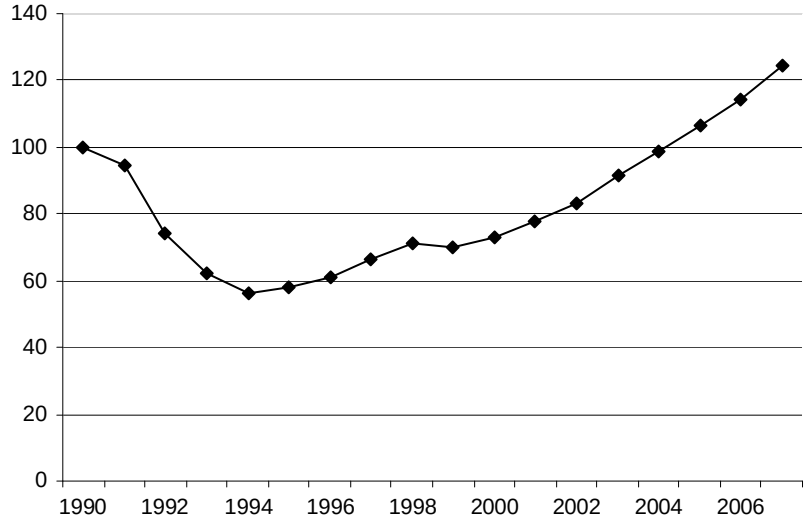
$$ATT = \frac{1}{n}\sum_{i=1}^{n}(\ln TFP_{year}^{treated} - \ln TFP_{year}^{control}) - \frac{1}{n}\sum_{i=1}^{n}(\ln TFP_{pre-acquisit\_year}^{treated} - \ln TFP_{pre-acquisit\_year}^{control})$$

where *n* is the number of companies, *year* is the chosen post-acquisition year (e.g. one or two years after the change in ownership) to be compared with the pre-acquisition year *pre-acquisit_year*. By taking the difference-in-difference approach, researcher eliminates the influence of factors which are common to all firms, for example, the demand or supply shocks which affect all the firms in the two groups. Taking into account that the pool of domestic companies is very large compared to the number of foreign affiliates, it is possible to find a close match for each company, which increases the reliability of estimates.

3. OVERVIEW OF THE LITHUANIAN ECONOMY

After regaining independence in March 1990, Lithuania started its path through the period of reforms. Figure 1 shows that country started to create free market economy having Gross Domestic Product (GDP) at a level which it managed to reach again at year 2004 only.

Figure 1: Index of Gross Domestic Product as compared to 1990 (percent), 1990-2007



Source: Statistics Lithuania

Immediately after 1990, the supply and demand links, which existed in the pre-independence years among Lithuania and other Soviet Union countries, were terminated. It significantly added to a sharp decrease in output, hyperinflation and a decrease in total employment numbers (Table A1). 1994 marks the lowest point in economic activity during the period of independence in term of GDP and employment contraction. Afterwards, performance started to improve with only a short intervention to growth by

the Russian crisis in 1998. During the last decade, output levels as well as growth rates increased, employment level grew while unemployment rates declined.

Until the middle 90's country was undergoing mass privatization of state enterprises and reorganization. The sectoral distribution of employment followed the evolution of output production across economic activities (Table A2). The agricultural production and employment was constantly shrinking, while service sector was expanding – by 2007, it constituted 61% of total output compared to 55% in 1995. Employment in services grew by 17 percentage points, while industry's output and employment shrank.

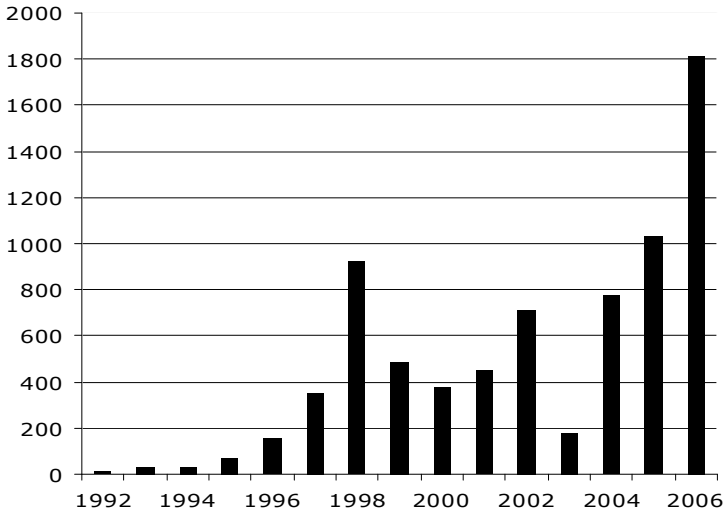
The primary effort to attract foreign capital was made in December 1990 by passing the Law of Foreign Investment. It defined three forms of foreign investment in Lithuania: obtaining securities of a domestic company, establishing an entity based on foreign capital or forming joint ventures with the domestic investors. The law set the procedure of investing, and the rights and tax privileges for foreign companies depending on the size of foreign capital share. That is, companies with 25% to 75% foreign participation were exempted from paying taxes on profits for three years, while firms with 10% to 25% and 75% to 90% of foreign capital share had one year period of exemption from taxes on profits. Also, foreigners were provided a right to a tax-free repatriation of profits and reinvested capital. The Law of Foreign Investment was amended several times; most important changes were made in issues concerning land ownership. However, foreigners were not attracted to invest in Lithuania during the first part of the 90's (Figure 2 below); the threat from organized crime groups is one of the reasons behind.

Two stages of privatization of state companies delivered different prospects for foreigners to enter Lithuanian companies. During the first stage, which was started in September 1991, widespread private ownership was created through the system of privatization vouchers. The Primary Law of State Property Privatization set the background for massive privatization. The right to acquire state property was almost exclusively given to the residents of Lithuania, who were assigned vouchers to be used for the purpose of investments. Domestic as well as foreign private companies were restricted to buy objects from a separate list created by the Government. Privatization proceeded through public auctions and public share offerings, and resulted in 5,714 firms being sold during the first round. The second privatization round, which started in August 1996, created equal opportunities for foreign and local investors to engage in privatization process. Thus, as can be seen from Figure 2, 1996 marks a start of period of significant increase in net foreign direct investment (FDI) inflows.

