ERASMUS UNIVERSITY ROTTERDAM

# Does Foreign Ownership in Firms Increase Productivity and Create Productivity Spillover Effects?

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# The Case of East Europe and Central Asia

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## Table of Contents

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**Abstract**

This thesis theoretically and empirically investigates the impact of foreign investment and foreign ownership on firm and industry productivity. A general equilibrium model with firm heterogeneity, employed by Melitz(2003), suggests a positive direct and indirect impact of foreign ownership on increase in sales through the transfer of technology, know-how and efficiency in production. The empirical analysis, employing firm level data on East European and Central Asian countries over the period 2002, 2004, 2007, 2009 confirms, in a limited number of cases, a significantly positive direct and indirect impact of foreign ownership on firm's and industry's sales. However, no significant evidence has been found in favor of an additional indirect effect of foreign ownership on joint ventures in an industry. The statistical results in general, when found, support the theoretical hypothesis. This thesis and the research are a fresh start for analyzing the effects of foreign investments in Eastern European and Central Asian countries.

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## 1. Introduction

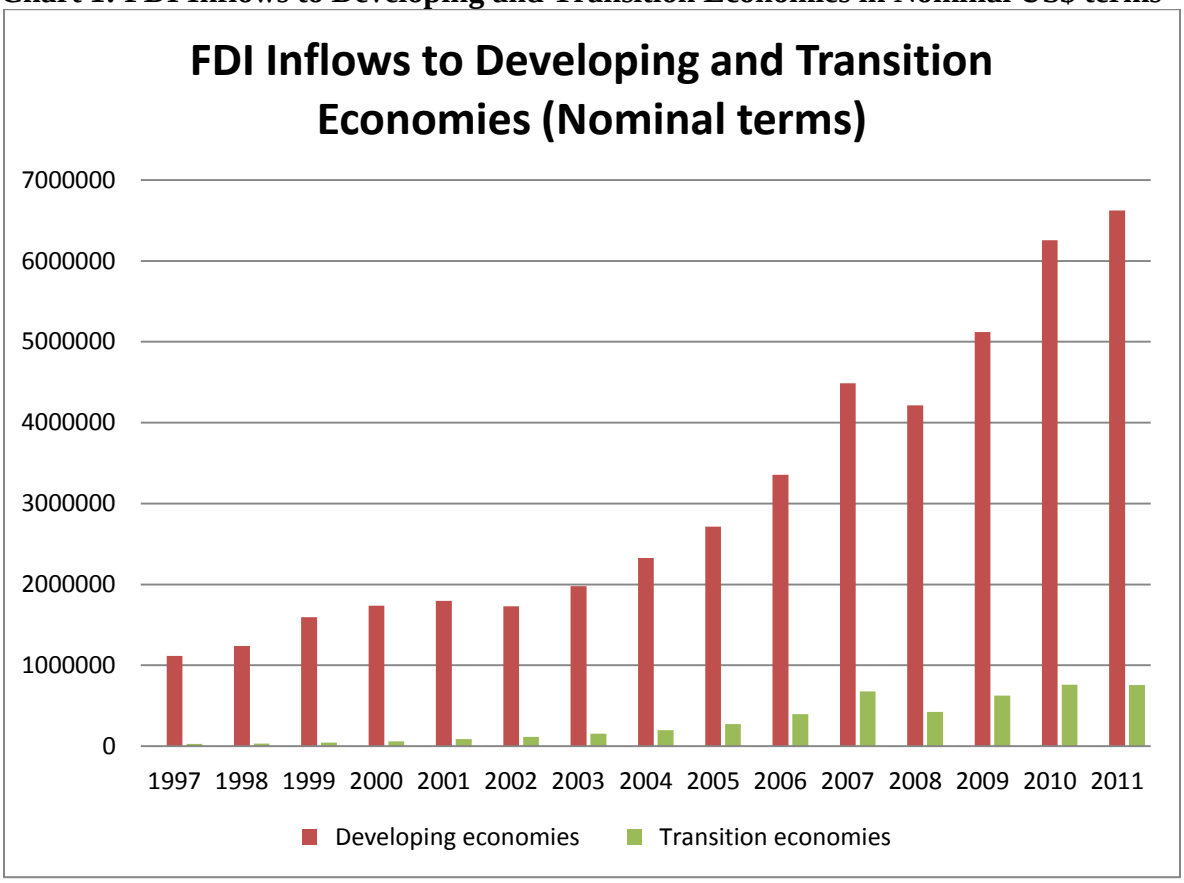
This research master thesis focuses on the impact of foreign investments and foreign equity participation on the productivity of domestic firms and the industry in which they operate. Hence the research question, "Does Foreign Equity Participation in Domestic Firms Increase the Productivity and Create Intra-Industry Productivity Spillovers: The case of Eastern Europe and Central Asia".

This thesis will primarily investigate the role of foreign ownership on firm's productivity and the ability of foreign owned firms to crate productivity spillover effects. Foreign investors heavily invest in emerging markets, introduce new technologies and allow local firms and employees to update their technologies and skills. To this end, this paper presents a theoretical and empirical analysis of the aforementioned relationship.

The motivation behind this research topic is driven by several reasons. The policy reforms undertaken in the countries of these regions are a true testament of their persistence and confidence for success in creating a sound economic and political environment to attract foreign investments into their markets. A wave of privatization of state enterprises has been the first step to creating an opportunity to attract foreign equity participation in domestic firms. The Foreign Investment Advisory Service (FIAS), as part of the World Bank, works with European and Central Asian countries on business environment reforms and investment policy reforms in order to promote foreign investments that will boost economic growth (World Bank/ FIAS, 2012). The results are in the right direction and satisfactory, although some of the Eastern European region, more specifically South East Europe has not yet reached its full investment potential(World Bank/FIAS, 2012). As manufacturing, construction and financial services are the driving sectors behind economic growth in Eastern Europe, foreign investments have risen threefold from $8.4 billion in 2003 up to $26.3 billion in 2006 (World Bank/FIAS, 2012). Even countries, such as Bulgaria, Croatia, Estonia, Latvia and Slovenia, had not attracted large amounts of FDI prior to 2003 but have seen inflows rise markedly from 2004(World Bank/FIAS, 2012). In order to support their hard work FIAS has established a network of reformers to exchange ideas and share knowledge on best practice investment reforms that would facilitate more foreign equity participation (World Bank/FIAS, 2012). Together with Russia this region has a total FDI of $155

billion recorded in 2008 (PWC, 2010). These data is presented in the chart below, taken from an economic report on the region by PriceWaterhouseCoopers in March 2010.

**Chart 1: FDI Inflows to Developing and Transition Economies in Nominal US$ terms**




Source: UNCTAD 2012

The work of FIAS is present on the territory of the former Soviet Union as well. Their work involves reforms to reduce bureaucracy and corruption, enhancing the investment attractiveness of regions, enhancing access to finance as well as improving the regulatory quality for private sector development (World Bank/FIAS, 2012). A good example of the success of the reforms is The Kyrgyz Republic with $4.5 billion in 2009 and an expected 47% increase in 2012 (Naumenko, 2011). Other Central Asian countries follow these developments as well.

The theoretical model in this thesis uses the setting of Melitz (2003) in order to derive two important equilibrium conditions in the market of an open economy while showing how do changes in average productivity in the industry, coming from foreign investments, affect an

individual firm's sales. The theoretical predictions are straightforward and clear. The model predicts direct positive effect of foreign ownership on a firm's productivity and a positive indirect effect on the productivity of other firms which is a proof of positive spillover effects. These hypotheses are then tested into a panel regression model with firm level data on 27 countries from the regions mentioned above over a period of four nonconsecutive years with sales as a dependent variable and labor (skilled and unskilled), capital, materials, plant and sector foreign ownership and GDP_per_capita as a set of repressors and control variables. Three fixed effects are used to control for certain differences. GDP_per_capita is used to control for differences in the countries level of economic growth which is an indicator of their absorptive capacity to turn foreign investments into potential economic benefits, or better known as country fixed effects. In addition, cross-section fixed effects are used to account for the differences in productivity of the different three digit ISIC industry sectors in the economies of the countries, as well as period fixed effects to account for time variations of the different variables in the analysis. To add on this, a certain adjustment of the dataset is done in order to mitigate any problems of collinearity or linear dependence between the different independent variables.

The empirical results support the hypotheses in very limited instances and those results are robust over time and for countries which are more open to foreign ownership than other countries. The results for both predictions are also supported and increase in magnitude when only manufacturing industry sectors are considered. Moreover, the direct effect of foreign ownership on productivity is consistent for small firms although they tend to exhibit negative productivity spillover effects which makes them unusual for the analysis. For large firms the direct effect is smaller than for small firms although they exhibit positive productivity spillovers which are largest in magnitude. The results on the effects of foreign ownership participation in domestic firms on joint ventures are inconclusive. In a nutshell, although significantly very limited, the results support the notion that foreign ownership of firms can benefit not only the firm but also the industry in which the firm operates and the country as a whole by creating economic growth effects.

The remainder of this thesis is structured as follows. An overview of existing literature studying the relationship between FDI and economic growth, both on a macro- and micro level, is presented in section 2. Section 3 presents a theoretical analysis of the impact of FDI on GDP growth, using a general equilibrium model with firm heterogeneity and serving as a basis for the

formulation of hypotheses. Section 4 provides a description of the methodology, data and results of the empirical analysis. The limitations of the analysis and any improvements offered by the researcher are presented in section 5. Section 6 concludes.

