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The Impact of FDI on the Host Economy

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Abstract

The foreign direct investment (FDI) and its impact on performance of domestic firms has been studied in many empirical papers, which, however, present rather ambiguous results. I argue that this is due to some limitations of prevalently used methodology, which does not separate the FDI spillover effects from the changes in competitive environment faced by domestic firms. I propose a novel estimation strategy that allows me to disentangle FDI spillovers from the effects of competition changing in response to the entry of a foreign firm. I consider this issue on the industry level and I compare the effects of FDI to the impact of international trade on the domestic economy. My analysis covers the time period 2001 - 2007 and concerns both Western and Eastern European countries. My identification strategy leads me to confirm the presence of positive spillovers stemming from FDI.

Abstrakt

Přímé zahraniční investice a jejich dopad na domácí firmy byly analyzovány v mnoha empirických studiích, které ovšem nepřinesly jednoznačné výsledky. V článku ukazuji, že je to dané omezeními dosud používané metodologie, která neodděluje technologická zlepšení od změn v konkurenčním prostředí, jimž domácí firmy čelí. Navrhuji novou strategii odhadu, která mi umožňuje odlišit změny v technologii od změn v míře konkurence daných vstupem zahraniční firmy na trh. Studuji tuto problematiku na sektorální úrovni a porovnávám vliv zahraničních investic na domácí trh s vlivem mezinárodního obchodu. Má analýza pokrývá časové období 2001-2007 a týká se zemí jak východní tak i západní Evropy. Má identifikační strategie vede k potrvrzení pozitivního dopadu zahraničních investic na efektivitu domácích firem.

Keywords: FDI, MNE, horizontal spillovers, international trade

JEL classification: F23

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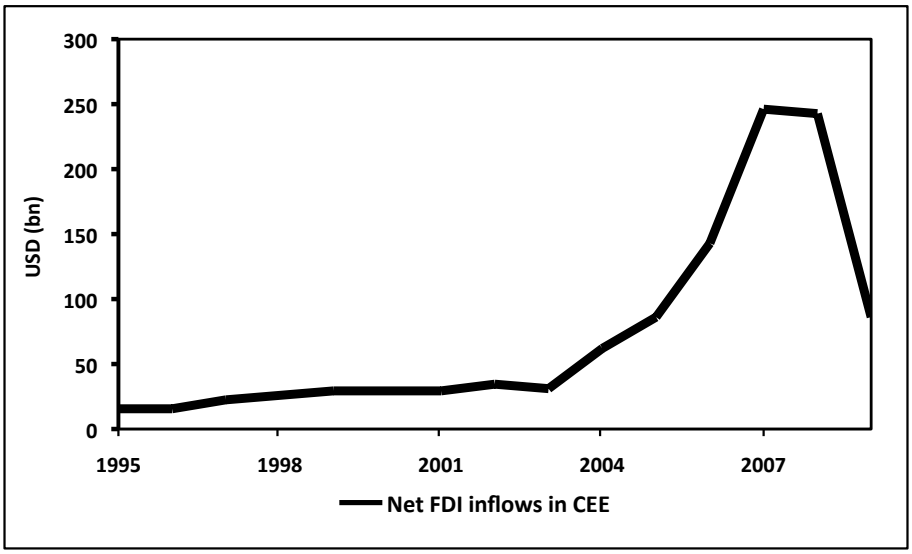
1 Introduction

Foreign direct investment (FDI) can be characterized as an operation by which a multinational enterprise (MNE) acquires substantial control over a domestic firm in the host economy. FDI can be realized in several ways, among which the literature distinguishes mainly between takeovers, where the foreign capital enters an existing domestic company, and greenfield projects, where a new firm is created with foreign capital. Under both of these arrangements, the volume of foreign direct investment in Central and Eastern European (CEE) countries has been increasing in the past twenty years, as depicted in Figure 1. It has generally been welcomed by domestic

Figure 1: FDI in CEE



Source: OECD

governments because the presence of a foreign firm is considered to have strong potential to improve domestic economic conditions. Instead of confirming this common expectation, however, empirical studies draw rather ambiguous conclusions as to whether the consequences of FDI are indeed as significant and as positive as it is believed.

As Meyer (2004) explains, this question is highly relevant for policymakers and for the MNEs themselves. Host country governments often try to attract foreign investors with substantial economic incentives, such as tax holidays, free acquisition

of real estate and enhanced infrastructure. Such expedients to attract FDI can be very costly and it is therefore crucial to know if the entry of a foreign investor indeed does indeed have the desired impact that would warrant the costs - both for the governments which decide whether to promote FDI or not, and for the MNEs which need to know their bargaining power in negotiations over the conditions of investment.

Following the existing literature dedicated to this topic, my research focuses in particular on the impact of FDI on the performance of domestic firms. In doing so, I leave aside the impact FDI has on the performance of the firm into which the investment is made, since this question does not induce any contradictions in the academic literature, there being strong evidence of positive effects on individual firm (Konings, 2000; Sgard, 2001). Rather, the focus of this paper is on the impact of FDI on other firms in the same industry, complementing the research that has been done in this field, which is very extensive but which still leaves many questions without clear and definitive answers. My paper addresses some of the issues that seem to be problematic in existing analyses.

Many papers examine the consequences of FDI on the performance of firms in CEE countries during transition. However, the conclusions are surprisingly contradictory, given that these studies deal with relatively comparable countries and comparable time periods, as well as basically using the same methodology - the Total Factor Productivity (TFP) approach. The point of my research is certainly not to increase the variance of results by adding another study that would consider the issue of FDI using exactly the same methodology. Therefore, although my approach is also inspired by TFP model, I complement it by a novel estimation strategy which allows me to consider aspects of the impact of FDI on the host economy which have not been identified in previous studies and which might explain some of the discrepancies among the existing literature.

This estimation strategy is based on a comparison of the competition given by the presence of MNEs on the local market as opposed to the competition induced

by international trade. This approach helps to disentangle the influence FDI might have through direct spillovers between a MNE and domestic firms from the effect that FDI has on the demand which domestic firms face. To my knowledge, none of the existing studies uses a similar approach, which is why they usually fail to clearly identify the different and often contradictory impacts of FDI on the host economy in their results. The purpose of my research is to filter out the spillover effect of FDI to see if the physical presence of foreign MNEs in a country has some advantages for the host economy compared to the situation when the country is just exposed to international trade.

2 Review of relevant literature

Although the existing empirical literature concerning the impact of FDI on the performance of firms in CEE countries is very rich, the particular issues it addresses are not very heterogeneous. The main concern is the technological transfer related to FDI. This technological transfer is represented by spillover effects, which may be of two types: horizontal and vertical. Horizontal spillovers concern transfers within the industry which the MNE entered, i.e., among its local competitors. Vertical spillovers concern either upstream (backward spillovers) or downstream (forward spillovers) domestic firms, i.e., the suppliers or the customers of the MNE respectively. A common belief is that technological transfer should occur because a technologically more advanced MNE enters into an environment where firms were stagnating under the centrally planned economy, and gives them a positive example which they can follow: they can copy the technologies, they can hire workers or managers that have had experience in this foreign company, and so on. This should increase the domestic firms' performance by improving their efficiency and thus create the positive impact on the domestic economy, for which FDI is so valued by governments.

However, empirical research suggests that in reality the situation might not be

as favorable as expected. There is a large discrepancy among the papers concerning both the results and the interpretation of these results. Often horizontal spillovers are found to be insignificant or negative and forward spillovers insignificant, whereas backward spillovers are found to be significant and rather positive[1]. The explanation for this is usually that whereas MNEs have no interest in improving the performance of their customers and have strong incentives not to improve the performance of their competitors, they might tend to help their own suppliers to improve performance and also the quality of the intermediate goods produced. The significance of backward spillovers make these a very compelling topic and since they were introduced for the first time by Javorcik (2004), special attention has been paid to them in the majority of most recent studies. Yet, even here the results differ. Whereas Gorodnichenko et al. (2007) find backward spillovers significantly positive, Stančík (2007) provides evidence to the complete contrary.