During the second round, privatization of large state owned companies took place. The period of privatization of strategic companies to foreigners was preceded by the new Law of Foreign Capital Investment in June 1995. It was amended in July 1999 by the Law of Investment, which was harmonized with European Union directives for free capital movement. In the assessment of Lithuanian investment policy, OECD (2000) notes the latter law's comprehensive scope – it covers all investment relations, including those between the state and foreigners, not just between the companies. That is, it presents the state investment policy: when is the state supporting investment, and what are the forms of support such as tax incentives, material assistance for personnel retraining activities and provision of state guarantees.

Figure 2 provides net inflows of FDI starting from 1992. Big fluctuation in inflows is apparent: foreign capital inflows jumped in the years of privatization of some large companies. For example, the peak in FDI in 1998 is attributable to the inflow of Swedish and Finnish origin capital to Lithuanian Telecom, the monopoly company in fixed-line telecommunication market.

Figure 2: Net inflows of Foreign Direct Investment (current US$), 1992-2007



Source: World Bank

The sectoral distribution of FDI is provided in Figure A1. Manufacturing sector absorbed the greatest share of investment, followed by FDI inflows in financial intermediation sector (mainly due to bank privatizations). The capital city Vilnius attracts by far the biggest share of all FDI flowing to Lithuania, e.g. in 1998, FDI per capita in Vilnius was 1.3 times bigger than in the second most attractive city to invest the port Klaipeda, but by 2007 the number reached 4.3. The gap in FDI inflows between the capital and the second biggest city Kaunas was even wider, 2.7 and 5.8 accordingly.

Lithuania was never a leader in the region according to the FDI attracted to the country, for example, it was seventh in the list of ten Central and Eastern European

(CEE) countries according the FDI inflows expressed as percent of GDP in 2000 (Javorcik (2004), p. 610, Table 1).

4. DATA AND SUMMARY STATISTICS

Data come from a large panel of firms in Lithuania observed from 1995 to 2005. Data are obtained from the annual enterprise survey performed by the Statistical Department of Lithuania, which together with information from tax and social insurance authorities forms a pool of sources for a comprehensive analysis of aggregate firm performance during a year. I only use data for companies which are sampled for the survey, because other sources mentioned above do not provide information on firm ownership. Companies are selected for the survey in the following manner: first, they are listed in a descending order according to total earnings and average number of employees. Then, firms are included in the sample until the cumulative sum of their earnings reaches 80% of total earnings for each NACE 3-4 digit sector and the cumulative sum of their number of employees reaches 60% of the total in the corresponding sector. Sole entrepreneurs are excluded from the survey (Statistics Lithuania (2007)).

Data contains variables for the average number of employees, total share capital as well as distribution of capital between owners, property, plant and equipment for the beginning and the end of the year, earnings from sales and earnings from produced industrial production. Summary statistics for 1996, 2000 and 2005 are provided in Table 1. It shows that output and capital increased significantly in the end of the sample. Size of the companies is also biggest in 2005. A firm in analysis is defined to be foreign owned if the share of foreign capital is at least 50%. Foreign acquisition is a change in ownership

when the majority shares of capital go from domestic to foreign hands. Divestiture is defined as disposal of the majority shares by the foreigners.

Table 1: Summary statistics

Variable	1996	2000	2005
Output	4.57 (32.22)	4.49 (47.33)	12.28 (107.52)
Capital	1.71 (19.08)	1.99 (30.60)	4.84 (45.29)
Employment	47.89 (281.49)	39.05 (224.96)	69.31 (282.30)
Number of observations	7532	10653	7330

Note: table contains means of variables for specified years, standard errors in parenthesis. Output and capital values expressed in million Litas. Output is measured as earnings from sales. For manufacturing companies, producer price indexes at 2 digit NACE sectors (base year 2000) were used as deflators for output. Construction sector nominal output values were deflated with construction price index (base year 2000). For other sectors GDP deflator (base year 2000) was used. Capital is measured as the average of property, plant and equipment in the beginning and the end of the year. Capital is deflated using GDP deflator (base year 2000).

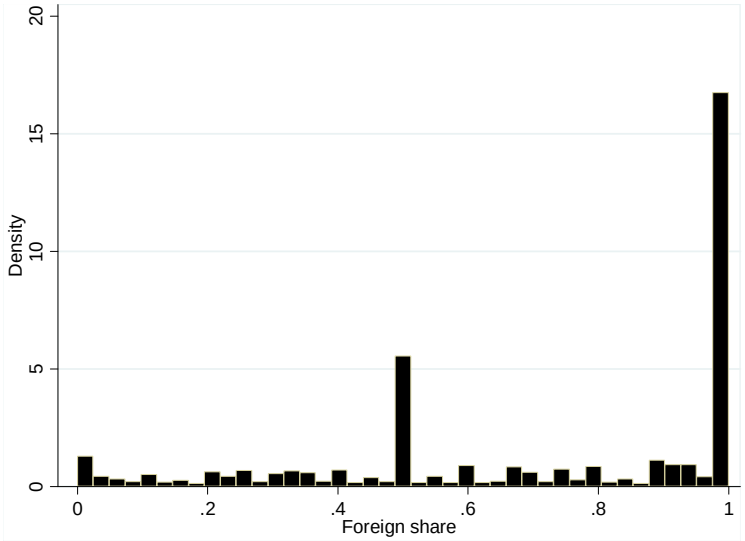
Considerable sample cleaning was needed before using the data. First, observations with zero values for earnings from sales, employment and capital were eliminated. Second, 71 observations from 1996 were dropped because capital of foreigners, domestic private and state owners did not add up to the total share capital provided. Moreover, total share capital in 1995 is missing from the data; thus I calculated it as a sum of capital of different groups of owners. Third, only companies with non-missing observations for ownership structure were used to construct the variables for foreign ownership, foreign acquisition and divestiture, because an identification of exact date of change in ownership is crucial for analysis. Thus, from the initial collection of 28,693 companies I end up with an unbalanced panel of 27,413 firms observed at least

once over the eleven year period. In fact, half of the firms in the sample are observed for maximum of three years, and only 1671 companies were participating in the survey for the full period (Table A3).