## 2. Literature Review

### 2.1 Foreign Direct Investment and Economic Growth

Many economists have looked into the relationship between foreign direct investment (FDI) and economic growth, both on a macro and a micro level. Nunnenkamp and Spatz (2003) have studied the effect of FDI as a source of external finance on growth by differentiating between different types of FDI and their suitability under different conditions in the host country. The motivation for their research comes from the uncertainty in the empirical results reported by Ram and Zhang (2002) and Dutt (1997). A clear limitation of these studies is a lack of attention on the importance of economic, political and demographic characteristics of the developing countries which attract FDI. More precisely, factors relating to the human capital endowment, the openness to trade, the institutional development, the rule of law, the degree of transparency, property rights and the quality of public management may be highly relevant. Therefore, Nunnenkamp and Spatz (2003), empirically test the hypothesis that developing countries must offer a supportive business environment and must have achieved a minimum level of economic development before it is possible to capture the positive growth effects of FDI (OECD, 2002). Data on countries in Asia, the Middle East, Latin America & the Caribbean and Africa for the 1990s is used. The countries considered are divided into two groups with favorable and unfavorable economic, political and demographic characteristics. The manufacturing sector in each country is divided into seven subsectors, ranging from food and chemicals to electric and transport equipment. The results of their analysis clearly indicate that the general consensus on the positive impacts of FDI on economic growth is not as straightforward as it may seem. In particular, the link between FDI and subsequent GDP growth is highly dependent on the characteristics of the developing country in which the FDI takes place. In general, it is easier to attract FDI as a source of finance than to obtain economic benefits from it. Additionally, the impact of FDI on growth differs among the different manufacturing subsectors. It is shown that FDI inflows with an efficiency enhancing objective yield more positive growth effects than

market-seeking FDI. In sum, Nunnenkamp and Spatz (2003) indicate that an automatic positive impact of FDI on growth cannot be readily assumed. Rather, policy makers should focus on creating the right business and political environment which will allow the receiving country to fully exploit the benefits of FDI (Nunnenkamp and Spatz, 2003). On the other hand, Roy and Van den Berg (2006) find slightly different results when looking at the effects of FDI on a large and highly technologically developed country such as USA. They used a time series data to a simultaneous equations model. Their results show that even a technologically advanced economy such as the US benefits from FDI, and especially the benefits can be felt in the long run and that the sustainability of the US current account deficit is maintained by the positive effect of FDI on productivity (Roy/Van den Berg, 2006).

Moreover, Borensztein et al. (1998) test empirically the role of foreign direct investment in the process of technology diffusion and economic growth in a cross-country regression framework, involving 69 developing countries. Technological progress is framed through a process of 'capital deepening'. This takes place via FDI by multinationals in the host economy. However, the effectiveness of FDI depends on the initial stock of human capital in the developing country, potentially limiting the impact of FDI on GDP growth. Their empirical panel regression results suggest that foreign direct investment plays an important role in the transfer of technology and economic growth. Furthermore, there exists a positive interaction effect between FDI and human capital stock indicating that a sufficient level of human capital needs to be present in the host economy for FDI to be effective in terms of GDP growth. The researchers also report marginal evidence suggesting complementary relationship between FDI and domestic investment. This result shows that the main channel through which FDI contributes to economic growth is by stimulating technology diffusion (Borensztein et al., 1998).

Finally, Katerina, John and Athanasios (2004) conduct research on the effect of FDI on economic growth in a panel of transition economies. Hence their hypothesis is an expected positive relationship between FDI and economic growth, measured by GDP. The period of FDI coming into the transition economies is 1995 to 1998 with a dataset very similar to the one employed in this thesis. In order to conduct the analysis they have employed Bayesian regression technique. Their final conclusion was that FDI does not exert any robust influence on growth as measured by GDP (Katerina et al, 2004), even after the countries were divided into high and low income.

In a nutshell, the papers used for the literature review of the effect of FDI on growth, at a macro level, give mixed evidence of the FDI's effect on economic growth and productivity.

### 2.2 Foreign Ownership and Firm Productivity

On a micro level, including firm and sectoral level, Aitken and Harrison (1999) have focused on the case of Venezuela and the effect of foreign ownership participation on firm and sector productivity as well as productivity spillover effects. Many developing countries tend to stimulate incoming foreign investments via lowering income taxes, import duty exemptions, and subsidies for infrastructure. This is done because it is believed that foreign investments generate externalities in the form of technology transfer and thereby enhance opportunities for economic growth. Apart from the employment and capital inflows which accompany foreign investment, multinational activity may lead to technology transfer for domestic firms. If foreign firms introduce new products or processes to the developing market, local firms may benefit from the accelerated diffusion of new technology. In some cases, domestic firms may increase productivity simply by observing nearby foreign firms. In other cases, spillovers may occur from labor turnover as domestic employees move from foreign to local firms. The intense and valuable training received by these workers during the employment in foreign firms may potentially increase the productivity of local firms. To investigate this theoretically supported rationale, the researchers employ a Venezuelan dataset including information of foreign ownership and firm level productivity. The analysis is based on a panel regression, regressing firm level productivity on FDI, specific for a particular firm and a particular sector, an interaction term between the two and a series of control variables. The results are twofold. Firstly, there is a positive relationship between increased foreign ownership and firm productivity. However, this result is different among firms, with smaller firms capturing most of these benefits. Secondly, the productivity of domestically-owned firms falls as FDI and hence foreign equity stake increases. This result indicates a crowding-out effect, or a 'market-stealing' effect as it is called by Aitken and Harrison (1999), with negative spillover effects from foreign to domestic firms. Overall, summing up the positive and negative effects of FDI suggests a fairly small impact of foreign ownership on firm productivity (Aitken and Harrison, 1999).

In addition, Akulava and Vakhitova (2010) research the impact of FDI on firm's performance across sectors including primary, secondary and tertiary sectors, in Ukraine over the period of 2001-2007. They employ a log linear regression with output as dependent variable and capital, labor, materials and production efficiency as regressor variables. Their results concerning the direct effect of FDI are straightforward and they find that firms with foreign capital perform better than domestic firms in all three sectors of the economy. This direct effect is largest in magnitude in the primary sector which supports their hypothesis that the productivity gap between domestic and foreign firms in the primary sector is much larger to begin with. In the services sector, where there were recent policy liberalizations for Ukraine this direct effect is smallest. The spillover effects vary by sectors with positive horizontal spillover effects in the secondary sector which benefit more the foreign firms than the domestic firms. The services sector show positive forward spillover effects on firm's productivity while backward spillover effects are negative. The primary sector has insignificant horizontal and vertical spillover effects. Their findings are in line with their predictions and hypothesis and do follow some previous research on the similar topic (Akulava/Vakhitova, 2010).

Yassar and Morrison Paul (2007) focus on the question of firm performance and FDI in five transition economies. A sample of 100 firms drawn randomly from each country was used and a log linear regression analysis was employed with performance related variables such as total factor productivity, labor productivity and output as dependent variables regressed on FDI, employment and industry characteristics. Their findings support the hypothesis that foreign companies bring technologies and skills which enhance the productivity of domestic firms in the same industry, which is supported by their findings of positive productivity spillover effects and higher productivity of foreign firms when compared to domestic firms (Yassar/Morrison Paul, 2007).

Aydin, Sayim and Yalama (2007) investigate foreign ownership and firm performance in Turkey with dataset concerning only firms listed on the Instanbul Stock Exchange. An analysis using t-test is conducted to examine whether there are significant differences between Operating Profit Margin, Return on Assets and Return on Equity between foreign and domestic firms. (Aydim, Salim, Yalama, 2007) The results show that foreign firms' performance is better but this result is only robust with respect to ROA. However it supports their hypothesis that foreign ownership increases firm's performance with reasons similar to the ones mentioned earlier in this section

including transfer of knowledge and technology as well as better managerial skills of foreign owned firms (Aydim, Salim, Yalama, 2007).

In general the majority of the literature gives a supporting evidence towards increased productivity of foreign firms when compared to domestic firms and supports the policy changes undertaken by governments to attract more foreign investments and equity participations in their economies.

### 2.3 Foreign Ownership and Productivity: Sectoral Level

Since the analysis in this thesis looks at different sectors in the economy and spillover effects between sectors in the economy it is important to show some previous research done in this direction, concerning FDI and productivity. Tondl and Fornero (2008) investigate sectoral productivity and spillover effects of FDI in Latin America. Their motivation stems from previous research on the same topic which gave inconclusive results. They investigated the productivity effects of FDI in eight different sectors representing the primary, secondary and tertiary sectors in 14 Latin countries over the period 1990-2006. FDI, sector specific factors, education as well as sector's export shares are used as control variables as part of Generalized Method of Moments estimation procedure. They find direct productivity effects being strongest in the primary sector, mainly agriculture and mining, as well as in financial services. Moreover, they find that foreign investments in manufacturing create productivity spillovers on all other sectors (Tondl/Fornero, 2008).

In the Journal of Development Economics, Fernandes and Paunov (2011), look at the effects of FDI in services and manufacturing in the Chilean economy. They investigate the changes on total factor productivity as a dependent variable. They use an unbalanced panel with roughly 4913 firms per year in the period of 1992-2004 segregated into 4 digit ISIC industry codes. Their findings suggest that foreign investments in the services sectors have a positive effect on the TFP in Chilean manufacturing. This finding is explained by the phenomenon that services FDI stimulates innovation activities in manufacturing and also allows lagged firms to catch up with industry leaders (Fernandes/Paunov, 2011)

Girma, Greenaway and Wakelin (2009) analyse the link between productivity, spillovers and foreign ownership in the UK manufacturing sector. The research employed a panel dataset for the first half of the 1990s. Although they find significant evidence that foreign firms have higher productivity than domestic firms and in turn they pay higher wages, they find no evidence of intra-industry spillovers (Girma/Greenaway/Wakelin, 2009). Domestic firms with low productivity relative to the sector average gain less from foreign firms, as well as firms in sectors with low skills and low levels of foreign competition.