Hence, the most striking observation concerning the review of literature relevant to CEE countries is how conflicting the conclusions can be. One could argue that the disparity might arise from the fact that the papers deal with different countries and different time periods. Evidently, as Javorcik and Spatareanu (2005) point out, different CEE countries have experienced different transition paths, which have resulted in different economic conditions and made some of these countries more attractive for foreign investors. Nevertheless, in the same article, where they compare Romania and the Czech Republic, the authors themselves come to the conclusion that the disparity of results is more likely due to methodological issues than to differences between the countries studied. This is a very sound observation, because in fact, even in studies concerning the same country, one can find different results (cf. Stančík (2007) and Kosová (2008) who both study the Czech Republic, but using different methodological approaches).

A possible explanation for these differences can be found in Kosová (2008), who studies the impact of foreign presence on the growth and survival of domestic firms.

[1] for a detailed survey, see Hanousek et al. (2010)

The main contribution of her paper is in distinguishing between short-run and long-run effects and thus setting the issue in a dynamic context. Kosová's model is based on Jovanovic (1982), who describes how the efficiency of firms (included as a factor that determines the firms' cost function) influences their growth and survival in a competitive market. In Kosová's modification, the model is complemented by the presence of the foreign firm, which captures a share of demand, so reducing even further the domestic firms' output and making their survival even harder. This is an exogenous competition shock which changes the market conditions in the short run. The short-run effects of FDI are thus characterized as competition effects, given by the entry of an efficient foreign firm into the domestic economy, which is at that point in time in a certain equilibrium. This equilibrium is distorted by the new entrant and the domestic firms either leave the market (this is described as a crowding out effect) or accommodate to the situation. Therefore, in the short run, we observe a decline in efficiency given by firms that are being crowded out, which is the negative effect of FDI. As for the firms which are not crowded out and which manage to survive the negative short-run effect, they can adjust to the situation by increasing their efficiency in the long run. In Kosová's model, there are positive technological shocks due to the presence of the foreign firm that accumulate over time and reduce the cost function of the domestic firms in the long run, representing the technological spillovers that offset the short-run competition effect.

Kosová's paper clearly shows that if we do not separate the short run and the long run, we might measure the competition effect and the spillover effect simultaneously, without being able to understand exactly what the role is of each of them. As a result, we can misinterpret the overall effect as being positive, negative or insignificant, because we just do not see that it is composed of two opposite effects and we do not distinguish which one is offsetting the other in the given time period.

The models used in the majority of papers (with the exception of Kosová) are based on the Total Factor Productivity approach, where the augmented production function is estimated. Unfortunately, these models allow only an overall analysis of

the issue without identifying various effects that may play a role in the process of adjustment of the domestic economy to the entry of a foreign firm. Dobrinsky et al. (2000) say apropos this issue: “The operationalization of the analysis of the determinants of firm level efficiency requires in principle to define a structural efficiency model. This is still a rather blank field in economic theory and most empirical studies rely on partial models that allow to estimate reduced form equations. (p. 6)"

The fact that Kosová offers a clear structural model that explains the different roles of competition effects and of technological spillovers is therefore very important, because it allows us to better understand mechanisms that are hidden when the standard TFP model is used. It has to be said, though, that she studies only horizontal effects and focuses solely on the Czech Republic without taking into account regional factors, which represents an important limitation since the Czech Republic is too small and open an economy to be considered outside the regional context.

My own approach to the question of the impact of FDI on the host economy uses the basic structure of a TFP model, but the identification of the effect studied stems from theoretical predictions of Kosová (2008) and others. I thus contribute to the literature by separating the competition effect from the spillover effects within a reduced form model using a novel identification strategy. To make my methodology clear, I present the traditional approach used in literature in the following section; then I show why this approach fails to identify correctly the spillover effect and l explain why my methodological approach remedies this issue. Afterwards, I describe the data I use for the analysis, I provide my econometric specification and I present the results, including robustness checks and extensions.

2.1 Current estimation methodology

The main focus of the empirical literature studying the impact of FDI lies in estimating the production function. This method refers to the Solow model and the

standard neoclassical production function

$$F = AK^{\alpha}L^{1-\alpha} \quad ,$$

where A is an index of the level of technology, called Total Factor Productivity (TFP). Models derived from this representation generally use variations of the Cobb-Douglass production function and after taking logarithms and denoting the log of output by y and the vector of logs of inputs by $\mathbf{x}$, the models proposed for studying firms' productivity take the general form

$$y = \boldsymbol{\beta}'\mathbf{x} + TPF + \varepsilon \quad .$$

Furthermore, Total Factor Productivity (which is just the logarithm of the technological efficiency index) is supposed to depend linearly on some variables $\mathbf{z}$, which results in the final estimated equation

$$y = \boldsymbol{\beta}'\mathbf{x} + \boldsymbol{\delta}'\mathbf{z} + \varepsilon \quad .$$

The TFP approach, or more generally the representation of a firm's efficiency as its productivity, is very common and the production function estimation is the most widespread technique in empirical studies applied in this field. One of the seminal papers here is Nickell (1996), where the author's main purpose is to assess the impact of competition on corporate performance. Nickell regresses the output (measured as sales) on the inputs (number of employees for labor and tangible assets for capital), on the cyclical component (measured by overtime hours of workers) and on the variables of interest that represent the market competition. These variables should drive the changes in Total Factor Productivity and thus in the technical efficiency of the firm. Following the same logic, those authors who study the impact of FDI on firms' productivity use as the variable $\mathbf{z}$ some measure of the foreign presence in

the industry in question, coming to the specification

$$y = \boldsymbol{\beta}'\mathbf{x} + \delta \cdot FDI + \varepsilon$$

and asking about the sign and significance of δ.

There are several problems with production function estimation. One of them is that, according to the underlying economic theory, TFP measures the productivity of a firm only if the factors are efficiently allocated. However, as Bartelsman and Doms (2000) explain, this might not always be the case, meaning that the firm might not be able to optimize its inputs so quickly. In empirical papers such as Nickell (1996), this problem is accounted for by including the lagged output into the regression, which might help to obtain more precise estimates of the coefficients of the model. This is the approach I follow as well.

The second problem stems from a slight but important disparity between the underlying theoretical model of a production function and empirical studies performed on real data. The dependent variable of the theoretical model is the physical output of a firm, but such a variable is often unavailable to researchers. It is most usually proxied by the revenues (or sales) of the firm, i.e., the output multiplied by the price. But then the efficiency of the firm is influenced also by the price and demand components; in this case, the production function estimation might be problematic, because, as Melitz (2000) and Foster et al. (2005) show, this method does not allow one to separate the demand and the productivity shocks, or, in other words, the profitability and the technical efficiency described above.

In the following section, I explain how using the sales as a proxy for physical output influences the estimation of the impact of FDI in the production function framework.

2.2 Problem of the dependent variable

When we come back to the model of the Cobb-Douglas production function

$$F = AK^{\alpha}L^{1-\alpha} \quad ,$$

we can write the revenues of the firm as

$$R = P \cdot F = PAK^{\alpha}L^{1-\alpha} \quad ,$$

where P is the price of the good produced by the industry (in this simplified model, I consider the price to be constant over all firms in the industry and exogenous in the sense that each of the firms is supposed to be too small to affect the price in the industry).

After taking logarithms and denoting the log of revenues by $\widetilde{y}$ and the vector of the logs of inputs by $\mathbf{x}$, the model to be estimated takes the form

$$\widetilde{y} = \boldsymbol{\beta}'\mathbf{x} + \widetilde{TPF} + \varepsilon \quad ,$$

similar to above, but now the $\widetilde{TPF}$ term includes both logarithms of the price P and of the technical efficiency A.