Fourth, foreign ownership dummies were cleaned to correct for possible mistakes in reporting. That is, if a company is observed to be foreign owned in year x and domestic for years before and after x, I changed it to be domestic for the year x, also. The same applies for companies which report domestic ownership for one year and foreign ownership for years before and after that year. After these changes, I have 448 acquisitions (590 before cleaning) and 297 divestitures (439 before cleaning). Fifth, missing or zero values for property, plant and equipment (PPE) in the beginning of the year were imputed with the values from the end of last year's PPE. By the same token, if PPE was missing or zero in the end of the year, I imputed it with the values from the beginning of the next year.

It is common practice in research to assume that if foreigners own at least 10% of share capital, they gain access to the management of the company and thus can influence the performance of the firm. Following this reasoning, one would expect to observe a considerable amount of companies with foreign ownership share around 10% levels. This is precisely what Petkova (*unknown*) detected in the panel of Indian manufacturing companies through the period 2002-2006. However, Figure 3 shows no concentration of foreign shares around 10% level in the Lithuanian data. In fact, most foreigners (except full ownership cases) obtain dominant stake in the company. This encouraged me to concentrate on the effect of foreign ownership on productivity levels for majority shareholding by foreign investors.

Figure 3: Histogram of foreign ownership shares for the whole sample, 1995-2005



Source: author's calculations

The time span of the sample begins even before the significant increase in the FDI (see Figure 2), hence providing a possibility for analyzing the performance of companies to-be-owned by foreigners some years before acquisition. Specifically, most of companies undergo foreigners' acquisition after being observed at least two years in the sample. On the other hand, sample period is long enough to analyze the performance of companies before and after the divestiture – on average foreigners own a company for about two years before selling it.

My sample covers following sectors of economic activity: manufacturing, construction, wholesale and retail trade, hotels and restaurants, transport and real estate sectors; other sectors are excluded due to small number of foreign participation (share of foreign companies in these sectors is less than 3%).

The distribution of foreign owned companies in the sample across sectors in 2000 is provided in Table A4. Apparently, from manufacturing industries, foreigners are concentrated in textile industry, manufacture of rubber and plastic products, and high

technology industries (marked with stars*) such as chemicals, transport, electrical and optical equipment and machinery. Foreigners also invest substantially in wholesales and transport sectors.

5. ESTIMATION STRATEGY

To examine the effect of foreign ownership on firm productivity in this chapter I present results based on the Ordinary Least Squares and Fixed Effects estimation. Comparing the results based on these methods, I can infer about the direction of biases in the estimates.

5.1 Ordinary Least Squares Estimation

The benchmark model estimated by the OLS has the two factor Cobb-Douglas production function form:

$$\ln Y_{it} = \alpha + \beta \cdot \ln K_{it} \cdot \mathbf{IND}_{it} + \gamma \cdot \ln L_{it} \cdot \mathbf{IND}_{it} + \kappa \cdot F_{it} + \delta \cdot D\_FO_{it} + \lambda \cdot \mathbf{IND}_{it} \cdot \mathbf{YEAR}_{it} + \varepsilon_{1it}$$

here Y_{it} is the output of the company *i* at year *t*, measured as total earnings from sales (not adjusted to the change in the inventories as they are not available in the dataset); K_{it} is capital defined as the average of fixed assets at the beginning and the end of the year; L_{it} is the total number of employees per year. Capital and employment are interacted with industry dummies to allow the production function elasticities to change across industries. F_{it} is a dummy variable equal to one in case the company is foreign owned during the whole sample period. D_FO_{it} is the variable of interest – dummy, equal to one if company is foreign owned, zero otherwise. As mentioned above, I analyze the effect of foreign presence in the company when foreigners own at least 50% of total share capital. $\mathbf{IND}_{it}$ is a vector of dummy variables showing to what NACE sector company's main activity belongs. $\mathbf{YEAR}_{it}$ is a vector of time dummies. The interaction term

between the sector and the time dummies takes care of all the unmeasured influences to the sales of the company which are changing across activities and time, for example, changes in prices not captured by deflators.

The definition of D_FO_{it} in the model above provides the interpretation of δ as an average effect of foreign ownership on the level of productivity, and thus does not distinguish between the cases when a company is acquired or divested during the sample period. There are reasons to suspect that acquisition and divestiture have a different effect on the level of productivity. The anticipated impact of acquisition is an improvement in the performance measures brought by the transfer of knowledge and advanced technology to the domestic company. However, the anticipated effect of divestiture is ambiguous. On the one hand, divestiture can signal some kind of failure of the expectations of investors, among those possibly productivity and profitability. Also, seeing no future with the company, foreigners might put less effort and financial resources to the firm which again could downgrade the level of productivity. On the other hand, companies can engage in performance improving actions to get the best return from disinvestment. For example, foreigners may acquire poorly performing firms in order to improve their results and consequently the price, and then sell it. Taking these considerations into account, I anticipate observing a higher level of productivity after acquisition than in the last years before divestiture. To check these conjectures, I estimate the same model with dummies for acquisition and divestiture:

$$\ln Y_{it} = \alpha + \beta \cdot \ln K_{it} \cdot \mathbf{IND}_{it} + \gamma \cdot \ln L_{it} \cdot \mathbf{IND}_{it} + \kappa \cdot F_{it} + \delta_A \cdot A_{it} + \delta_D \cdot D_{it} + \lambda \cdot \mathbf{IND}_{it} \cdot \mathbf{YEAR}_{it} + \varepsilon_{2it}$$

here all the variables are defined as above, except for the foreign ownership dummy, which is now split into dummy indicating if the company is acquired by the foreigner A_{it} or if it is sold out during the sample period D_{it}.

Afterwards, I perform the event study to analyze the evolution of productivity levels before and after the change in ownership. Namely, I estimate the model specified in the following fashion:

$$\ln Y_{it} = \alpha + \beta \cdot \ln K_{it} \cdot \mathbf{IND}_{it} + \gamma \cdot \ln L_{it} \cdot \mathbf{IND}_{it} + \boldsymbol{\delta}_A \cdot \mathbf{A}_{it} + \boldsymbol{\delta}_D \cdot \mathbf{D}_{it} + \lambda \cdot \mathbf{IND}_{it} \cdot \mathbf{YEAR}_{it} + \varepsilon_{3it}$$