There is also one very particular paper discussed in this literature review that focuses on a particular sector in the economy of a particular country. Bielik, Pokrivcak, Qineti and Pokrivcakova (2006) analyze the spillover effect of foreign investment in the beer and malt production in Slovakia. The methodology uses in depth interview to collect data on the Slovak grain-malt-brewing sector. They find a positive effect of FDI in the Slovakian malt and beer sector. This helps those firms operating in those industries toward a more efficient use of the apparent comparative advantage and dominant position they already enjoy in the market. Hence positive productivity spillovers effects are apparent in this particular industry in Slovakia (Bielik/Pokrivcak/Qineti/Pokrivcakova, 2006).

In a nutshell, the papers discussed in this part of the literature review show supportive evidence for positive spillover effects and increased sector productivity in different industries part of the primary, secondary and tertiary sector of an economy. The magnitude of these effects depends on the level of development in that particular industry in a country and the business environment.

## 3. Theoretical Framework and Model

### 3.1 The Basis of the Model

The theoretical model in this thesis is based largely on the model developed by Marc J.Melitz in his paper on "The Impact of Trade on Intra-Industry Reallocations and Aggregate Industry Productivity" of 2003. His model is based on the previously recent empirical studies on firm level data which have proven the existence of persistent productivity differences among firms in the same industry. In addition, studies have shown that these persistent productivity differences are related to the firms export status because more productive firms are more likely to export and hence reallocate resources across the firms in the industry from the less productive to the more

productive firms in the industry. This is where Melitz makes his contribution by developing a dynamic industry model with heterogeneous firms to look at the impact that international trade has on between firms' reallocations in the same industry. His model shows that exposure to trade allows the more productive firms to export while at the same time forces the least productive firms to exit the market (Melitz, 2003). This exit of firms and the additional sales that are gained by the more productive firms lead to market share reallocation towards the more productive firms and lead to a total productivity increase in the industry. For the purposes of this thesis and the empirical research done on the available dataset this model of Melitz is used but instead of exposure to trade and the opportunities on the export market the model focuses on the entrance of foreign investors into domestic firms and the way that this foreign investments affect aggregate productivity and whether they create productivity differences between firms in the same industry and whether more foreign ownership on one industry sector creates productivity spillovers to another industry sector.

The interest in foreign investments into domestic firms to investigate the role of FDI as a driver of productivity enhancements for firms which will lead competitors to also become more efficient and increase productivity which in turn will lead to overall economic growth in the country. This just follows the recent literature on multinational activity into emerging markets where the MNCs through their investments introduce new technologies and allow local firms and employees to enhance their technologies and managerial skills. On one hand, through this transfer of knowledge and know-how as well as the process of technological diffusion (the adaption and introduction of new and more advanced technologies), especially in the manufacturing sector, the domestic firms can potentially benefit from foreign investments. On the other hand, domestically owned firms which are not open to foreign investments can learn from foreign owned establishments in the same industry or in a different industry and through the process of competition become more efficient and increase their productivity as well. In the end, the aggregate productivity and output in the industry or the country should increase because the most productive firms have remained to operate in the specific sector and serve their markets while the least productive firms, who were unable to adapt to the changes, will be driven out of the market. For the reader it is important to understand that a general equilibrium model is presented where firms with different productivity levels coexist in general equilibrium. Further

on, an analysis is made on how changes in individual firm's productivity or changes in aggregate productivity (in the case of spillovers) through foreign investments influence the firm's sales

In order for the model to make sense in the current setting firm heterogeneity must be modeled. For this Krugman's model of trade under monopolistic competition and increasing returns is used by Melitz. The contribution of Melitz on this part is to provide a general equilibrium model with firm heterogeneity. This is achieved by focusing on the average productivity level of a firm.

The next step in the model is shaping the preferences of the consumers. The analysis relies on the Dixis-Stiglitz preferences in a model of monopolistic competition (Melitz, 2003). Dixis-Stiglitz preferences introduce the 'love of variety'. What this means is that if a consumer consumes a certain good X, but different varieties of that particular good X, then the utility of consumers increases if consumers consume three different varieties rather than only one variety of the good. The utility function is:

$$U = (\sum_{i=1}^{N} q_i^{\rho})^{1/\rho}, \qquad (1)$$

where N is the number of varieties, and ρ is between 0 and 1. If ρ=1 then all varieties are perfect substitutes. Lets say that all varieties are sold at the same price, and identical amount of each variety is consumed so that $q_i \rightarrow q$ and $U = (U * q^{\rho})^{1/\rho} = N^{1/\rho} * q$. If then q=0.5, $U = N^2 * q$. If then consumption of each variety is halved and the number of varieties doubled: $U = (2N^2) * \frac{q}{2} = 2N^2 * q$. This simple example shows that when variety of the good available for consumption increases, then the utility increases as well. Regarding the thesis and the research question, the assumption is that when foreign investment and hence foreign equity participation in a domestic firm increases they are able to produce more variety of a particular good since they become more efficient and with that they give more opportunities to the consumers on the market. This would then lead to increases in utility of the domestic consumers. Melitz allows for the total range of varieties produced to vary with exposure to trade. Each firm is hence a multi-variety firm.

In addition, the model assumes a forward looking entry decision of firms facing sunk market entry costs for both domestic and foreign markets.

## 3.2 Setup of The Model

### *3.2.1 Demand*

The Constant Elasticity of Substitution Utility function over a continuum of goods index by ω is used to show the preferences of the consumer (Melitz, 2003):

$$U = \left[\int_{\omega\in\Omega} q(\omega)^{\rho} d\omega\right]^{1/\rho}, 0 < \rho < 1 \qquad (2)$$

**,**where the set Ω is the mass of all available goods. The fact that $0 < \rho < 1$ means that the goods are substitutes with an elasticity of substitution between any two goods of $\sigma = \frac{1}{(1-\rho)} > 1$. Because the number of varieties is equal to the number of firms there are no integer problems with infinitely many varieties. Dixit and Stiglitz (1977) showed that consumer behavior can be represented by considering U as an aggregate consumption good which respectively should have an aggregate price which is price per unit utility. In order to derive this price per unit utility the cost-minimizing behavior of households must be taken into account. When this household behavior is considered, price of utility becomes:

$$P = \left(\int_{\omega\in\Omega} p(\omega)^{1-\sigma} d\omega\right)^{1/1-\sigma} \qquad (3)$$

$\sigma > 1$, in the case of infinitely many varieties.

An example will be shown to see how changes in income (M) affect the aggregate price of utility for homogeneous goods. Since $P = (M * p^{1-\sigma})^{\frac{1}{1-\sigma}} = M^{\frac{1}{1-\sigma}} * p$. Since σ > 1, the aggregate price(P) drops with increases in income(M), Utility ceteris paribus increases and less of each variety is needed to maintain constant level of utility.

The aggregates of the Utility and the Price per unit utility can be used to derive the optimal consumption and expenditure decisions for individual varieties:

- Total demand for a single variety is given by equation (4)

$$q(\omega) = U * P^{\sigma} * p(\omega)^{-\sigma}, where\ U \equiv Q \qquad (4)$$

$$q(\omega) = I * P^{\sigma-1} * p(\omega)^{-\sigma}, because\ I(total\ expenditures) = Q * P$$

If $M^{\frac{1}{1-\sigma}} * p$ from the above example is substituted for P in equation (4) then the way in which the total demand for a single variety behaves with changes in income and individual price. This is shown in equation (5) below:

$$q(\omega) = I * P^{\sigma-1} * p(\omega)^{-\sigma} = I * (M^{\frac{1}{1-\sigma}} * p)^{\sigma-1} * p(\omega)^{-\sigma} = \mathbf{\frac{1}{M}\frac{I}{p}} \quad (5)$$

Hence it is clear that the demand for a single variety decreases with increases in either income or individual variety's price.

Moreover, the total revenue per variety is given in equation (6) below:

$$r(\omega) = p(\omega) * q(\omega) = (\ I * P^{\sigma-1} * p(\omega)^{1-\sigma} = I * \frac{p(\omega)}{P})^{1-\sigma} \quad (6)$$

### *3.2.2 Production*

Before the presentation of the formulas for production a simple introduction into the setup of the production process is outlined. This follows the paper of Melitz (2003). Each firm chooses to produce a different variety (ω) of a certain good. Only one factor of production is used, labor which is inelastic ally supplied at level L. Labor is thus a linear function of output, $l = f + \frac{q}{\varphi}$. (Melitz, 2003) The technology of the firm, which is its capital is represented by a cost function that follows constant marginal cost with fixed overhead cost (Melitz, 2003). The fixed cost ($f$) for each firm is positive but each firm has a different productivity level given by $\varphi > 0$. What is interesting is the way how different productivity is modeled. Higher productivity just means producing the similar variety at a lower marginal cost or a higher quality variety at the same cost.(Melitz, 2003) However, the profit maximizing markup that each firm chooses is equal to $\frac{\sigma}{\sigma-1} = \frac{1}{\rho}$, given that each producing firm faces the same demand curve with constant elasticity σ despite of its productivity level. Hence the pricing of the firm is given by equation (7):

$$p(\varphi) = \frac{w}{\rho\varphi} = \frac{\sigma}{\sigma-1}\frac{w}{\varphi} \quad (7)$$

This is derived by setting marginal revenue (MR) equal to marginal cost (MC). Since the productivity parameter ($\varphi$) is in the denominator in the above equation it means that as productivity increases the firm becomes more efficient in the production process and the price it can charge decreases because the costs of production are smaller with higher productivity. With respect to the change in the price given the change in the elasticity of substitution between the varieties, the profit maximizing price decreases if σ increases because the larger the elasticity of substitution the less unique a variety is and the less monopolistic a single firm is. This is represented in equation (8):

$$\frac{dp(\varphi)}{d\sigma} = \frac{-1}{(\sigma-1)^2}\frac{w}{\varphi} < 0 \qquad (8)$$

It Is important to realize that this is not a setting with perfect competition rather the firm can charge a price higher than marginal cost (MC). However if all varieties are perfect substitutes then σ → ∞, and P=MC!