Now suppose we claim, similarly as in the previous section, that $\widetilde{TPF}$ linearly depends on some measure of the foreign presence in the industry in question, and use the specification

$$\widetilde{y} = \boldsymbol{\beta}'\mathbf{x} + \delta \cdot FDI + \varepsilon \quad . \tag{1}$$

In this case, what does the coefficient δ tell us? It encompasses at the same time the effect of the foreign presence on the price for the industry and on the technical efficiency of the firm. It is therefore important to determine what sign of these effects we expect to obtain.

The theory of technological spillovers predicts that the impact of FDI on the

technical efficiency of the domestic firms should be positive, for reasons which I explained in the introduction to this paper. The question of how FDI impacts the price is addressed by Kosová (2008), who models the entry of a MNE in a domestic industry as the entrance of a dominant firm in a competitive environment. This means that the dominant foreign firm can affect the price so that its marginal revenues are equal to its marginal costs and the domestic firms (the competitive fringe) have to take this price as given. This new price will be lower than the price set before in the competitive environment and so we should expect the impact of FDI on the price for the industry to be negative.

The above reasoning is obviously very simplified, but it shows why the impact of FDI, when estimated within the framework of the equation (1), is ambiguous in nature: we can reasonably expect this impact to be a composition of two opposite effects. One effect is the technological transfer from MNEs to domestic firms, which is positive. The second effect is the competition effect given by decreasing prices, which is negative.

If the purpose of an analysis of the impact of FDI on the host economy is to decide upon the role of technological spillovers (which is the case of the majority of empirical papers), the applied methodology must allow the identification of such spillovers by disentangling them from the competition effect. A similar concern was already raised by Javorcik and Spatareanu (2005), who claimed that the spillover effect cannot really be observed properly if we do not control for the competition effect, and who criticized the fact that many authors omit, be it explicitly or implicitly, to incorporate competition effects into their models. As I discussed in the previous section, it is in fact hardly possible to control for the competition effect under the model that is prevalently used for the analysis of the impact of FDI in the current literature: the δ coefficient in equation (1) reflects both the competition effect and the spillover effect. If the spillover effect prevails, δ is positive, whereas if the competition effect prevails, δ is negative. The two effects may also cancel out, in which case δ is insignificant. Therefore, within the specification described above,

the spillover effect cannot be identified. This is why I propose a new estimation strategy to deal with this problem, which is described in the following section.

3 Sources of identification of the spillover effect

The motivation for my estimation strategy stems from a theoretical model proposed by Helpman et al. (2004), who study the conditions under which a firm decides to export or to invest abroad. This decision is known as a "proximity-concentration tradeoff": when a firm wants to serve a foreign market, it can either undertake an investment in the country in question (by buying a local enterprise or by founding a new one) or it can export. Helpman et al. (2004) discuss the aspects of this decision from the point of view of the investing/exporting firm, which is not in the scope of my research, but the existence of this tradeoff provides me with the argument that foreign competition on the domestic market, i.e. the competition given by foreign MNEs, can be of two sources. It can come from foreign firms that are located abroad through imports, or from foreign firms that are implanted in the country through FDI.

In both cases, we can still assume that foreign firms are dominant and local firms represent the competitive fringe: as Melitz (2003) shows, it is only the most efficient firms that engage in the FDI or in exporting, and so we can assume that these firms have competitive advantages over firms that serve only the local market. Hence, the competition effect is present in both cases (although it might be less pronounced in more developed markets where local firms may be closer in efficiency to MNEs). On the other hand, if the MNE is located abroad, there is smaller scope for technological spillovers which should be stronger if domestic firms are in close contact with the MNEs[2]. Therefore, the idea of my estimation strategy would be to compare how industrial sectors are influenced by the imports from abroad and

[2]This issue is discussed in many papers: Keller (2004) sees the international trade also as a source of technological spillovers, but Markusen and Venables (1999) claim that such spillovers need a face-to-face interaction with MNEs, similarly as Morita and Nguyen (2011) for whom FDI is the only or major source of spillovers.

by the presence of MNEs in the country. Using this approach, I will be able to filter out the competition effect, and if I find that firms in the sector with higher foreign presence are more efficient, I can conclude that it is due to positive spillover effects.

To illustrate this reasoning formally, we should come back to the equations presented in Section 2.2. Suppose we add a variable representing the share of imports in the equation (1):

$$\widetilde{y} = \boldsymbol{\beta}'\mathbf{x} + \delta_{FDI} \cdot FDI + \delta_{Imports} \cdot Imports + \varepsilon \quad .$$

When we suppose that δ_{FDI} represents the sum of competition and spillover effect and $\delta_{Imports}$ represents the competition effect only, than the spillover effect should be filtered out by taking the difference of the two coefficients. Therefore, if we find

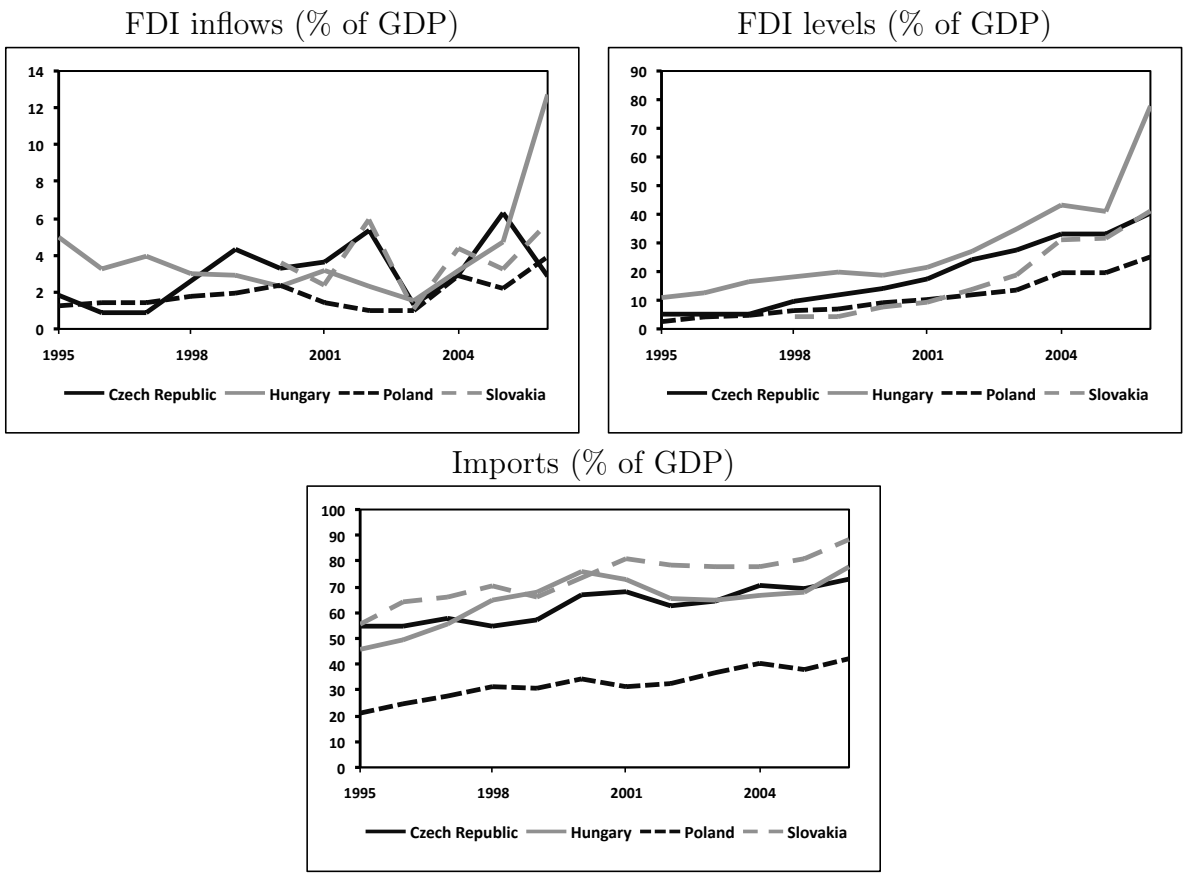
$$\delta_{FDI} - \delta_{Imports} > 0 \quad ,$$

we can conclude there is a positive spillover effect.