Here I inspect the performance of firm in the years prior to the change in ownership and the years after. Namely, I include dummy variables marking years before and after the acquisition and divestiture. Vector $\mathbf{A}_{it}$ is composed of seven dummies: $A_{it(-3)}, A_{it(-2)}, ..., A_{it(0)}, ..., A_{it(+3)}$; where $A_{it(-3)}$ is equal to one for the period three years before acquisition, $A_{it(0)}$ marks the year of acquisition – the time when companies first report a majority share of foreign capital participation. $A_{it(+3)}$ is equal to one for the period three years from acquisition and later; and zero otherwise. I assume that there are no effect of becoming foreign owned four and more years before the acquisition, so that the coefficients $\delta_{A(-4)}, \delta_{A(-5)}$ and so on are all zero. More formally, I assume that $E[\ln Y_{it}(A_{it(j)} = 1 \mid controls)] = E[\ln Y_{it}(ever\_domestic \mid controls)]$ for j <= - 4, here j is an index of event time and *ever_domestic* is indicating that the company stays domestic for the whole sample. I leave out from regression the period four or more years before the acquisition, so the coefficients $\boldsymbol{\delta}_{\mathbf{A}}$ are interpreted with the reference to that period. I also carry out analogous analysis of divestitures: vector $\mathbf{D}_{it}$ is composed of seven dummy

variables: $D_{it(-3)}, D_{it(-2)}, ..., D_{it(0)}, ..., D_{it(+3)}$; variable $D_{it(-3)}$ is equal to one for a company which is still owned by the foreigners, but it will be sold in three or more years. $D_{it(0)}$ marks the first year of domestic ownership, while $D_{it(+3)}$ is one for the period three years after divestiture. Here, I make analogous assumption as for the acquisition analysis – that divestiture does not have an effect on productivity four or more years after it happened, specifically, $E[\ln Y_{it}(D_{it(j)} = 1 \mid controls)] = E[\ln Y_{it}(ever\_domestic \mid controls)]$, where j>=4. So, I assume that the coefficients $\delta_{D(+4)}, \delta_{D(+5)}$ and so on are zero. Dummies for period j>=4 are excluded from the analysis, so the estimates of $\boldsymbol{\delta}_D$ are interpreted with reference to this period.

This event analysis is intended to show if there are any signs of anticipation of the change in ownership which would result in shifting level of productivity before the ownership change. Also, it allows comparing the evolution of productivity under the foreign control during the years after the acquisitions, and the performance of companies which switch from foreign to domestic hands in years after divestiture. Thus, it allows checking if domestic owners who acquire companies from foreigners manage the companies as good as foreigners did.

The Ordinary Least Squares estimates can be biased and inconsistent, because the unobserved company-specific variables are not controlled for. This gives rise to the problems discussed before – namely, selection bias and simultaneity issue. To cope with them, I employ the Fixed Effects method.

5.2 Fixed Effects Specification

Fixed effects estimator results after all the firm-specific effects which are constant over time are eliminated from the unobservables, for example, the employees' quality or the brand name effects. Thus, one additional term is added to the benchmark model:

$$\ln Y_{it} = \alpha + \beta \cdot \ln K_{it} \cdot \mathbf{IND}_{it} + \gamma \cdot \ln L_{it} \cdot \mathbf{IND}_{it} + \delta \cdot D\_FO_{it} + \lambda \cdot \mathbf{IND}_{it} \cdot \mathbf{YEAR}_{it} + \alpha_i + u_{it}$$

here α_i captures all the time-constant firm-specific effects, which are eliminated during the estimation procedure. One can expect that after controlling for industry, year and firm-specific influences on the output, the simultaneity and selection problems are taken care of, or at least greatly diminished. Unfortunately, methods dealing with the simultaneity issue proposed by Olley and Pakes (1996) and Levinsohn and Petrin (2003) are not feasible to implement using the dataset I work with. I perform the FE estimation for all the specifications described above: the benchmark model with a dummy indicating foreign ownership; the model showing the average effect of acquisition and divestiture on the level of productivity; and the event study of contribution of separate years to the change in the productivity.

Next section presents the results according to all specifications described above.

6. EMPIRICAL RESULTS

Table 2 contains estimation results from the different specifications using the data which covers most sectors of the economy.

Table 2: Estimation results from OLS and FE specifications

	OLS		FE	
	(1)	(2)	(3)	(4)
All period foreign owned	**0.09** (0.06)	**0.69***** (0.04)		
Foreign ownership dummy	**0.61***** (0.05)		**0.08**** (0.04)	
Acquisition dummy		**0.56***** (0.07)		**0.13***** (0.05)
Divestiture dummy		**0.68***** (0.08)		**-0.02** (0.06)
Industry-year interactions	yes	yes	yes	yes

Note: Dependent variable – log earnings from sales. Capital and employment interacted with industry dummies. Interactions of industry and time dummies included. Variables not deflated. Number of observations is 105,309.
*** 1% significance, ** 5% significance, * 10% significance.

Starting from the OLS estimates, there appears to be a very strong and significant effect of foreign ownership on the level of productivity. Comparing companies with at least 50% foreign ownership participation with those which stay domestic through the whole sample (column 1), a 61% difference in productivity is observed. In order to investigate separately the average effect of foreign ownership on productivity between the years following acquisition and years preceding divestiture, I ran regressions with dummy variables indicating the direction of the change in ownership (column 2 of Table 4). OLS estimates of both foreign acquisition and divestiture dummies show a big

positive effect (56% and 68%, accordingly) on domestic companies productivity levels compared to those staying domestic for the length of the sample.

Also presented in Table 4 columns 3 and 4 are the results from estimation which eliminates company fixed effects (FE) from the unobservables. They reveal quite a different picture of foreign ownership effect on company's performance. First, firms with the presence of foreign ownership have on average 8% advantage compared to domestic ones. This result is quite modest compared to what Brown et al (2006) report for four transition economies (Ukraine, Hungary, Russia and Romania): their FE specification produces foreign privatization effect of around 40%. Fixed effects estimates of foreign acquisition are much smaller than OLS results – on average acquired companies have an 8% (column 9) to 10% (column 10) higher productivity, while dummy for foreign divestiture does not show any effect of foreign ownership on the dependant variable.

Table A5 contains labor and capital elasticities estimated separately for the five industries. Labor elasticities from OLS estimation vary from 46% to 55%, but decrease in FE. The latter specification gives similar estimates of labor coefficients (22% to 27%) between the industries; they are smaller than the OLS results, indicating that OLS specification suffers from simultaneity problems described in chapter 2.2. Estimated elasticities of capital range from 16% to 36% in OLS regression. FE specification gives a bit smaller magnitudes, but in all cases the estimates are significant and practically plausible. There does not seem to be much difference in technologies across the economic activities, except for the real estate, renting and business activities (NACE K), which has smaller capital elasticity (9% from to FE regression).