In equation (7) the wage is normalized to 1 and the equation is transformed into equation (9):

$$p(\varphi) = \frac{1}{\rho\varphi} = \frac{\sigma}{\sigma-1}\frac{1}{\varphi} \qquad (9)$$

The firm's total profits are

$$\pi(\varphi) = TR - TC$$

$$\pi(\varphi) = p(\varphi) * q(\varphi) - c(\varphi) * q(\varphi) - f$$

$$= p(\varphi) * q(\varphi) - \frac{\sigma-1}{\sigma}p(\varphi)q(\varphi) - f$$

$$= p(\varphi) * q(\varphi) * \left(1 - \frac{\sigma-1}{\sigma}\right) - f$$

$$= \frac{p(\varphi)*q(\varphi)}{\sigma} - f = \frac{r(\varphi)}{\sigma} - f \qquad (10)$$

In equation (10) $r(\varphi)$ is the firm's revenue, while $\frac{r(\varphi)}{\sigma}$ is the variable profit. The revenue and the profit in turn depend on the aggregate price and revenue as represented in equations (11) and (12).

$$r(\varphi) = \left(\frac{1}{\varphi}\frac{\sigma}{\sigma-1}\right)^{1-\sigma} * Q * P * P^{\sigma-1} = \varphi^{\sigma-1}\left(\frac{\sigma}{\sigma-1}\right)^{1-\sigma} * I * P^{\sigma-1}$$

Since$\frac{\sigma}{\sigma-1} = \frac{1}{\rho}$, $\left(\frac{\sigma}{\sigma-1}\right)^{1-\sigma} = \rho^{\sigma-1}$, and hence equation (11) shows the revenue as a function of productivity parameter φ:

$$r(\varphi) = (\varphi\rho P)^{\sigma-1} * I, \sigma > 1 \qquad (11)$$

This means that when productivity increases the revenues of a firm increase because it becomes more efficient and hence total profits increase through revenues. The profits, when the revenue function (11) is substituted are given by equation (12):

$$\pi(\varphi) = \frac{(\varphi\rho P)^{\sigma-1} * I}{\sigma} - f \qquad (12)$$

In the end, the ratios of any two firms' outputs and revenues depend only on their productivity levels(Melitz, 2003). This said:

$$\frac{q(\varphi_1)}{q(\varphi_2)} = (\frac{\varphi_1}{\varphi_2})^{\sigma} \quad \text{and} \quad \frac{r(\varphi_1)}{r(\varphi_2)} = (\frac{\varphi_1}{\varphi_2})^{\sigma-1} \qquad (13)$$

From the last two ratios it can be concluded that hypothetically through foreign investment a firm will become more productive (higher φ) and as such will be bigger (larger output and revenues), charge a lower price and earn higher profits than a less productive firm that will not not be able to benefit from FDI.

### *3.3.3 Aggregation*

With a mass of firms (M) and productivity levels distributed over the set [$\varphi_{lowerbound}$,$\varphi_{upperbound}$], where the lower bound is 0 and the upper bound is infinity(Melitz, 2003). The price index so far is:

$$P = (\int_0^{\infty} p(\varphi)^{1-\sigma} * M * \mu(\varphi) d\varphi)^{\frac{1}{1-\sigma}} \quad (14)$$

In equation (14), M is the total number of firms, and μ(φ) is the distribution of firms in the interval over the lower and upper productivity bounds. According to pricing rule (7) and (9), the price rule (14) can be rewritten as

$$P = M^{1/1-\sigma} p(\varphi_{average}) = M^{1/1-\sigma} * \frac{\sigma}{\sigma-1} \frac{1}{\varphi_{av.}} \quad (15),$$

Where the average productivity is defined as

$$\varphi_{average} = [\int_0^{\infty} \varphi^{\sigma-1} \mu(\varphi) d\varphi]^{\frac{1}{\sigma-1}} \quad (16)$$

The average productivity level is just the weighted average of the firm productivity levels φ with weights equal to the relative output shares of firms with different productivities and as such is independent of the total number of firms given by M (Melitz, 2003). In the group of equations under (17) a summary of all relevant aggregate variables is given.

$$P = M^{1/1-\sigma} p(\varphi_{average}) \quad (17)$$

$$Q = M^{1/\rho} q(\varphi_{av.})$$

$$R = PQ = Mr(\varphi_{av.})$$

$$\Pi = M\pi(\varphi_{av.})$$

In addition, the aggregate revenue and profits are given in equations (18) and (19) below:

$$R = \int_0^{\infty} r(\varphi) M \mu(\varphi) d\varphi \quad (18)$$

$$\Pi = \int_0^{\infty} \pi(\varphi) M \mu(\varphi) d\varphi \quad (19)$$

According to Melitz (2003) if an industry is comprised of a mass of firms (M) with any productivity distribution $\mu(\varphi)$ that gives the same average productivity level as in the equations above, will give the same aggregate outcomes as an industry with firms sharing the same productivity level $\varphi = \varphi_{average.}$(Melitz, 2003)

To make the analysis complete, the average firms' demand, revenue and profit are just shares in the total mass of firms, where $q = \frac{Q}{M}, r = \frac{R}{M}, and\ \pi = \frac{\Pi}{M}$. Below the demand and revenue for an individual firm with average productivity are given by:

$$q(\varphi_{av.}) = R * P^{\sigma-1} * p(\varphi_{av.})^{-\sigma} \qquad r(\varphi_{av.}) = R * P^{\sigma-1} * p(\varphi_{av.})^{1-\sigma} \quad (20)$$

### *3.3.4 Market Entry and Exit*

#### *Zero Cutoff Profit Condition*

The process of entering and exiting from the market follows some predetermined steps which apply to every firm in the pool of prospective entrants in the market. It is important to note that *a priori* all firms are identical. In order to enter the market firms must make an initial investment which is modeled as a fixed market entry sunk cost; $f_e > 0$. This cost includes setting up a factory, a production plant or maybe a retail channel. Then, firms randomly draw their productivity parameter from an exogenous distribution $g(\varphi)$ on the set $[\varphi_{lowerbound}, \varphi_{upperbound}]$. Upon entry a firm does not know the productivity of its workers or whether it offers a product which is accepted by the market. The question is then will the firm start with production after entering the market and drawing on its productivity? There are two possibilities. Upon entry, a firm with a low productivity draw may decide to exit immediately and not produce. The firm starts production only if the per period profits are at least zero, as shown in equation (21):

$$\pi(\varphi) = \frac{r(\varphi)}{\sigma} - f \geq 0 \qquad (21)$$

This means that the productivity level at which the per period revenues are at least equal to the fixed sunk market entry cost (per period profits are zero) is referred to as the threshold productivity parameter($\varphi^*$). And this becomes the zero cutoff profit condition, the first condition for maintaining equilibrium in the market.

Zero profit cutoff condition: $\pi(\varphi^*) = \frac{r(\varphi^*)}{\sigma} - f = 0$

Hence, if the productivity parameter drawn is below the threshold level ($\varphi < \varphi^*$) then the firm exits the market immediately. On the other hand if the productivity parameter drawn is above the threshold level the firm starts with production. These firms earn positive profits each period, and these profits are used to cover market entry costs. In order to calculate the aggregate productivity level in the market, only the active firms in the market must be considered. Equation (22) shows how the average productivity level depends on the threshold productivity level:

$$\frac{1}{\tilde{\varphi}} = \left(\int_{\varphi^*}^{\varphi} \mu(\varphi)\varphi^{\sigma-1} d\varphi\right)^{\frac{1}{1-\sigma}} \qquad (22)$$

where the interval is from the threshold productivity level up to the upper bound productivity. This cutoff productivity level ($\varphi*$) determines the average productivity level ($\varphi^{\sim}$), then the average profit and revenue levels are also related to the cutoff level $\varphi*$. Relating with ratios in equation (13) the average revenue and profit conditions are:

$$r^{-} = r(\varphi^{\sim}) = \left[\frac{\varphi^{\sim}(\varphi^{*})}{\varphi^{*}}\right]^{\sigma-1} * r(\varphi^{*}) \quad (23)$$

$$\pi^{-} = \pi(\varphi^{\sim}) = \left[\frac{\varphi^{\sim}(\varphi^{*})}{\varphi^{*}}\right]^{\sigma-1} * \frac{r(\varphi^{*})}{\sigma} - f \quad (24)$$

In addition, this zero cutoff profit condition also implies a relationship between the average profit and cutoff productivity level (Melitz, 2003):

$\pi(\varphi^{*}) = 0 \leftrightarrow r(\varphi^{*}) = \sigma f \;\leftrightarrow\; \pi^{-} = fk(\varphi^{*})$,

With $k(\varphi^{*}) = \left[\frac{\varphi^{\sim}(\varphi^{*})}{\varphi^{*}}\right]^{\sigma-1} - 1$.