This estimation strategy requires variation in the composition of foreign competition: to be able to estimate both δ_{FDI} and $\delta_{Imports}$, I need to compare sectors which have a similar degree of foreign competition but which have different shares of imports versus production of local MNEs, which means that one sector has to have relatively more FDI presence and the other one has to have relatively more imports. Of course, the sectors should also be similar in other characteristics so that there are not other sources of variation. To be able to ensure such a source of variation, I will rely on time and cross-country dimensions of my analysis, taking into account the European countries between years 2001-2007. My assumption is that the composition of foreign competition in these countries during this time period varies for different reasons. It might be that the countries were more attractive targets for FDI in later years rather that at the beginning of the period. Second, some countries might, for political reasons, rather encourage FDI than open to imports and vice versa. As an example, the variation of FDI presence and of imports

is presented in Figure 2 for the countries of Visegrad group.

Figure 2: FDI and imports



Source: OECD and World Bank

Such an estimation strategy requires a specific dataset: I need not only the information about domestic and foreign firms, but also about imports in particular industries. The following section describes the data that I use for the analysis.

4 Data description

4.1 Geographic and time coverage

The analysis covers the time period 2001 - 2007 and focuses on European countries, which are considered to be either *Western* or *Eastern* countries. The Western countries are the countries of EU15 (Luxembourg being joint with Belgium) plus Iceland, Norway and Switzerland. The Eastern countries are the countries that joined the

EU in 2004 or 2007. The analysis was performed on both groups separately to see the differences between fully developed countries and those who had just undergone the transition period. A special attention was paid to the countries of the Visegrad group, for which the analysis is provided separately. The list of countries and their classification in groups can be found in Table 1.

Table 1: Analysed countries and their classification

Western countries	*Eastern countries*	*Visegrad group*
Austria	Bulgaria	Czech Republic
Belgium	Cyprus	Hungary
Denmark	Czech Republic	Poland
Finland	Estonia	Slovakia
France	Hungary	
Germany	Latvia	
Greece	Lithuania	
Iceland	Poland	
Ireland	Romania	
Italy	Slovakia	
Netherlands	Slovenia	
Norway		
Portugal		
Spain		
Sweden		
Switzerland		
United Kingdom		

4.2 Data sources

I used the AMADEUS database to obtain information about firms operating in the chosen countries: their performance, their financial and organizational characteristics, their ownership structure (especially if they are domestic or foreign) and their industry classification expressed by the three-digits NACE code (Rev. 1.1). I link

this database with information from UN COMTRADE data about international trade, which covers international exports and imports between the selected countries and their trade partners in the studied time period, disaggregated to the four- and five-digits SITC level (Rev. 3)[3].

4.3 Aggregation on industry level

Unlike in other papers concerning the subject of FDI, my analysis is performed on an industry level. It is still inspired by the estimation of production function, but all the characteristics are aggregated on an industry level in a way that will be described below. The motivation for this approach is simple: first, I am not interested in the impact of the foreign presence on particular firms, but rather on the average efficiency of domestic firms in an industry, and second, both FDI and trade are sectoral variables and so there is no individual source of variation of these variables at the level of the firm. The aggregation implicitly assumes that the parameters of the production function are constant across firms, but in this regard, my approach is not different from standard estimation of production function at the level of the firm with constant coefficients, such as has been presented by Nickell (1996) and others.

Aggregating and merging the two data sources that I use first requires the choice of the same level of aggregation and also to harmonize the two coding systems. I work on the SITC four- and five-digits level, in which the trade data is coded, and I aggregate the data to this level within each country and year[4].

The first step of the preparation of my dataset was thus to harmonize the SITC Rev. 3 codes with the NACE Rev. 1.1 codes and to transform the AMADEUS database into this new coding. I used for this purpose correspondence tables that can be downloaded from the United Nations Statistics Division[5]. There is no direct correspondence between these two coding systems, but I managed to link them by

[3] I use the same dataset as Frensch and Gaucaite-Wittich (2009)

[4] Minimum, average and maximum number of firms in an industry resulting from this aggregation can be found in Appendix A.

[5] `http://unstats.un.org/unsd/cr/registry/regot.asp?Lg=1`

means of other coding systems for which the correspondence tables are available. Further information about these technical issues can be provided upon request.

4.3.1 Firms data

In this data, I aggregate the firms' characteristics within each SITC industry for domestic firms by using the weighted averages over all firms in the industry, where weights represent the shares of domestic owners in the given firm. Hence, when I am interested in a characteristic X of domestic firms in industry i and time t, I obtain it as

$$\overline{X}_{it}^{domestic} = \frac{1}{N_{it}} \sum_{j=1}^{N_{it}} d_{ijt} X_{ijt} \quad ,$$

where N_i is the number of firms in industry i, X_{ij} is the given characteristic of the j-th firm in industry i and d_{ij} is the share of domestic owners in the j-th firm in industry i (all in time t). The upper bar denotes that I am considering a weighted average and the superscript *domestic* reminds of the fact that I use the share of domestic ownership as weights. I focus on domestic firms only, because these are the subject of my research question; this is the standard approach used in the literature, which also focuses solely on the subsample of domestic firms.

Apart from basic characteristics, I use the firms' data also to construct the measure of foreign presence given by FDI in the industry, a variable that I will denote FDI. Its construction is slightly more complicated and will be presented after the specification of my regression model.

4.3.2 Trade data

With regards to the trade data, to get the imports and exports on the SITC industry level, I summed over all importers in the case of imported goods and over all export destinations in the case of exported goods. I thus obtained for each industry in the four- and five-digits SITC classification the volumes of goods that were imported and exported. Then I linked this data with those created from AMADEUS database.

4.3.3 Resulting dataset

By aggregating and joining the two data sources, I obtained a unique dataset of approximatively 250 000 observations. It has the structure of an unbalanced panel of industries in the above mentioned countries over the period 2001 - 2007[6].

5 Specification

5.1 Estimation on industry level

As explained in the previous section, my analysis is performed on an industry level. It is still very similar to other papers dealing with the issue of FDI, since it is performed for the share of industry represented by domestic firms only and it is inspired by production function estimation. My specification is thus

$$\ln\left(\overline{Y}_{it}^{domestic}\right) = \boldsymbol{\beta}' \ln\left(\overline{\mathbf{X}}_{it}^{domestic}\right) + \boldsymbol{\delta}'\mathbf{Z}_{it} + \varepsilon_{it} \quad ,$$

where i is the industry index and t the time index. Further, Y denotes output, $\mathbf{X}$ denotes factor inputs, and $\mathbf{Z}$ stands for other covariates, related to the foreign presence on the domestic markets (FDI and imports). The logarithmic specification stems from the form of a production function. The construction of the variables $\mathbf{Z}$ is yet to be explained, but to understand the notation, one should remember that they are industry specific rather than firm specific, which is why they are not limited to the domestic share of firms only.

My choice of variables Y, $\mathbf{X}$ and $\mathbf{Z}$ as well as the assumptions about the error term ε will be specified below. Before that, several aspects of the industry level approach should be stressed.

First, let me point out that in my specification, I estimate the production function of the whole industry, not those of individual firms, which is in line with the purpose of my research - to evaluate the impact of FDI on the domestic industry

[6]The number of observations for each year can be found in Appendix A.

as a compact and dynamic structure.

Second, let me stress that the aggregation does not affect the covariates that represent the foreign presence, which are sectoral in principle and which are defined as such even in papers that focus on the firm level analysis.

Third, the aggregation before estimation makes me lose of course some source of variation (on within industry level) making my estimates less efficient. On the other hand, it may help to reduce the measurement error bias which is very likely to occur in firm level data, and this might outweigh the efficiency loss.