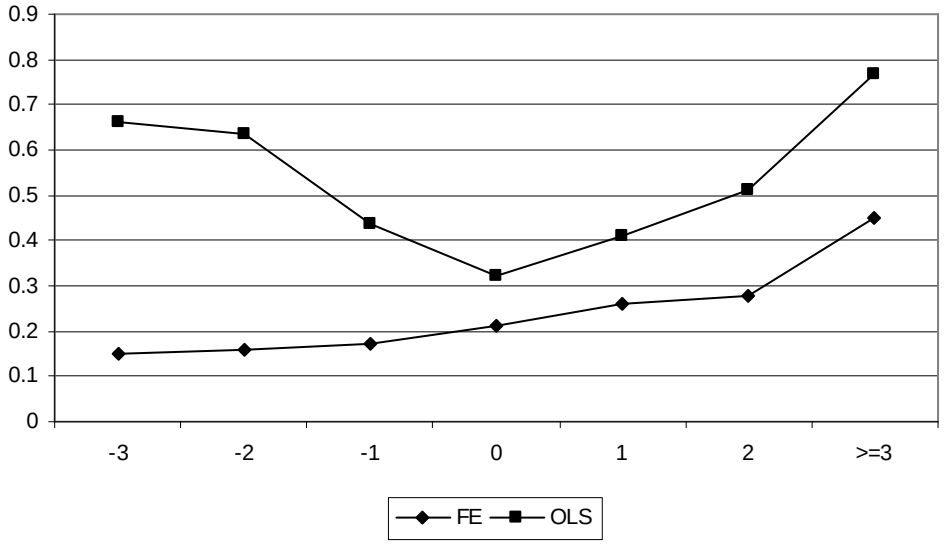
To further investigate the impact of foreign control on productivity, I estimated separately how much each year contributes to the observed average effect of acquisition or divestiture. One can observe a gradual improvement in the levels of productivity after acquisition, because reorganization in the company following the change in ownership is likely to have a temporary negative effect on performance. On the other hand, there are two issues concerning the decision to sell the company which could provoke opposite effects on firm productivity. First, among others, the motive for a multinational company to divest is likely to be associated with a decline in company's profitability or worsening in future growth perspectives. So, during the last years of foreign ownership, firm's performance can decline if foreigners exercise fewer efforts to manage or invest into the company seeing no future with it, or unfavorable market conditions which could have stipulated the decision to sell the company can depress its operation. Conversely, investors striving to get the best outcome from the deal are motivated to improve the performance of the company just because they want to get the best price for it. As a result, productivity levels during the last years before divestiture would not show a decline.

Figure 4 shows the estimated dynamics of productivity before and after the foreign acquisition; Table A6 contains the same estimates with accompanying robust standard errors. First, focusing on OLS estimation, the first year of acquisition has smallest (but still big and significant) positive effect on productivity, and this effect increases through the years. After at least three years from foreign acquisition, companies have on average 77% higher productivity compared to the reference years (more than three years before acquisition). The magnitudes of estimates are similar to what Brown el

al (2006) report for other transition economies mentioned above – their estimated foreign privatization effect averages about 0.6 across countries.

The magnitudes of estimates are almost twice lower in FE specification, thought they follow similar pattern in the post-acquisition years. The year of acquisition is associated with 21% higher level of productivity. Later, the estimate slowly rises and reaches 45% in the period three and more years after acquisition. This pattern is consistent with the conjecture that it takes time for the foreigners to adapt to the environment, so productivity level grows with time.

Figure 4: Dynamics of foreign acquisition effects



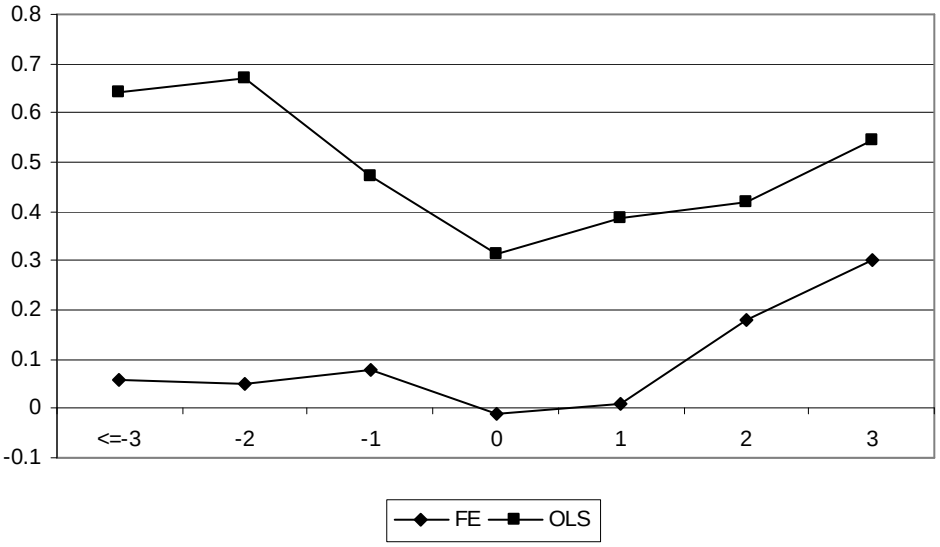
Source: Author's calculations

The estimates from OLS and FE illustrate the effect of selection bias on the coefficients. OLS estimates are much higher in the pre-acquisition years compared to FE specification. However, they are decreasing when the time of change in ownership is approaching. This pattern suggests that companies which will be acquired are performing worse in the years close to the change in ownership. The reason behind it could be asset stripping behavior by the management – anticipating a change in ownership they try to

reap the benefits while they are still in the control of the company. But still, companies which will be acquired in one year are 44% more productive than in the period at least four years before acquisition. The FE specification greatly reduces the selection bias; it eliminates the unobserved time-fixed heterogeneity between the companies. For example, in OLS estimation I control for the number of employees, but not for their quality which could be a great advantage of the company and increase its chances of being chosen for acquisition. Another possible time-fixed source of heterogeneity is the infrastructure surrounding the firm: location or quality of supply and demand links. All these factors are reflected in high magnitudes of OLS coefficients, but are at least to great extent eliminated from in FE. The latter specification shows that pre-acquisition productivity is around 16% compared to ever domestic companies; thus, there still appears to be some unmeasured variables which make domestic companies to-be-acquired better. For example, it could be the unmeasured time-variable growth trends, which are perceived by the foreigners, but not measured in regression.