The downside of continuing production after market entry is the probability that in each period a firm might be hit by a negative shock with a probability $\theta_t$that would force the firm to exit the market. These negative shocks are necessary in order to maintain a certain amount of market entrants in each period of the steady state equilibrium.

***Free Entry Condition***

Moreover, market entry is unrestricted and market entry stops when the expected profits of market entry exactly equal sunk market entry costs. Because all firms active in the market earn positive profits, except the threshold firm, the average profit level must be positive and this expectation of future positive profits is the only attractive reason why firms would consider sinking the investment cost ($f_e$) required for entry (Melitz, 2003). This means that each potential new entrant would expect to get average firm's profits each period, given that it is active in the market. This assumption follows to the next condition which is the free entry condition of firms related to the value of firms which is another condition necessary to maintain equilibrium in the market. The value function of a firm entering the market is:

$$v_e = \frac{1 - G(\varphi^{*})}{\theta}\, \pi(\varphi^{\sim}) - f_e$$

If the value is negative then no firm would want to enter. However in any equilibrium where entry is unrestricted, this value could not be positive as well since number of entrants in unbounded. Hence if equal to zero:

$$\big(1 - G(\varphi^*)\big)\pi(\varphi^{\sim}) = \theta f_e \qquad (25)$$

The left hand side shows the product of the probability of a successful market entry, so the productivity parameter being larger than the threshold level and the average firm's per period profits. The right hand side shows the per period equivalent of sunk market entry costs.

To summarize, the equilibrium in the market is maintained and satisfied by two conditions, namely the zero cutoff profit and the free entry condition given by equations (21) and (25) respectively.

### *3.3.5 Open Market Equilibrium*

The case of an open economy is considered since all countries in the empirical analysis are small and large open economies. There are several conditions which allow for the model to be highly tractable. All countries have the same wage which is normalized to one and share the same aggregate variables(Melitz, 2003). Although the general characteristics of the goods in every country are similar, the actual bundle of goods available in the countries is different since there are some goods available to consumers that are produced by non exporting firms (Melitz, 2003). The pricing in the domestic market is according to equation (7), however those firms that export will set a slightly higher price in the foreign market in order to cover the marginal cost of serving the foreign market (τ). Hence the price for the supply to the foreign market becomes:

$$p(\varphi) = \frac{\tau}{\rho\varphi} = \tau p_d(\varphi) \qquad (26)$$

Then the revenues earned from domestic sales and from export sales for a country become:

$$r_d(\varphi) = R(P\rho\varphi)^{\sigma-1} \qquad (27)$$

$$r_x(\varphi) = \tau^{1-\sigma} r_d(\varphi)$$

The export costs in each country are equal which means that a firm will either export to all countries in every period or never export (Melitz, 2003). As previously, the export decision

occurs only after the firm knows its productivity parameter and this is the only uncertainty for the firm. This allows the firm to be indifferent between paying the one time investment cost ($f_{ex}$), or paying the per period portion of this cost in every period which is affected by the probability of the firm being hit by a bad shock, $f_x = \theta f_{ex}$.(Melitz, 2003) As well as the revenues, the profits of each firm can also be segregated into domestic and foreign market profits:

$$\pi_d(\varphi) = \frac{r_d(\varphi)}{\sigma} - f, \qquad \pi_x(\varphi) = \frac{r_x(\varphi)}{\sigma} - f_x \tag{28}$$

If the export profit for a firm is positive, $\pi_x(\varphi) \geq 0$, then a domestic firm will export to all available countries. The export market, as well as the domestic market has a cutoff productivity level which is necessary for the firm to satisfy in order to be able to operate in the foreign country. If $\varphi_x^* = \varphi^*$, then all firms are exporting. In this case, the firm with the cutoff productivity level in both markets earns zero total profit and nonnegative profit in the export market, $\pi_x(\varphi^*) \geq 0$. (Melitz, 2003) On the other hand if the foreign cutoff level is higher than the domestic one, then firms that have productivity between these two cutoff levels do not export since their export profits will be negative and they only produce for the domestic market. Moreover, the firms with productivity parameters above the foreign cutoff level ($\varphi_x^*$) earn positive profits on both, the domestic and foreign markets. (Melitz, 2003)

For the aggregation it is important to determine the weighted productivity average that reflects the combined market share of all firms and the output lost due to serving the export market.(Melitz, 2003)

$$\tilde{\varphi_t} = \left\{ \left\{ \frac{1}{M_t} [M \tilde{\varphi}^{\sigma-1}] \right\} + n M_x (\tau^{-1} \tilde{\varphi_x})^{\sigma-1} \right\}^{\frac{1}{\sigma-1}} \tag{29}$$

In equation (29) M is the equilibrium mass of firms in any country, $M_x$ is the mass of exporting firms and $M_t$is the total mass of varieties available to consumers in any country. Furthermore, the aggregate price level, expenditure and the welfare per worker for a country can be written only as functions of the productivity average and the number of varieties consumed:

$$P = M_t^{\frac{1}{1-\sigma}} * \frac{1}{\rho \tilde{\varphi_t}}, \quad R = M_t r_d \tilde{\varphi_t}, \quad W = \frac{R}{L} M_t^{\frac{1}{\sigma-1}} \rho \tilde{\varphi_t} \tag{30}$$

The overall average revenues and profits, combined from domestic and foreign markets are:

$$r_{av.} = r_d(\varphi^{\sim}) + p_x n r_x(\varphi_x^{\sim}), \qquad \pi_{av.} = \pi_d(\varphi^{\sim}) + p_x n \pi_x(\varphi_x^{\sim}) \qquad (31)$$

In the open market equilibrium as in the closed economy, the zero cutoff profit condition will involve a relationship between the average profit per firm and the cutoff productivity level (Melitz, 2003). From before this implies:

$$\pi_d(\varphi^*) = 0 \;\leftrightarrow\; \pi_d(\varphi^{\sim}) = fk(\varphi^*), \qquad \pi_x(\varphi_x^*) = 0 \;\leftrightarrow\; \pi_x(\varphi_x^{\sim}) = fk(\varphi_x^*)$$

With k again being defined in the same way as in the zero profit cutoff condition above on page X. Using (31) for the average profit above the new zero cutoff profit condition applicable for the open market case is:

$$\pi_{av.} = \pi_d(\varphi^{\sim}) + p_x n \pi_x(\varphi_x^{\sim}) = fk(\varphi^*) + p_x n f_x k(\varphi_x^*) \qquad (32)$$

The free entry condition in the open economy is defined as follows:

$$\left(1 - G(\varphi^*)\right) * \left(\frac{r(\varphi^{\sim})}{\sigma} - f\right) + \left(1 - G(\varphi_x^*)\right) * \left(\frac{r_x(\varphi_x^{\sim})}{\sigma} - f_x\right) = \theta f_e \qquad (33)$$

The first term on the left hand side is the expected profit from serving the domestic market while the second term is the expected profits from serving the foreign market. Their sum must equal the per period sunk market entry costs for the domestic and foreign market.

A comparative statics question is whether the cutoff productivity in the open economy is larger or smaller than the cutoff productivity in the closed economy. For the particular case studied in this thesis the question asks whether the country gains or losses in productivity due to the increase in foreign equity participation in domestic firms and hence the ability to export its products on the foreign market? Since the additional term in (33) on the left hand side is positive and the first term decreases with increase in $\varphi^*$; $\varphi^*$ has to increase even more now in order to compensate for the additional positive term on the left hand side. How about the firm selection process with foreign investments and exposure to foreign markets? With these two changes in for the domestic firms, the expected profits of market entry increase, due to the additional term on the left hand side in (33). This makes more firms to enter the market which leads to increased competition and only firms with higher productivity can survive in the market.

### *3.3.6 Impact of φ and φ˜ on firm's sales*

In this last section the impact of the productivity parameter (φ) and the average productivity parameter ($\varphi^{\sim}$) on the firms sales will be analyzed. The firm's sales which is used to measure output of the firm are given by the Revenue variable. The most important in this respect is to look at the revenue equation in the open economy equilibrium. According to equation (31) the average revenue for a firm operating in the domestic and foreign markets is the sum of the average domestic revenue and average foreign revenue. These two parts will be considered separately. For the average domestic revenue the zero cutoff profit condition from the general model will be used to determine how the change in average and cutoff productivity affect the average domestic revenue. According to equation (23)

$$r^{-} = r(\varphi^{\sim}) = \left[\frac{\varphi^{\sim}(\varphi^{*})}{\varphi^{*}}\right]^{\sigma-1} * r(\varphi^{*}) \qquad (23)$$

When the cutoff productivity level increases then this in turn affects the average productivity level as well in equation (23). If the cutoff productivity level ($\varphi^{*}$) rises that means that less firms will be able to survive in the industry because now they need higher productivity in order to sell enough output and cover their fixed entry costs. That means that only the best firms will survive in the market with higher productivities than before which in turn will increase the average wide productivity level in the industry. Hence, for a wide class of distributions, e.q. Pareto or uniform distribution, the ratio on the right hand side of equation (23) increases with increase in $\varphi^{*}$. The increase in the cutoff productivity level also affects the second term of the equation. It leads to less firms entering the market, only the most productive ones and since there are less firms and the same market size, the market shares of firms will be bigger now than before and hence they will be able to sell more output and increase their revenue. So, the increase in the cutoff productivity level will increase the average productivity level in the industry which will lead to higher average revenue.

The revenue from the foreign market is also dependent on the average productivity level but in the foreign market. This is shown by the second part of equation (31), namely the foreign market revenue: $p_x nr_x(\varphi_x^{\sim})$. When the average productivity in the foreign market increases the revenues of the firm form operating on the foreign market will also increase for the same reasons that lead to increase in revenue on the domestic market because of increase in average productivity.