5.2 Choice and definition of variables

Following the seminal paper by Nickell (1996), I choose sales ($Sales$) to proxy the output variable Y and tangible fixed assets ($Assets$) and number of employees ($Employment$) to proxy the factor inputs $\mathbf{X}$. Moreover, I include in my specification the lagged values of output to account for the imperfect allocation of factor inputs. Descriptive characteristics of these variables can be found in Appendix A.

Concerning variables which indicate the foreign presence, I use the variable FDI to account for the FDI presence and $Imports$ to account for the foreign presence given by import flows. To explain the construction of these variables, I need to recapitulate my identification strategy for the spillover effect of FDI.

I claim that the overall impact of FDI, especially when estimated within the framework of production function with sales the dependent variable, is ambiguous, since it is composed of two contradictory effects: the competition effect and the spillover effect. Domestic firms are competing with foreign owned firms in sales on the market (and so their sales may be lowered), but they can supposedly benefit from the presence of the foreign owned firms by technology spillovers.

To identify the possible spillover effect, I want to compare the effect of FDI to the effect of competition given by international trade: I claim that domestic firms compete also with foreign firms that serve the domestic market through imports and that this can be comparable to the competition given by foreign owned firms

implanted in the country. The difference is that there should not be technology spillovers in this case, because of the geographical barrier between domestic and foreign firms.

Therefore, my aim is to compare the impact of FDI with the impact of imports, and if the difference between the two is positive, it could be attributed to the existence of technological spillovers. Yet, for this comparison to be possible, both variables should be defined in line with the underlying heuristic presented above.

Since the effect of competition that I am trying to filter out is channeled through the sales of firms, my definition of the two variables, FDI and $Imports$, is based on these. Basically, I define the foreign presence given by FDI as the ratio of the sales of foreign owned firms in a given industry over the sales of all firms operating in that industry (in a given country), and the foreign presence given by imports as the ratio of the volume of imported goods in an industry over the sales of all firms operating in that industry (in a given country). This is quite a simple definition, however, there are two issues that have to be taken into account.

First, I have to deal somehow with the timing of FDI. I do not really expect the spillover effect, if there is such, to take place instantaneously. In my opinion, even if domestic firms could benefit from the presence of FDI, they would need some time to accommodate and to incorporate possible technological improvements into their production. Therefore, when I say that I define the foreign presence given by FDI as the ratio of the sales of foreign-owned firms in a given industry over the sales of all firms operating in that industry, I should add that it is in fact the sales of foreign owned firms that were already foreign-owned in the previous year which I use in the numerator of this ratio. More precisely, my definition is as follows:

$$FDI_{it} = \frac{\sum_{j=1}^{N_{it}} f_{ijt-1} Sales_{ijt}}{\sum_{j=1}^{N_i t} Sales_{ijt}} \quad ,$$

where t is time, N_i is the number of firms in industry i, $Sales_{ij}$ are the sales of

the j-th firm in industry i and f_{ij} is the share of foreign owners in the j-th firm in industry i.

Note that this definition is the same as used by Javorcik (2004), the only difference is that I use the lagged and not the current share of foreign owners. Note also that this variable is not a lagged variable in the usual sense, because it still represents the share of current sales of foreign-owned companies that are operating in the market, only the companies that have just been created or purchased by a foreign owner in the current year are not included. The only assumption that has to be made here is that companies which were foreign-owned in the previous year are still foreign-owned in the current period, or at leas that, even if they were sold again to a domestic owner, they have kept the efficiency level they have had under the foreign owner. I believe such an assumption is not unrealistic. Descriptive characteristics of FDI and its evolution over the studied period can be found in Appendix A.

The foreign presence given by FDI, the measure of which I have just defined, is compared to the foreign presence given by imports. My definition of imports is the following:

$$Imports_{it} = \frac{ImpVol_{it}}{\sum_{j=1}^{N_{it}} Sales_{ijt}} \quad ,$$

where $ImpVol$ is the volume of imported goods in industry i and otherwise the notation is the same as for the definition of FDI. In other words, in my definition, imports represent the volume of imported goods normalized by the size of the industry. Descriptive characteristics $Imports$ can be found in Appendix A.

At this point we can consider the second issue that has to be solved before the variables FDI and $Imports$ can be used to identify the potential spillover effect. We have to realize that whereas by construction, the variable FDI is from the interval $[0, 1]$, the variable $Imports$ can have any positive value. The reasons are that first, there is nothing that prevents the imports from being larger than domestic production and second, whereas from the UN COMTRADE, I have the complete

information about international trade, from the AMADEUS database, I have only a representative (even though very large) sample of firms and so I do not capture the whole domestic production. This implies that the two variables are measured in very different units. As is usual in such cases, I decided to standardize both variables by dividing them by their standard deviation, to get them on a comparable scale.

5.3 Econometric specification

I run two different specifications. In the first one, I account only for the influence of FDI, whereas in the second one, I account both for the influence of FDI and of imports. In both specifications, I use time and industry fixed effects (the industry being in fact an industry-state unit, because I aggregate over firms in industries only within countries, not across).

Hence, my first specification is

$$\begin{aligned}\ln(Sales_{it}) &= \beta_0^{(1)} + \beta_1^{(1)} \ln(Sales_{it-1}) + \beta_2^{(1)} \ln(Assets_{it}) + \beta_3^{(1)} \ln(Employment_{it}) + \\ &+ \delta_{FDI}^{(1)} FDI_{it} + \gamma_i + \gamma_t + u_{it} \quad ,\end{aligned}$$

and my second specification is

$$\begin{aligned}\ln(Sales_{it}) &= \beta_0^{(2)} + \beta_1^{(2)} \ln(Sales_{it-1}) + \beta_2^{(2)} \ln(Assets_{it}) + \beta_3^{(2)} \ln(Employment_{it}) + \\ &+ \delta_{FDI}^{(2)} FDI_{it} + \delta_{Imports}^{(2)} Imports_{it} + \gamma_i + \gamma_t + u_{it} \quad .\end{aligned}$$

Every estimation is run twice: first on the whole sample of industries in the given geographical region, and second on industries that are not oriented to exporting. The estimation on the whole sample is presented basically for the sake of completeness of my analysis. My identification strategy that is based on filtering out the competition effect can work only when we talk about the competition in the domestic market, because I compare imported goods (which are obviously sold only in the domestic market) to sales of firms operating in the industry. If a significant

part of the production of the domestic firms goes for export, then my identification strategy cannot really work.

In reality, most of the industries have both import and export flows, because they are industries with differentiated products. Hence, I cannot really find an industry that would be purely import-oriented and as a consequence, my identification strategy is not flawless. However, I can at least focus on industries that are less export-oriented than others, which is why I run for each geographical region a second estimation, only on a subsample of industries where the exports (normalized by total sales) are below the median for the whole sample. This is the estimation that I focus on when evaluating my research hypotheses, presented in the following section.

5.4 Hypotheses

The literature on spillover effects claims that if these are present, the coefficient δ_{FDI} should be positive. However, if only the first specification is used (and this is the case of the existing literature on this issue), it is often found insignificant or negative. I argued throughout this paper that this might be because in this specification, the variable FDI influences the output in two opposite ways: by inducing the negative competition effect and the positive spillover effect at the same time. Hence, I have a priori no hypothesis about the coefficient $\delta^{(1)}_{FDI}$; I introduce this specification basically only to compare my results with studies made on firm level.

To account for the foreign competition, I introduce in the model the $Imports$ variable, which should also represent the negative competition effect but no positive spillover effect. To verify this, I test if the coefficient $\delta^{(2)}_{Imports}$ is negative:

Hypothesis 1:

$$H_0: \ \delta^{(2)}_{Imports} \geq 0 \quad \text{vs} \quad H_A: \ \delta^{(2)}_{Imports} < 0 \ .$$

In my second specification, I can compare the coefficients δ_{FDI} and $\delta_{Imports}$ and if their difference is positive, I can conclude that there is a positive spillover effect present:

Hypothesis 2:

$$H_0 : \ \delta^{(2)}_{FDI} - \delta^{(2)}_{Imports} \leq 0 \quad \text{vs} \quad H_A : \ \delta^{(2)}_{FDI} - \delta^{(2)}_{Imports} > 0 \ .$$

Hence, the rejection of H_0 of the first hypothesis justifies my identification strategy and the rejection of H_0 of the second hypothesis proves the presence of positive spillover effects of FDI.