There is also a clear pattern of estimated effects of years before the divestiture – OLS estimates show that foreign owned companies which will be sold out after at least 4 years are on average 81% more productive compared to the reference period. This effect is slowly decreasing until the last year of foreign presence in the company, but again remains to be very big and statistically significant. This pre-divestiture pattern of OLS coefficients is very similar to the pre-acquisition dynamics. It shows that companies have a smaller level of productivity one year before the divestiture than for example in two years before the change in ownership. After divestiture, the level of productivity starts to grow again and reaches 54% in three and more year period.

Figure 5**:** Dynamics of foreign divestiture effects



Source: Author's calculations

FE specification shows that there is no divestiture effect on MFP in pre-divestiture years – the coefficients are close to zero and insignificant. So, foreign affiliates which will be sold to domestic investors in few years are performing similarly to ever domestic companies. There is no sign of pre-divestiture productivity increase caused by the motive to improve the performance and consequently the price of the company before selling it. Also, productivity dynamics does not support the conjecture that foreigners decide to sell the company when it starts to perform badly, which would be revealed in negative pre-divestiture coefficients. The first and second year of domestic control has no effect on MFP. However, in the period three years after divestiture, the coefficient reaches 30%, implying that domestic owners, who buy the company from foreigners, perform no worse and even better than foreigners during the last pre-divestiture years.

A large difference in the OLS and FE estimates is again a consequence of not controlling for the unmeasured company characteristics. First, these companies were

already chosen by the foreigners to be acquired (except for the greenfield investment cases), and, as was already shown, foreign acquired companies are on average better than those staying ever domestic. Also, divested companies are chosen to be acquired by the domestic investors who also have an incentive to pick the best candidates for investment. Thus, OLS reflects the fact that divested companies are on average better performers than the domestic firms, the vantage possibly stemming from better quality of employees, technology know-how and marketing knowledge brought by foreigners, or quality of infrastructure. The lesson which could be drawn from the results is that after acquisition domestic investors manage to exploit the characteristics of a company as good as foreigners and even achieve some improvement in MFP.

CONCLUSION

This study analyses the effect of foreign ownership on multifactor productivity using a rich firm level dataset which was never applied before in empirical research. Paper analyzes separately the performance of foreign acquired and divested companies before and after the change in ownership.

This paper contributes to the field by providing new evidence to the growing body of research on corporate governance in the CEE region. The estimated effects differ substantially in OLS and FE specifications. Starting from OLS, foreign owned companies are on average 61% more productive than domestic. This result can be decomposed to 56% effect of foreign acquisition and 68% effect of foreign divestiture. Further, the analysis of dynamics of acquisition effects shows a gradual increase in productivity when foreigners take the control of the firm. Productivity in three and more years after acquisition is 77% higher compared to domestic companies. The pre-acquisition performance is as well better than in the domestic companies, but there is a decrease in productivity levels during the last years before acquisition. OLS estimates for the dynamics around the years of divestiture show that companies are performing better before being sold to domestic investors, productivity decreases close to the change in ownership, and starts to raise in post-divestiture years. OLS coefficients describe the dynamics of productivity before and after the change in ownership, however, they cannot be interpreted as causal effects due to selection bias.

FE specification provides evidence for positive foreign acquisition effect – productivity becomes on average 13% higher when company's control switches to

foreign hands. Divestiture does not seem to have any effect on productivity. Dynamic specification of acquisition effects follow similar pattern as OLS results just in smaller magnitudes: post-acquisition coefficients rise gradually and reach 45% four and more years after the ownership change. There is little dynamics in foreign divestiture effects in FE specification. Companies are similar in terms of productivity before they are sold to domestic investors. Three years after divestiture, previously-foreign firms have 30% productivity than ever domestic companies. Thus, domestic investors buy better firms and achieve higher level of productivity in three years.

The results from the OLS and FE specifications provide evidence for selection bias. Companies which are chosen to be acquired have higher levels of productivity, implying that it is crucial to use research design which controls for the unobserved company heterogeneity. A more careful treatment of MFP measure could improve the results but was prevented by lack of relevant data.

REFERENCE LIST

Arnold, Jens Matthias and Beata Smarzynska Javorcik (2005), "Gifted Kids or Pushy Parents? Foreign Acquisitions and Plant Performance in Indonesia". *Centro Studi Luca d'Agliano Development Studies Working Paper No 197*.

Benfratello, Luigi and Alessandro Sembenelli,(2002), "Foreign Ownership and Productivity: Is the Direction of Causality So Obvious". *Centro Studi Luca d'Agliano Development Studies Working Paper No. 166.*

Brown, J. David, John S. Earle and Almos Telegdy (2006), "The Productivity Effects of Privatization: Longitudinal Estimates from Hungary, Romania, Russia, and Ukraine". *Journal of Political Economy*, Vol. 114, No. 1.

Caves, Richard E. (1990), "Multinational enterprise and economic analysis", Cambridge University Press.

Frydman, Roman, Cheryl Gray, Marek Hessel and Andrzej Rapaczynski (1999), "When Does Privatization Work? The Impact of Private Ownership on Corporate Performance in the Transition Economies". *The Quarterly Journal of Economics*, Vol. 114, No. 4.

Griffith, Rachel, Stephen J. Redding and Helen Simpson (2004), "Foreign Ownership and Productivity: New Evidence from the Service Sector and the R&D Lab". *CEPR Discussion Paper No. 4691.*

Griliches, Zvi and Jacques Mairesse (1995). "Production Functions: The Search for Identification". *Harvard Institute of Economic Research Working Papers.*

Harris, Richard and Catherine Robinson (2002), "The Effect of Foreign Acquisitions on Total Factor Productivity: Plant-Level Evidence from U.K. Manufacturing, 1987-1992", *The Review of Economics and Statistics*, Vol. 84, No. 3

Helpman, Elhanan, Marc J. Melitz and Stephen R. Yeaple (2004), "Export versus FDI with Heterogeneous Firms". *The American Economic Review*, Vol. 94, No. 1.