To relate this to the analysis in this thesis foreign investments into domestic firms are considered as a driver for changes in productivity parameters, either cutoff levels or average. More foreign investments into an industry will increase the average productivity parameter because they will transfer knowledge and know how as well as more efficient production technologies and managerial techniques which will make those firms more competitive and more productive than their domestic counterparts. Their increased efficiency through FDI will raise the productivity bar in the industry and will make domestic firms either drop from the market or find ways to become more competitive. This in turn should increase market shares and revenues of the more productive firms, which is assumed to be the foreign owned ones. From this analysis the following hypotheses are formulated:

1. Foreign firms are more productive than domestic firms in the same industry and in turn exhibit higher revenues with more foreign investments.
2. Foreign ownership in a particular industry affects the productivity of domestically owned firms in the same industry; there is evidence for positive productivity spillover effects.
3. Foreign owned firms benefit more than domestically owned firms from the presence of other foreign firms; positive impact on joint ventures in the industry from foreign investments.

These three specific hypotheses are tested thoroughly in the next section of the thesis, the Empirical Analysis.

## 4. The Empirical Analysis

### 4.1 Methodology

In order to empirically assess whether foreign ownership in a firm is associated with an increase in that firm's productivity and whether foreign ownership in a given sector of the economy affects the productivity of domestically owned firms in the same industry, hence the ability to create positive or negative productivity spillovers to domestically owned firms according to the theoretical model outlined in Section 3 of the paper, this empirical analysis follows the following baseline specification, where both hypothesis are grouped in the same general regression specification (34):

$$Sales_{i,t} = \alpha_i + \beta_1 GDP(per\ capita)_{x,t} + \beta_2 Plant\_FDI_{ijt} + \beta_3 Sector\_FDI_{jt} + \beta_4 Plant\_FDI_{ijt} * Sector\_FDI_{jt} + \beta_5 \boldsymbol{X}_{ijt} + \varepsilon_{ijt}$$

Since the obtained dataset is characterized by time, cross-section and country specific dimensions a panel data analysis was conducted. As it can be seen from the above regression specification sales of the firm which are a measure of its output as part of sector *j* in time *t* are regressed on a constant, plant level foreign ownership, sector level foreign ownership, GDP per capita as well as a vector of control variables. In regression specification (34), *Plant_FDI* is the share of foreign ownership in a particular firm as part of a sector *j* at time *t* and it varies between 0 and 100 percent. A positive and significant coefficient of this variable should be observed if foreign ownership in a plant increases that plant's productivity. To measure the presence of foreign ownership in a particular sector of the economy, which is determined by a four digit ISIC code the variable *Sector_FDI* is used. This means that if there are productivity advantages spilling over from foreign to domestic firms this coefficient should also be positive and significant. Moreover, the interaction term between the firm and sector level foreign ownership allows for investigating whether the impact of foreign presence on other foreign firms differs from the impact on domestic firms. A positive and significant coefficient should be obtained if firms with foreign shares benefit from the presence of other foreign firms. On the other hand the coefficient will be negative if joint ventures are negatively impacted by the activities of other foreign plants. The vector $\boldsymbol{X_{ijt}}$ is a vector of control variables which vary across different firms, years and countries. This vector of control variables includes plant level inputs such as unskilled labor ($UNSKL_{it}$), skilled labor ($SKL_{it}$), materials ($M_{it}$) and capital ($K_{it}$). These variables and the way they are obtained is explained in the part **Data** below.

However since as an economist the interest lays in elasticity or the respective relative change in the dependent variable owing to a relative change in one of the repressor variables a logarithmic version of regression (34) was used for the analysis. Hence the following regression formulation (35):

$$\log(Sales_{i,t}) = \alpha_i + \beta_1 * logGDP(per\ capita)_{x,t} + \beta_2 * Plant\_FDI_{i,t} + \beta_3 * Sector\_FDI_{i,t} + \beta_4 * Plant\_FDI_{i,t} * Sector\_FDI_{i,t} + \beta_5 logX_{i,t} + \varepsilon_t$$

An important assumption underlying the empirical analysis of equation (35) is the independence of the country specific intercept and the country and time specific error term, resulting from the

estimation. In order to account for this it is essential to model different country specific intercepts rather than a general constant. To achieve this econometrically, in the panel regression the log of GDP per capita for every country for every year in constant US dollars is used. This term represents a country specific dummy, capturing country specific fixed effects. The logarithm of the country specific GDP per capita is of economic importance as well. First of all it captures the level of economic development in the country and as such it is an indicator of the ability of the firms in the country in the different industry sectors to benefit from a potential foreign ownership. The natural logarithm of the country-specific GDP per capita can be interpreted as accounting for an economic 'catch-up' effect between the developing and developed countries. Endogenous growth theory, predicts that poor countries grow faster than and converge towards more developed countries due to the relatively lower cost of introducing new varieties of capital goods. Standard Solow growth theory predicts a similar economic 'catch-up' effect for slightly different reasons. It assumes that countries converge towards a balanced growth path. Additionally, the rate of return to capital is lower in countries with more capital per worker due to diminishing marginal productivity. Finally, poorer countries are in the position to gain access to state of the art technologies. Based on these theoretical considerations, the coefficient of logarithm of the GDP per capita should be positive and significant meaning that as the country develops more it bring about an internal economic prosperity and hence it allows for firms in that country to gain more from foreign ownership and turn it into a profitable opportunity. That was the inclusion of the country fixed effects. Moreover, in the regression procedure a cross-section and period fixed effects were employed in addition to a random component $\varepsilon_t$ which varies across plants and a time varying component. Cross-section fixed effects represent a set of dummy variables where each cross-sectional unit gets its own dummy variable. In this analysis the cross-sectional unit is the 4 digit level ISIC code for the industry. Hence when employed cross-section fixed effects each 4 digit level ISIC code (minus one) gets a dummy variable. This is done in order to control for productivity differences across industries and to put aside the condition that some industries are to start with more productive than other industries in a given economy in a given country. Next the regression employs period fixed effects which is a set of dummy variables where each period (minus one) gets its own dummy variable. Using a panel regression with fixed effects for the country, period and ISIC code allows for an estimation of the regression parameters by ordinary least squares.

Because of differences in the level of economic development as well as the political and financial environment in the panel of countries of interest, differences in cross-sectional residuals might exist, which would in turn indicate heteroskedasticity. Statistical software as Eviews 7 cannot provide significant evidence for heteroskedasticity by means of a standard White test. A way to control for this occurrence which might in turn bias the results is to use cross-section weights. When using cross-section weights the influence of heteroskedasticity in the error terms is minimized. However, econometrically in the panel date set on which the regressions are conducted, cross section weights cannot be employed when the regression uses cross-section and period fixed effects at the same time. One of these effects has to be removed and since for the regression results it is not sound to remove either cross-section or period fixed effects the regression specification does not control for heteroskedasticity by including cross-section weights and this is left out of the analysis.

As it can be seen in the **Results** part later on in this section different types of regression specification (35) are used. These different approaches are done for reasons of robustness checks as well as adjusting the data set in order to make sure that all ways in which the results can become more firm are exhausted.

The first types of regressions are ones where gradually different control variables are being introduced in the regression while the variable *log_GDP_percapita* is always used. The gradual inclusion of the different control variables allows for adjustments to the model and makes it possible to see how the inclusion of a given control variable accounts for the explanatory power to the model as well as the ability of that variable to explain changes in the output of the firms. In addition, the independent variables *Plant_FDI* and *Sector_FDI* are also always included in the analysis. The inclusion of the interaction term between plant and sector foreign equity participation is done in different combination with the set of control variables and also in regressions without any control variables. It is important to note that firstly the regressions were run with the whole dataset without any changes or adjustments to the panel. However, in Eviews the box 'Near Singular Matrix' appeared which means there is linear relationship between two explanatory variables or better known in statistics as collinearity. This collinearity in the regression exists between the variables *Plant_FDI* and *Sector_FDI.* The reason for this occurrence is the fact that there are many sectors in the economy of the countries of interest which have zero foreign ownership which follows from the individual plants in that sector

having zero foreign ownership as well. In addition, this linear dependence also appears because there are quite some sectors which have hundred percent foreign ownership just because there is only one firm in that sector which happens to have also hundred percent foreign equity participation. Hence, when the regression was run with all those sectors the coefficients for the *Plant_FDI* and *Sector_FDI* were insignificant since because of the collinearity they essentially measure the same thing and there is no distinction between them in the regression. A way to keep this out of the dataset all sectors with zero foreign ownership were deleted as well as all sectors with hundred percent foreign equity which have only one firm. Moreover, all regressions in the thesis are done using this adjusted data set in order to make sure the results are not affected by collinearity. So, this is the basis for the regressions. Without any further adjustments for the purpose of robustness checks regressions are done also in first differences, as well as second and third differences of all variables included in the analysis. This transformation allows us to control for any fixed effects which could be present at the firm level, instead of the industry level. For instance, the coefficient of *Plant_FDI* which is positive might arise because of the fact that foreigners purchase shares in only the most productive industries. And taking differences is a way to account for this. The way in which the longer term difference is taken is by subtracting from the current data point the data point two periods before and three periods before respectively. Hence for second difference: $Y_t - Y_{t-2}$ and for third difference: $Y_t - Y_{t-3}$. Although taking longer differences is a good robustness check, for the working panel data set there were not enough observations to run those regressions.

More on these results and their implications is explained in the section **Results** further below.