6 Results

All regression tables with results can be found in Appendix B[7] and there are several observations that can be made based on these.

First, it has to be said that in all specifications and subsamples, the effect of FDI (when measured solely by the coefficient on this variable) is estimated as negative. This is in line with the results of many other papers concerning this topic and also with the metaanalysis proposed by Hanousek et al. (2010), and it shows that even if my definition of foreign presence given by FDI inflow is slightly different from the other studies and even if my estimation is run on industry level rather than on firm level, I come to comparable results. Hence, if my findings differ from those already published, it is not because of the construction of my dataset nor my variables, but just because of my identification strategy.

Second, in all specifications and all subsamples, the effect of $Imports$ is negative and significant. I can reject the null of *Hypothesis 1* and conclude that imports really induce a negative competition effect on domestic firms, supporting thus the

[7]They are presented in separate tables first for Western countries, then for Eastern countries, and finally for the Visegrad group. The results of the estimation over the whole sample can be found in the first three columns, the results for the subsample of non export oriented industries are in the the last three columns.

assumption on which my estimation is based.

Third, the results differ in the estimation performed over the whole dataset as compared to the estimation over the subsample of non-export-oriented firms. In line with my expectations, in the latter one, the negative effect of imports is more pronounced: in this subsample, domestic firms serve the domestic market and compete with imported goods. On the other hand, the effect of FDI is less negative for the subsample, and this result is consistent over all geographic regions. One possible explanation could be the following. In export-oriented industries, both domestic and foreign-owned firms compete in the domestic market as well as abroad - their target market should be approximatively the same because of the same geographical constraints. We could expect that competing on markets abroad might be more difficult for domestic firms, because foreign owned firms might have some support from an international network created by MNEs, and so export oriented domestic firms might suffer more from the competition than firms that sell their production in the domestic market, where the advantage of having a foreign owner is not that strong.

6.1 Main results and tests

As I have already explained, it is the subgroup of non-export-oriented firms that is more suitable for my identification strategy and hence I focus on the results coming from the estimation over this subsample to answer my research question about the presence of positive spillovers. I present these results separately in Table 2.

We can see in this table that the coefficient on FDI is consistently less negative than the coefficient on $Imports$ and so it may seem that I can reject the H_0 of my *Hypothesis 2* presented in Section 5.4. I test this hypothesis formally using a one-sided t-test of the difference of the two coefficients. The results of this test for each of the three regions are presented in Table 3[8] and they confirm that I can reject the H_0 at 95% confidence level for Eastern countries and the countries of the

[8]Note that due to the number of observations, I use standard normal distribution as an asymptotic approximation of the t-distribution to determine the p-values.

Table 2: Overview of main results

	Western countries	Eastern countries	Visegrad group
FDI	-0.103***	-0.058***	-0.058***
	(0.005)	(0.004)	(0.007)
Imports	-0.148***	-0.126***	-0.246***
	(0.032)	(0.031)	(0.088)
Lagged Sales	0.012***	0.008*	0.009*
	(0.004)	(0.004)	(0.005)
Tangible fixed assets	0.433***	0.520***	0.694***
	(0.010)	(0.007)	(0.010)
Employment	0.285***	0.311***	0.133***
	(0.010)	(0.010)	(0.010)
Year effects	Yes	Yes	Yes
R^2	0.517	0.744	0.797
Observations	86737	38691	18331

The table presents the results from the FE estimation of the main specification for different subgroups of countries, where only the subsample of non-export-oriented industries is taken into account.
The dependent variable is Sales. Sales, Assets and Employment are in logarithms.
Clustered standard errors are in parentheses.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Visegrad group, whereas for Western countries, the statistical significance is a little bit less strong (but still valid at 90% confidence level).

To sum up, I can reject the null hypothesis that the effect of FDI is more negative than the effect of imports: I find the difference of these two effects to be positive. This result supports the theory that there might be positive spillover effects stemming from FDI, and thus answers my main research question, but it merits further comment.

6.2 Regional difference

It is interesting to compare the estimation results for the three geographical regions. If we define the spillover effect as the difference between the coefficients on FDI and on $Imports$, we see it is the largest for the countries of the Visegrad group

Table 3: Hypothesis testing

	Western countries	Eastern countries	Visegrad group
t-statistic	1.407	2.152	2.121
p-value	0.080	0.016	0.017

The table presents the results of the test of positive difference between the effect of FDI and of Imports. The null hypothesis is that this difference is negative.
The results are presented for different subgroups of countries and only the subsample of non-export-oriented industries is taken into account.
Note: p-values of asymptotic one-sided test are based on standard normal distribution.

and relatively smaller for Eastern countries as a whole and for Western countries. This result can be interpreted in line with other papers analyzing the effect of FDI: it is hypothesized that to internalize the spillover effect, the domestic companies should not be too inferior in terms of efficiency to the MNEs, because when the efficiency gap is too wide, the domestic companies are not able to "catch up". Hence, the spillover effect is a U-shaped function of domestic firms' efficiency: if domestic firms' efficiency is very small compared to MNEs, the spillover effect is weak because of the inability to internalize; if domestic firms' efficiency is similar to the efficiency of MNEs, the spillover effect is also weak because there is not too much scope for improvement; if the gap between domestic firms and MNEs is significant but moderate, the spillover effect the strongest[9].

If we assume that domestic firms in Western countries are the closest to MNEs in terms of efficiency, we should not be surprised that there is not a very significant spillover effect present - there is not too much to learn from the point of view of domestic firms. Further, when we inspect the descriptive statistics of the data, we notice that the firms of the Visegrad group are closer in their characteristics to the Western firms than the mean of Eastern firms. This signals that within the group of Eastern countries, the countries of the Visegrad group are rather above the average and they are then also closer to MNEs in terms of efficiency, even though the gap is still very significant. This observation together with the theory of the U-shaped

[9]For more details, see Smeets (2008)

effect presented above could explain the differences we observe among regions.

6.3 Evaluation of the impact

Not only do we have to conclude that the countries of the Visegrad group seem to benefit the most from FDI spillovers, we can also see (from the descriptive statistics presented in Appendix A) that the presence of MNEs in these countries is above the average for Eastern Europe, reinforcing the economic significance of the estimated positive effect. It is interesting to see how important the spillovers from FDI is in the three regions when we take into account not only the estimated coefficients, but also the change in the presence of MNEs.

To assess the importance of the effect of FDI, I evaluate the following expression:

$$Effect = (\delta_{FDI} - \delta_{Imports}) \cdot \Delta FDI \quad , \tag{2}$$

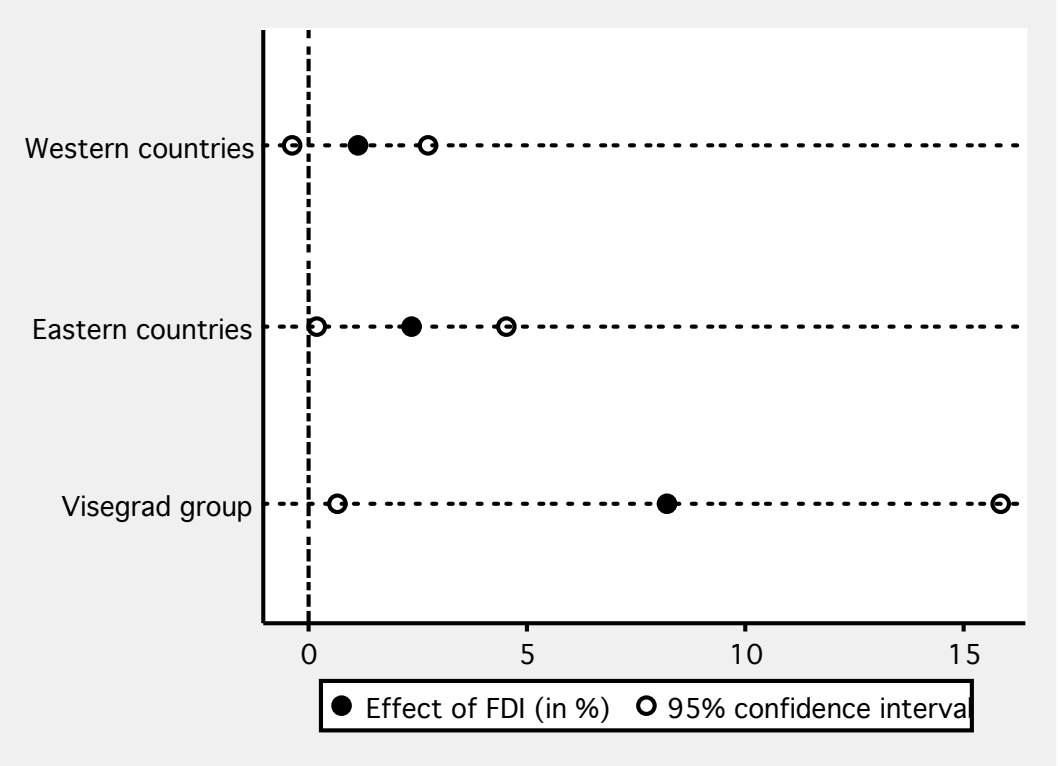
where δ_{FDI} and $\delta_{Imports}$ are the estimated coefficients from Table 2 and ΔFDI is the difference of the average foreign presence between the years 2002 and 2007. Because of the semi-logarithmic specification of the regression equation, one unit change of FDI induces a change of domestic firms' sales by one percent and the effect of FDI is thus measured as a percent change.

In Figure 3, I visualize the values of the expression (2) separately for the three regions together with its 95% confidence interval[10].

In this figure, we observe (in line with results presented above) that the effect is significant for Eastern countries and for countries of the Visegrad group. For the countries of the Visegrad group, it is much larger than for Eastern countries as a whole, which is given both by the size of the estimated effect and by the large increase of foreign presence in these countries.

[10]To obtain the measure of the effect in percents, I multiply all values by 100.

Figure 3: Effect of FDI



6.4 Alternative explanation of the positive spillover

My conclusion that there is a positive spillover effect stemming from FDI is based on the assumption that we may proxy the increase in competition due to FDI by a comparable increase in international trade (imports). This assumption is in line with theoretical models such as Melitz (2003) or Markusen and Venables (1999), but for the completeness of my analysis, it has to be admitted that in the real word, this assumption might be violated. A company that enters a market via FDI may have different long-term objectives and therefore different strategic (pricing) behavior than a foreign exporter whose goods are imported to the market. Such difference can also lead to the positive difference between the two coefficients which I interpret as a positive spillover effect. Therefore, if the main assumption about the comparable effects of the two types of foreign competition does not hold, the positive effect of FDI as compared to imports should not be interpreted as a technological spillover. However, from a policy point of view, it still confirms that foreign investment can

be more beneficial for domestic firms than foreign imports.

7 Robustness checks

7.1 Alternative control variables

It has to be admitted that the validity of the results presented depends on how well the chosen variables proxy the control variables of the theoretical model, especially labor and capital. In my estimation, I choose total fixed assets and number of employees, because these are often used in the stream of literature to which I am relating my analysis. However, some authors also suggest using the working capital as a measure of capital used for production and the staff costs as a measure of labor.

To see how the different choices of proxies for control variables affect my results, I performed the same estimation with different combinations of proxies for capital and labor. The results for the countries of the Visegrad group are presented in Appendix C, where we can observe a consistent positive difference between the coefficients on FDI and on $Imports$ for non export oriented industries, signaling the presence of a positive spillover effect from FDI in line with the results discussed above. The whole set of results for Western and Eastern countries is not published in the paper, but it can be provided upon request.

7.2 Spillovers vs technological intensity

The analysis I performed brings information only about the average impact of FDI on domestic industries. However, I am aware of the fact that all industries are not the same and the way in which they respond to the foreign presence can be very heterogenous, also because the channels of potential spillovers are very diverse, including copying new technologies, benefiting from a better trained workforce or managers due to labor turnover, getting access to higher quality intermediate products, etc. Each of these channels may play a different role, especially if the industries differ in the intensity with which they use technologies or in their capital to labor

ratio.

This is why I extend my analysis by taking into account the degree of technological intensity, relying on the official OECD classification, according to which industries in manufacturing can be divided into four categories: high-technology industries, medium-high-technology industries, medium-low-technology industries and low-technology industries[11]. Based on this classification, I divide the industries in my dataset into two groups: the first group contains high and medium-high technology industries and the second group contains the rest. I estimate my model over the two groups separately.

The results of the analysis (for non export oriented industries only) are reported in Appendix D. Comparing the coefficients on FDI and $Imports$, we can see that for Western countries, the impact of FDI seems to be more accentuated in the case of high and medium-high technology industries, whereas in Eastern countries, including the countries of the Visegrad group, it is the other way round. This observation is somehow limited by the fact that for Eastern countries, the coefficient on $Imports$ for the first group of industries is not significant [12], yet it suggests that mechanisms through which the spillovers from FDI are channelled may be substantially different in Western and Eastern countries.

7.3 Industries containing a low number of firms

Table 4 suggests that the minimum number of firms in an industry is one. Since the precision of the industry-level measures could vary with the number of firms per industry and industries with a low number of firms can be noisy, as a robustness check, I repeated the analysis focusing only on industries where the number of firms in the industry is larger than 10 (these industries represent 95% of the sample). The results were not significantly different from those presented here.

[11]The details of the classification by 3-digits NACE codes can be found in OECD (2001).

[12]Due to the size of the standard error, compared to previous estimations, I would say that this is due to low variation in imports in this particular subsample.

8 Conclusion

In this paper, I contributed to the literature concerning the impact of FDI on the host economy by presenting a new identification strategy for the horizontal spillover effect. I explained why this effect is not correctly identified in papers that take into account only the presence of firms with foreign owners in the domestic market. I pointed out that the positive spillovers might be outweighed by a negative competition effect if the competition environment is not controlled for. My strategy for identification of spillovers is to compare the effect induced by foreign firms that import on the domestic market with the effect induced by foreign firms that actually operate in the domestic economy: the difference between these effects should be attributed to potential spillovers. I performed the analysis on a large panel of industries in European countries in the period 2001-2007.

To study the effect of FDI on data at industry level is a novel approach by itself, but as I explain and as I show by applying it to the traditional specification that is used with firm level data, it does not change the very principle of the analysis, it just improves some of its statistical properties. The key contribution of my paper lies in the comparison of the two sources of foreign competition which enables me to properly isolate the spillover effect and to confirm its positive impact on the performance of domestic firms. I support my results by a robustness check of the quality of the proxies for my control variables and I extend them while discussing regional and technological differences between industries.

I find an economically significant positive effect of FDI on the performance of domestic firms especially for the countries of the Visegrad group. The effect is the strongest for industries with lower technological intensity, where it is consistently significant across all specifications.

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A Descriptive statistics

Table 4: Number of firms per industry

	# of firms
Min	1
Median	74
Max	13289

Table 5: Number of observations per year

	# of observations
2001	34763
2002	39161
2003	42063
2004	46656
2005	47132
2006	47030
2007	33551

These numbers correspond to the set of all countries.

Table 6: Descriptive statistics of explanatory and control variables

	Western countries	Eastern countries	Visegrad group
Sales	40.380	5.844	9.753
	(156.124)	(19.565)	(27.542)
Tangible fixed assets	6.656	2.451	4.058
	(22.472)	(10.088)	(13.987)
Employment	88	83	114
	(280)	(122)	(153)
Observations	197996	92361	42389

Means of the variables are presented. Standard errors are in parentheses.
Sales and tangible fixed assets are in millions of current EUR.
Employment is measured as number of employees.