Iwaskiw, Walter R, "Lithuania: A Country Study"(1995), *Washington: GPO for the Library of Congress.*

Javorcik, Beata (2004), "Does Foreign Direct Investment Increase the Productivity of Domestic Firms? In Search of Spillovers through Backward Linkages", *The American Economic Review*, Vol. 94, No. 3.

Levinsohn, James and Amil Petrin (2003), "Estimating Production Functions Using Inputs to Control for Unobservables" *The Review of Economic Studies*, Vol. 70, No. 2.

Lichtenberg, Frank R., Donald Siegel, Dale Jorgenson and Edwin Mansfield (1987), "Productivity and Changes in Ownership of Manufacturing Plants", *Brookings Papers on Economic Activity*, Vol. 1987, No. 3, Special Issue On Microeconomics.

Marschak, Jacob and William H. Andrews, Jr. (1944), "Random Simultaneous Equations and the Theory of Production". *Econometrica*, Vol. 12, No. 3/4.

OECD (2000), "Lithuania: Foreign Direct Investment Impact and Policy Analysis". *Directorate for Financial, Fiscal and Enterprise Affairs Working Paper No. 2000/3.*

Olley, Steven and Ariel Pakes (1996), "The Dynamics of Productivity in the Telecommunications Equipment Industry". *Econometrica*, Vol. 64, No. 6.

Petkova, Neviana (unknown), "Does Foreign Ownership Lead to Higher Firm Productivity?", *Dissertation*.

Statistics Lithuania, Internet access: http://www.stat.gov.lt/en/.

Statistics Lihuania (2007), "Technique of statistical analysis of enterprise structure".

APPENDIX

Table A1: Distribution of employment across economic activities, 1992-2007

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Total employment	1855.2	1778.2	1675	1480	1493.4	1502.4	1490.4	1457	1399.2	1346	1394.7	1425.7	1425.4	1460.7	1485.8	1514.6
Employment growth, %	-2.2	-4.1	-5.8	-11.6	0.9	0.6	-0.8	-2.2	-4.0	-3.8	3.6	2.2	0.0	2.5	1.7	1.9
Self-employed in % of total employment	-	12.6	16.3	18.8	23.1	23.6	20.4	20.1	19.7	19.9	20.2	20.5	18.7	17.1	15.8	14
Services in % of total employment	42.4	44.6	47.5	51.5	51.7	54.3	52.2	53.5	54.7	55.8	54.9	54.2	56.2	57.1	58.1	59
Industry in % of total employment	38.0	32.8	29.2	29.2	28.3	28.1	28.6	27.2	26.7	26.9	27.3	28	28	28.9	29.5	30.2
Agriculture in % of total employment	19.6	22.5	23.4	19.3	20.1	17.6	19.1	19.3	18.7	17.2	17.8	17.8	15.8	14.0	12.4	10.8

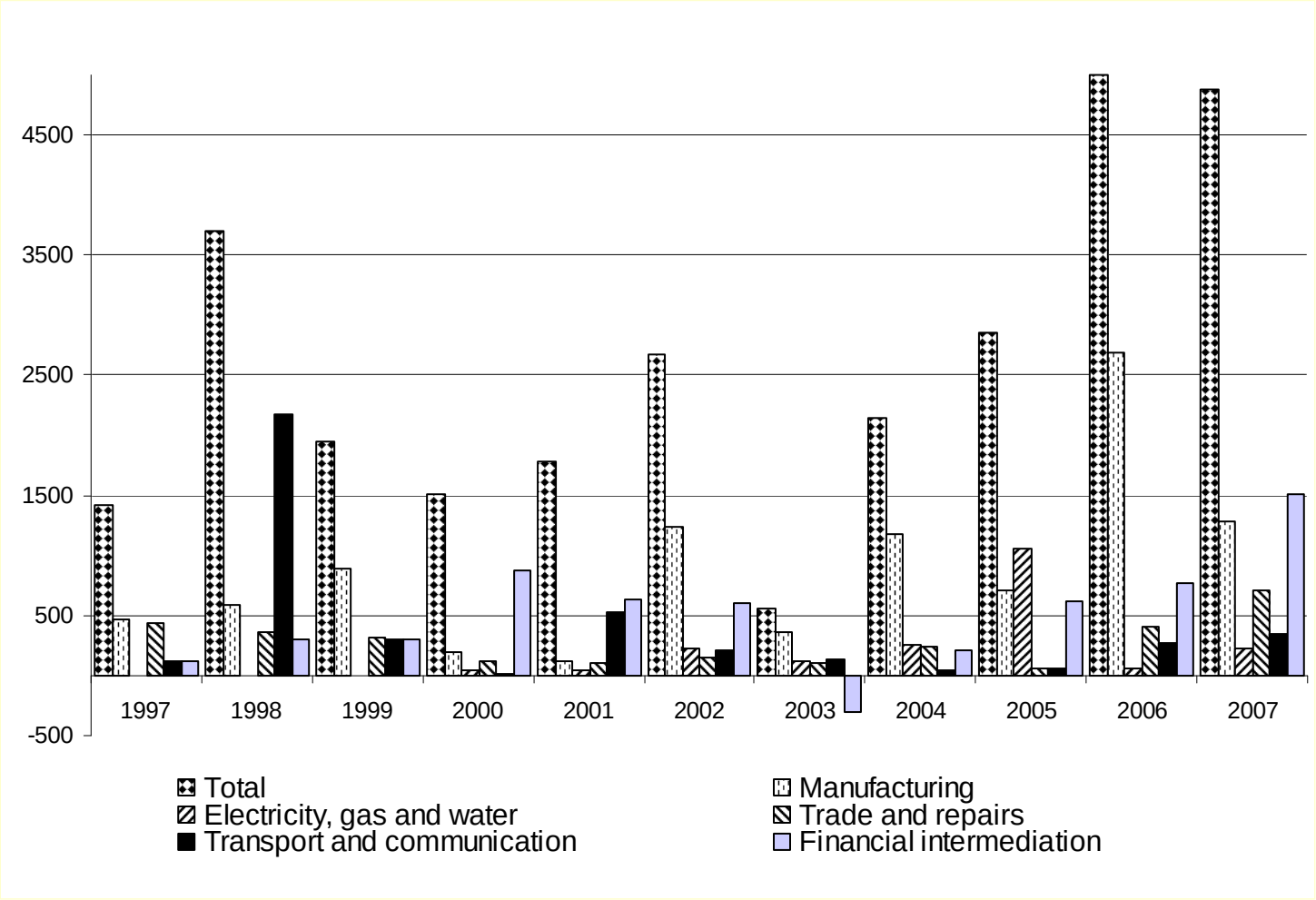
Note: total employment in thousands
Source: Eurostat