After the regression with the differences several further adjustments to the panel were done in order to extend the analysis. Firstly, in the already adjusted dataset all sectors that did not involve manufacturing were excluded from the panel and the regressions were done only with manufacturing sectors. The reason for this is because the dataset includes a lot of services sectors where there the production does not involve a tangible product. Also, mostly labor is employed and hence no spillovers leading to technological progress can be expected. It is also worth noting that when the data set was adjusted and the services sectors were neglected, also the agriculture sector was taken out of the analysis. The reason is somewhat similar, because food production is somewhat natural resources intensive spillovers leading to technological progress are unlikely to occur. The results of these regressions are of course discussed later in this part of the thesis.

Secondly, while all sectors were included, services and manufacturing, the data set was adjusted by taking out of the panel the countries that have more than fifty percent of their sectors with zero foreign ownership. Eight countries made the cut including Bosnia, Czech Republic, Kyrgyz Republic, Lithuania, Montenegro, Slovakia, Slovenia and Tajikistan. This adjustment was done in order to avoid to a considerable extent countries with half of their sectors in the economy with zero foreign equity participation in order for the analysis to be sounder when trying to investigate productivity enhancements and productivity spillover effects from foreign ownership. Thirdly, since differences in the coefficients might exist because of systematic differences across small and large plants, the data set is divided into firms which have less than 50 employees, categorized as small firms and firms which have 50 or more employees, categorized as large firms. This follows the empirical analysis of Aitken and Harrison (1999) when they investigated similar foreign ownership effects on Venezuelan plants. All specifications include annual time dummies as well as industry dummies and country fixed effects.

### 4.2 Data Description

For the purpose of empirical investigation of the two hypotheses mentioned in the theoretical framework, data set from the World Bank Enterprise Survey was collected. This is a firm level survey of representative sample of the economy's private sector. It covers a broad range of business environment topics such as access to finance, corruption, infrastructure, competition, crime and most importantly performance measures. The survey is conducted by the World Bank and the data is collected through face to face interviews with managers and business owners in around 130,000 firms in 135 economies. The data is collected by a team of economists and enterprise level survey experts.

The empirical analysis in this thesis focuses on firm performance in Eastern Europe and Central Asia over a period of four non consecutive years, including 2002, 2005, 2007, and 2009. The Enterprise Surveys conducted in Eastern European and Central Asian countries are known as Business Environment and Enterprise Performance Surveys or BEEPS and are conducted jointly by the World Bank and the European Bank for Reconstruction and Development. Because of the sensitivity of the information provided in the survey confidentiality of the respondents is maintained and the data is released without firm identifiers. This ensures great survey participation as well as high quality of the data. The survey typically interviews firms in large,

medium and small sized economies with up to 1800, 360 and 150 interviews respectively. The main sectors of interest are the manufacturing and services sectors with ISIC codes in the range of 15-37, 45, 50-52, 55, 60-64, and 72. The services sectors include construction, retail, wholesale, hotels, restaurants, transport, storage, communications and IT. Manufacturing sectors are basic metals, chemicals, electrical equipment, garments, machinery, non metals, other manufacturing, plastics and textiles. Additional sectors include fabrication and food production. In order to qualify for the survey an organization has to be officially registered and have at least five employees. Firms with 100 percent government/state ownership are not included in the survey. As part of the survey questionnaire firms have to respond to different inquiries that in the end gathers data on firm characteristics, gender participation, access to finance, annual sales, costs of inputs/labor, workforce composition, bribery, licensing, infrastructure, trade, crime, competition, capacity utilization, land and permits, taxation, informality, business-government relations, innovation and technology, and performance measures. In year 2002 the data set included 6153 small, medium and large firms, in 2005 there were 9098 firms, 2007 only contained 1958 firms and 2009 was the largest sample with 9709 firms. Hence in total over the four years the panel included 27 developing and developed countries in Eastern Europe and Central Asia with 26,918 enterprises. The countries are: Albania, Armenia, Azerbaijan, Bosnia, Bulgaria, Belarus, Croatia, Czech Republic, Estonia, Georgia, Hungary, R. of Macedonia, Kazakhstan, Kyrgyz Republic, Latvia, Lithuania, Moldova, Montenegro, Poland, Russia, Romania, Serbia, Slovakia, Slovenia, Tajikistan, Ukraine and Uzbekistan. Montenegro is the only country where there were too few observations for the analysis and was thus excluded. As it can be seen from the information the data set in not a balanced panel, rather the total number of plants varies across each year of the sample. These countries are used for the analysis because of the data availability through the surveys as well as the reforms of these countries to undertake policy changes and improvements regarding foreign investments into domestic firms and opening their markets to foreign activity.

When looking at the questions of interest concerning the panel data set besides the many different variables and indicators which are collected in the survey the following section will explain only the most important ones, hence the ones of greatest interest. Those variables are sales, employment (including skilled and unskilled workers), materials, capital, plant foreign ownership, sector foreign ownership and GDP per capita.

Sales, which measures output is the dependent variable and it is an indicator of the firm's performance. It is measured in absolute dollar terms and for the analysis the logarithm is considered in order to look at the relative change of output as affected by the other independent variables. The measure of sales in absolute dollar terms is not expressed in current dollar terms, e.g 2000 dollar terms, which means that the sales of 2002 are not comparable to the sales values of 2005, 2007 and 2009. The same holds for the comparability between the other years as well. The sales of a firm depend on the firm and its management, but also on the product and the industry in which the firm operates as well as the market which the firm serves with the corresponding product. For example, firms in country such as Russia that are manufacturing heavy machinery or metals have higher value of sales than firms in the same industry in Slovenia. The sales measure also depends on the conditions and the structure of the industry in which they operate, such as the level of competition, degree of transparency of information as well as the policy of the country in terms of openness to mergers and foreign direct investment. For instance, the Republic of Macedonia has a highly segmented market for food production with many firms that are involved in the same produce and mostly are there to meet domestic demand and at the same time have constrains to export to foreign markets because of EU market restrictions about food safety. These firms, in this sector have evenly distributed sales for example. Although, value of sales might be a biased and non-balanced measure of output it is a highly reliable measure that gives a good approximation of the management of the firm and its ability to sell its produce which is an indicator of its financial performance.

*Plant_FDI* is defined as the percentage of equity owned by foreign investors. It is a number between 0 and 100 percent.

*Sector_FDI* is defined as foreign ownership averaged over all plants in the sector, weighted by each firm's share in sectoral employment. Mathematically, this variable is composed in the following way:

$$Sector\_FDI_{jt} = \frac{\sum_i Plant\_FDI_{ijt} * Employment_{ijt}}{\sum_i Employment_{ijt}} \qquad (36)$$

The sectors in the above expression are according to 3 digit ISIC code segregation. The above derivation of the variable can also be done using physical capital as weight instead of employment however, according to the empirical literature conducted on different data set this

does not make any difference in the analysis. In addition, physical capital in the data set used in this thesis is not a straightforward measure and had to be constructed for the sake of the analysis, which means that using physical capital weights instead of employment weights would have made the analysis non reliable in terms of the empirical results. The importance of foreign ownership in sectors varies throughout the period under consideration. It was particularly high in agriculture, hotel, services and manufacturing outside the sectors included in the dataset, as well as transport and wholesale in the year 2002. The reasons for this are policies put in place to discriminate against foreign firms in many ways. The faced different corporate tax rates, non exclusive use of trade secrets in joint ventures etc. These policies were typical for countries that were at the time not building their profile for the EU, were uninterested in foreign investors entering their economies and this was a way to protect themselves, or were still part of certain trade blocks and expansion was not in the short term plan. In the later years because of reforms in the countries which allowed them to open their economies towards trade as well as foreign direct investment, the presence of foreign equity participation was felt in almost all sectors in the economy that are included in the survey. Zero foreign ownership occurs in almost every sector in the period and for some countries it tends to be regular in some sectors. For example in Russia, sectors such as basic metals or non metals are heavily regulated by the state and there is difficulty of making any progress towards FDI entering those sectors. The same holds for the agriculture sector for countries for which this sector represents part of the nation identity and a long tradition and is as such not easily given up to foreign investors. However, these trends are changing and foreign ownership becomes an integral part of the firm's development through expertise or larger capital investments and this in turn reflects in an increase in the FDI in the corresponding sectors.

Skilled labor is defined as number of skilled employees and unskilled labor is defined as number of unskilled employees. Worker hours can also be used instead of number of workers but this fact was not available in the data set.

Capital and materials are variables which had to be constructed from the information in the data set. Capital was constructed as the sum of two other variables, namely purchases of machinery, vehicles and equipment and purchases of land and buildings. Capital in the regression is meant to measure value of net assets and not equity capital, since equity capital is measured through plant

and sector foreign ownership. Materials on the other hand are the sum of total annual cost of raw materials and intermediate goods and total annual cost of fuel.

Last but not least is the variable *GDP_per_capita* which was obtained for each country for each of the four years from the World Bank, specifically the World Development Indicators. The variable is expressed in constant US dollar terms so that is comparable and so that an increase (decrease) in this measure really captures positive (negative) economic progress. As mentioned in the methodology part above, for the regression the logarithm of all the variables was used.