Table 7: Descriptive statistics of FDI

Year	Western countries	Eastern countries	Visegrad group
2002	19.50	20.91	24.31
	(21.48)	(27.25)	(28.52)
2003	22.45	28.85	37.81
	(21.95)	(29.11)	(27.98)
2004	24.35	28.47	41.74
	(22.99)	(29.69)	(26.53)
2005	23.24	39.81	39.12
	(21.78)	(28.49)	(27.54)
2006	26.98	37.74	42.49
	(24.16)	(28.87)	(28.16)
2007	24.46	31.83	32.02
	(24.32)	(35.76)	(40.08)

Mean of the share of foreign owners is presented.
Standard errors are in parentheses.
The variable is measured in percents.

Table 8: Descriptive statistics of imports

Year	Western countries	Eastern countries	Visegrad group
2002	51050	11822	14669
	(339953)	(51452)	(54691)
2003	50316	9849	16058
	(343837)	(46573)	(61404)
2004	53004	9873	17575
	(366435)	(46092)	(66339)
2005	52889	10293	17611
	(373335)	(45076)	(62587)
2006	59024	12492	21936
	(414975)	(61843)	(83513)
2007	59199	8898	18634
	(361961)	(38253)	(57631)

Mean of the volume of imported goods is presented.

Standard errors are in parentheses.

The variable is measured in millions of current EUR.

B Main results

Table 9: Western countries

	All industries		Non-export-oriented	
	(1)	(2)	(1)	(2)
FDI	-0.129***	-0.138***	-0.102***	-0.103***
	(0.004)	(0.004)	(0.005)	(0.005)
Imports		-0.100***		-0.148***
		(0.004)		(0.032)
Lagged Sales	-0.018***	-0.015***	0.012***	0.012***
	(0.003)	(0.003)	(0.004)	(0.004)
Tangible fixed assets	0.388***	0.377***	0.435***	0.433***
	(0.007)	(0.007)	(0.010)	(0.010)
Employment	0.336***	0.330***	0.286***	0.285***
	(0.007)	(0.006)	(0.010)	(0.010)
Year effects	Yes	Yes	Yes	Yes
R^2	0.479	0.489	0.516	0.517
Observations	173480	173480	86737	86737

Clustered standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 10: Eastern countries

	All industries		Non-export-oriented	
	(1)	(2)	(1)	(2)
FDI	-0.059***	-0.066***	-0.057***	-0.058***
	(0.003)	(0.003)	(0.005)	(0.004)
Imports		-0.051***		-0.126***
		(0.005)		(0.031)
Lagged Sales	-0.010***	-0.014***	0.009*	0.008*
	(0.003)	(0.003)	(0.005)	(0.004)
Tangible fixed assets	0.504***	0.498***	0.522***	0.520***
	(0.005)	(0.005)	(0.007)	(0.007)
Employment	0.297***	0.299***	0.310***	0.311***
	(0.007)	(0.007)	(0.010)	(0.010)
Year effects	Yes	Yes	Yes	Yes
R^2	0.710	0.712	0.744	0.744
Observations	81392	81392	38691	38691

Clustered standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 11: Visegrad group

	All industries		Non-export-oriented	
	(1)	(2)	(1)	(2)
FDI	-0.056***	-0.062***	-0.056***	-0.058***
	(0.004)	(0.004)	(0.007)	(0.007)
Imports		-0.038***		-0.246***
		(0.006)		(0.088)
Lagged Sales	-0.007*	-0.008**	0.010*	0.009*
	(0.004)	(0.004)	(0.005)	(0.005)
Tangible fixed assets	0.570***	0.565***	0.696***	0.694***
	(0.007)	(0.007)	(0.010)	(0.010)
Employment	0.209***	0.209***	0.133***	0.133***
	(0.007)	(0.007)	(0.010)	(0.010)
Year effects	Yes	Yes	Yes	Yes
R^2	0.736	0.737	0.797	0.797
Observations	36803	36803	18331	18331

Clustered standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

C Alternative control variables

Table 12: Working capital

	All industries		Non-export-oriented	
	(1)	(2)	(1)	(2)
FDI	-0.051***	-0.057***	-0.059***	-0.061***
	(0.003)	(0.003)	(0.005)	(0.005)
Imports		-0.042***		-0.242***
		(0.005)		(0.076)
Lagged Sales	0.004	0.003	0.034***	0.034***
	(0.003)	(0.003)	(0.005)	(0.005)
Working capital	0.572***	0.570***	0.649***	0.647***
	(0.006)	(0.006)	(0.011)	(0.011)
Employment	0.224***	0.222***	0.189***	0.189***
	(0.006)	(0.006)	(0.009)	(0.009)
Year effects	Yes	Yes	Yes	Yes
R^2	0.749	0.750	0.788	0.789
Observations	36036	36036	18112	18112

Clustered standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 13: Staff costs

	All industries		Non-export-oriented	
	(1)	(2)	(1)	(2)
FDI	-0.087***	-0.090***	-0.096***	-0.098***
	(0.004)	(0.004)	(0.007)	(0.007)
Imports		-0.016***		-0.196***
		(0.005)		(0.071)
Lagged Sales	-0.085***	-0.085***	-0.080***	-0.080***
	(0.004)	(0.004)	(0.005)	(0.005)
Tangible fixed assets	0.532***	0.531***	0.682***	0.682***
	(0.009)	(0.009)	(0.010)	(0.010)
Staff costs	0.320***	0.318***	0.227***	0.226***
	(0.008)	(0.008)	(0.008)	(0.008)
Year effects	Yes	Yes	Yes	Yes
R^2	0.770	0.770	0.819	0.819
Observations	38619	38619	19045	19045

Clustered standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 14: Working capital & Staff costs

	All industries		Non-export-oriented	
	(1)	(2)	(1)	(2)
FDI	-0.082***	-0.088***	-0.092***	-0.094***
	(0.003)	(0.003)	(0.005)	(0.005)
Imports		-0.037***		-0.302***
		(0.004)		(0.098)
Lagged Sales	-0.074***	-0.074***	-0.046***	-0.046***
	(0.004)	(0.004)	(0.005)	(0.005)
Working capital	0.482***	0.481***	0.616***	0.615***
	(0.009)	(0.009)	(0.010)	(0.010)
Staff costs	0.323***	0.319***	0.219***	0.218***
	(0.008)	(0.008)	(0.009)	(0.009)
Year effects	Yes	Yes	Yes	Yes
R^2	0.734	0.736	0.784	0.785
Observations	37859	37859	18832	18832

Clustered standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

D Spillovers vs technological intensity

Table 15: Results by technological intensity

	High and medium-high			Low and medium-low		
	West	East	Vis	West	East	Vis
FDI	-0.095***	-0.049***	-0.034***	-0.100***	-0.052***	-0.056***
	(0.007)	(0.005)	(0.009)	(0.006)	(0.008)	(0.012)
Imports	-0.169**	-0.010	-0.153	-0.114***	-0.138***	-0.316***
	(0.068)	(0.090)	(0.176)	(0.032)	(0.021)	(0.118)
Lagged Sales	0.000	0.038***	0.048***	0.022***	-0.025***	-0.031***
	(0.007)	(0.007)	(0.009)	(0.004)	(0.006)	(0.007)
Tangible fixed assets	0.598***	0.436***	0.680***	0.279***	0.581***	0.699***
	(0.012)	(0.010)	(0.018)	(0.012)	(0.010)	(0.012)
Employment	0.165***	0.408***	0.183***	0.451***	0.241***	0.087***
	(0.013)	(0.013)	(0.018)	(0.011)	(0.013)	(0.013)
Year effects	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.579	0.761	0.825	0.498	0.744	0.782
Observations	39408	16433	8456	47329	22258	9875

Clustered standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

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