Table A2: Structure of gross value added by kind of economic activity (percent)

Economic activity	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Agriculture, hunting, forestry and fishing	11.4	12.5	11.4	9.8	8.3	7.9	7.1	7.0	6.4	5.8	5.7	5.2	5.3
Industry	25.5	24	23.5	23	22.7	23.8	24.7	23.4	24.6	25.9	25.4	24.9	23.3
Construction	7.3	7	7.6	8.4	7.6	6.0	6.0	6.3	7.1	7.3	7.6	8.8	10
Trade; hotels and restaurants; transport, storage and communication	27.0	27.4	27.7	27.6	27.7	30.2	31.1	32.5	32.4	31.7	31.8	31.1	31.5
Financial intermediation; real estate, renting and business activities	12.6	12.2	11.5	11.6	12.4	12.5	12.3	12.5	12.3	12.6	13.5	14.3	14.7
Public administration; services for social sphere and community activities	16.2	17.1	18.3	19.7	21.3	19.6	18.8	18.2	17.2	16.7	15.9	15.7	15.1

Source: Statistics Lithuania

Figure A1: Foreign Direct Investment by Economic Activities, mln. Litas



Source: Statistics Lithuania

Table A3: Number of firms with consecutive observations in the sample, 1995-2005

Number of consecutive observations	**Number of companies**
1 year	6621
2 years	5026
3 years	4099
4 years	4396
5 years	2191
6 years	1167
7 years	573
8 years	537
9 years	573
10 years	559
11 years	1671
Total	**27413**

Source: Author's calculations

Table A4: Distribution of foreign firms across NACE sectors in sample in 2000

NACE	Firms with foreign capital in the sample	All firms in the sample	Share, % (2)/(3)
	(1)	(2)	(3)
Total Manufacturing	352	2460	**14.31**
Manufacture of food products, beverages and tobacco	47	412	**11.41**
Manufacture of textiles and textile products	76	309	**24.59**
Manufacture of leather and leather products	2	19	**10.52**
Manufacture of wood and wood products	45	381	**11.81**
Manufacture of pulp, paper and paper products; publishing and printing	18	246	**7.32**
Manufacture of coke, refined petroleum products and nuclear fuel	2	2	**100**
Manufacture of chemicals, chemical products and man-made fibres *	14	50	**28**
Manufacture of rubber and plastic products	22	130	**16.92**
Manufacture of other non-metallic mineral products	42	289	**14.53**
Manufacture of basic metals and fabricated metal products	0	0	**-**
Manufacture of machinery and equipment n.e.c.*	37	271	**13.65**
Manufacture of electrical and optical equipment *	19	132	**14.39**
Manufacture of transport equipment *	9	47	**19.15**
Manufacturing n.e.c.	19	172	**11.04**
Construction	37	1023	**3.62**
Wholesale and retail trade	548	4526	**12.11**
Hotels and restaurants	25	503	**4.97**
Transport, storage and communication	91	1121	**8.12**
Real estate, renting and business activities	193	1434	**13.46**
TOTAL	1246	11067	**11.26**

Note: foreign ownership defined with 10% threshold
Source: author's calculations

Table A5: Labor and capital elasticities

Variables	Coefficient (robust st. error)	
	OLS	**FE**
All period foreign owned	**0.69***** (0.04)	**-**
Acquisition dummy	**0.56***** (0.07)	**0.13***** (0.05)
Divestiture dummy	**0.69***** (0.08)	**-0.02** (0.06)
Ln Labor * Industry DA-DC	**0.48***** (0.03)	**0.25***** (0.02)
Ln Labor * Industry DD-DN	**0.52***** (0.02)	**0.22***** (0.02)
Ln Labor * Industry F	**0.55***** (0.02)	**0.24***** (0.02)
Ln Labor * Industry G-H-I	**0.46***** (0.01)	**0.26***** (0.01)
Ln Labor * Industry K	**0.55***** (0.02)	**0.27***** (0.02)
Ln Capital * Industry DA-DC	**0.36***** (0.02)	**0.22***** (0.03)
Ln Capital * Industry DD-DN	**0.27***** (0.01)	**0.20***** (0.02)
Ln Capital * Industry F	**0.25***** (0.02)	**0.26***** (0.02)
Ln Capital * Industry G-H-I	**0.31***** (0.00)	**0.25***** (0.01)
Ln Capital * Industry K	**0.16***** (0.01)	**0.09***** (0.03)
Industry year interactions	**yes**	**yes**

Note: dependant variable – log earnings from sales. Industry dummies denoted according to NACE classification.
*** 1% significance, ** 5% significance, * 10% significance.
Source: Author's calculations

Table A6: Dynamics of acquisition and divestiture effects

Variables	Coefficient (robust st. error)	
	OLS	FE
Acquisition:		
3 years before	**0.66***** (0.11)	**0.15*** (0.08)
2 years before	**0.63***** (0.10)	**0.16*** (0.08)
1 year before	**0.44***** (0.07)	**0.17*** (0.09)
Year of acquisition	**0.32***** (0.07)	**0.21**** (0.09)
1 year after	**0.41***** (0.08)	**0.26***** (0.10)
2 years after	**0.51***** (0.09)	**0.28**** (0.11)
3 and more years after	**0.77***** (0.11)	**0.45***** (0.11)
Divestiture:		
3 and more years before	**0.64***** (0.12)	**0.06** (0.08)
2 years before	**0.67***** (0.08)	**0.05** (0.09)
1 year before	**0.47***** (0.08)	**0.08** (0.09)
Year of divestiture	**0.31***** (0.09)	**-0.01** (0.115)
1 year after	**0.39***** (0.09)	**0.01** (0.13)
2 years after	**0.42***** (0.09)	**0.18** (0.13)
3 years after	**0.54***** (0.10)	**0.30**** (0.14)

Note: dependant variable – log earnings from sales. Industry specific labor and capital variables and industry-year interactions included.
*** 1% significance, ** 5% significance, * 10% significance
Source: Author's calculations