### 4.3 Descriptive Statistics

Now, the focus will be on some descriptive statistic for the whole dataset.

| | Log_Sales | Log_GDP_pc | Log_Skilled | Log_Unskilled | Log_Materials | Log_Capital | Plant_FDI | Sector_FDI |
|---|---|---|---|---|---|---|---|---|
| **Mean** | 5.907560 | 3.328977 | 1.170604 | 0.926944 | 5.396571 | 4.801157 | 0.143583 | 0.212159 |
| **Maximum** | 14.00000 | 4.100842 | 3.914713 | 3.880814 | 10.96997 | 10.39794 | 1.000000 | 1.000000 |
| **Std. Dev.** | 1.095339 | 0.390568 | 0.740374 | 0.689351 | 1.072722 | 1.015794 | 0.318510 | 0.236108 |
| **Jarque-Bera** | 2919.211 | 752.6259 | 572.3083 | 405.9723 | 796.5636 | 2434.267 | 13992.49 | 6462.743 |
| **Observations** | 20806 | 26911 | 17089 | 9774 | 10031 | 13237 | 16144 | 16144 |

**Table 1. Descriptive Statistics for the variables of interest in logarithmic terms and their individual samples.**

| | Sales | GDP_per capita | Skilled workers | Unskilled workers | Materials | Capital |
|---|---|---|---|---|---|---|
| **Mean** | 4.63E+09 | 3037.972 | 72.310 | 35.148 | 45574760 | 533073 |
| **Maximum** | 1.00E+14 | 12613.68 | 8217 | 7600 | 9.33E+10 | 2.50E+10 |
| **Std. Dev.** | 6.71E+11 | 2495.75 | 252.35 | 136.67 | 1.35E+09 | 1.94E+08 |
| **Jarque-Bera** | 4.57E+11 | 14072.69 | 58368731 | 4.75E+08 | 5.12E+09 | 1.33E+11 |
| **Observations** | 22219 | 26911 | 17089 | 9774 | 10684 | 26469 |

**Table 2. Descriptive Statistics for the variables of interest in absolute terms and their individual samples**.

The data obtained is characterized by some interesting descriptive features. First of all the variables, all of them, follow a normal distribution as it can be seen from the significance of the Jarque-Bera test statistic at the 1% level. The mean value of the sales in logarithmic terms is close to 6 with a maximum of 14. In absolute values these are fairly large numbers and mean level of sales is maintained by X countries out of all twenty seven. The mean value of GDP per capita when looking in non log terms is 3037.972 (in 2000 $US) with a maximum value of 12613 ($US 2000) corresponding to a log value of 4.10. This maximum value of GDP per capita is achieved by Slovenia in the year 2009 which makes it in comparable GDP value the most developed and richest country in the whole dataset. The mean value of GDP per capita is surpassed by nine countries which is one third of the dataset. These include the most developed countries which are part of the EU and an interesting common fact that they all share is them all being from Europe. When comparing the descriptive statistics for the labor variables it is interesting to note that the mean and maximum values for skilled workers are larger than those for unskilled workers. Although the difference is marginal it is a confirmation of the fact that on average the firms in the industries in all countries have larger number of skilled workers. The same holds for the comparison between materials and capital in favor of materials. Of course the descriptive statistics for the variables materials and capital depend on the tendency and the need of firms being in a particular sector to make purchases of the components that make up these variables. This just means that the mean and maximum values for materials are larger than for capital which in turn leads us to conclude that expenditures on materials were greater by some

marginal extent. The statistic for the last two variables is the most interesting and certainly the most important from an analysis stand point. They are both in relative terms. First the plant foreign ownership has a mean value of 14.3% with a maximum value of 100%. The mean value is quite low and that is why firms that surpass this average foreign ownership value are present in all countries, over all years, in all sectors of the economy. Hundred percent foreign ownership follows the same pattern which means that in every country in any year there are at least some sectors that have hundred percent foreign ownership. For some countries this is common for more sectors and for some countries less sectors are fully foreign owned. The variable *Sector_FDI* has a mean value of 21.2% and a maximum of 100%. There is only one country from the whole dataset that has no sectors in its economy with above average sector foreign ownership or at least equal to it. That country is Albania. However, except for Armenia and Montenegro, in all other countries this sectoral foreign equity participation is throughout all sectors in general and for every country present in retail, food and wholesale. Armenia and Montenegro have above average sectoral foreign ownership in the years 2005 in chemicals and 2009 in fabricate respectively. On the other hand, the maximum foreign equity participation in the sector is less common. It is present in only ten European countries, concentrated for one or at most three sectors in each country, involving only 35 firms in total. The individual country descriptive statistics are available in the Appendix at the end of the thesis in Tables 13 to 39.

## 4.4 Results

### 4.4.1 General Results

Conducting the panel regression as represented in the section **Methodology** yields some interesting and conflicting results when compared to the reference paper of Aitken and Harrison (1999). The results regarding the regression explaining the change in sales by means of plant and sector foreign ownership, an interaction term of the two, GDP per capita, and a group of control variables while controlling for country specific effects, period effects and industry productivity differences are summarized in Tables 3-5. Table 3 reports the results of the baseline specification using different set of control variables and at the same time varying between investigating the direct and indirect effect of plant and sector foreign ownership on the change in

sales of a firm by using the interaction term between plant and sector FDI. These are only the first different seven specifications out of 21 throughout Tables 3-5.

**Table 3. Regression Results for Change in Sales (log_sales)**

| Variable | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
|---|---|---|---|---|---|---|---|
| **Intercept** | -26.03*** | -26.03*** | -14.99*** | -15.834*** | -15.69*** | -15.67*** | -0.834 |
| | (2.789) | (2.790) | (4.515) | (4.712) | (4.713) | (6.006) | (7.782) |
| **Log_GDP_percapita** | 9.548*** | 9.544*** | 6.253*** | 6.398*** | 6.348*** | 5.851*** | 0.782 |
| | (0.832) | (0.833) | (1.363) | (1.418) | (1.419) | (1.810) | (2.378) |
| **Plant_FDI** | 0.129 | 0.162 | 0.055 | 0.090 | 0.259 | -0.084 | -0.095 |
| | (0.142) | (0.167) | (0.226) | (0.231) | (0.283) | (0.213) | (0.253) |
| **Sector_FDI** | -0.082 | -0.057 | 0.220 | 0.140 | 0.312 | 0.237 | 0.450** |
| | (0.110) | (0. 130) | (0.205) | (0.216) | (0.272) | (0.189) | (0.190) |
| **Log_Skilled** | | | | 0.257* | 0.254* | 0.120 | -0.052 |
| | | | | (0.136) | (0.136) | (0.116) | (0.139) |
| **Log_Unskilled** | | | 0.336*** | 0.363*** | 0.355*** | 0.360*** | 0.111 |
| | | | (0.104) | (0.109) | (0.109) | (0.096) | (0.144) |
| **Log_Capital** | | | | | | 0.337*** | 0.118 |
| | | | | | | (0.059) | (0.073) |
| **Log_Materials** | | | | | | | 0.649*** |
| | | | | | | | (0.077) |
| **Plant_FDI*Sector_FDI** | | -0.099 | | | -0.473 | | |
| | | (0.268) | | | (0.457) | | |
| **Adj. $R^2$** | 0.63 | 0.63 | 0.59 | 0.57 | 0.57 | 0.80 | 0.93 |
| **N Observations** | 12553 | 12553 | 4629 | 4366 | 4366 | 2878 | 1937 |

*** indicates significance at a 1% significance level; ** at a 5% significance level, * at a 10% significance level

**Table 3. Regression Results for Change in Sales (log_sales)**

Note: First 7/21 Model Specifications, depending on using different regressors and control variables: (1) Direct effect of Plant and Sector FDI on change in sales; (2) Direct and Indirect effect of plant and sector FDI on change in sales; (3) Direct effect of Plant and Sector FDI on change in sales including unskilled labor as a control variable; (4) Direct effect of Plant and Sector FDI on change in sales including skilled and unskilled labor as a control variables; (5) Direct and Indirect effect of plant and sector FDI on change in sales including skilled and unskilled labor as control variables; (6) Direct effect of Plant and Sector FDI on change in sales including skilled and unskilled labor and capital as control variables; (7) Direct effect of Plant and Sector FDI on change in sales including skilled and unskilled labor and capital and materials as control variables; Method Used: Panel Least Squares, with Period Fixed Effect and Log (GDP_percapita in constant $US 2000) to account for Country Fixed Effects and Cross-section fixed effects to control for different industry sector productivities; Industry Dummies are defined at the three digit ISIC level; All Standard Errors are reported in parentheses.

Tables 4 and 5 also consist of different regressions depending on the different combination of the set of control variables with the main three regressor variables. So forth, Tables 4 and 5 consist of the second seven and third seven specifications respectively. An interesting question to the reader

might be if there is some pattern behind the different twenty one regression forms? They are basically done in order to see in which set up does the model give the most significant results and which control variable and thus which model has the best explanatory power. The addition of the control variables is done in a certain pattern. For example first the labor control variables are added, then their effect in a combination with capital is investigated, and in the end materials are added. Some regressions, such as (4) and (5) for example use only the labor control variables, while others, such as (11) and (12) use only capital and materials.

**Table 4. Regression Results for Change in Sales (log_sales)**

| Variable | (8) | (9) | (10) | (11) | (12) | (13) | (14) |
|---|---|---|---|---|---|---|---|
| **Intercept** | -0.296 | -0. 653 | -0.903 | -2.372 | -2.709 | -2.501 | -1.309 |
| | (7.765) | (8.443) | (7.651) | (5.149) | (5.204) | (0.206) | (6.130) |
| **Log_GDP_percapita** | 0.656 | 0.717 | 0.799 | 1.060 | 1.171 | 1.362 | 1.004 |
| | (2.370) | (2.579) | (2.337) | (1.556) | (1.575) | (1.921) | (1.897) |
| **Plant_FDI** | -0.289 | 0.142 | | 0.159 | 0.074 | 0.458*** | 0.172 |
| | (0.308) | (0.253) | | (0.200) | (0.242) | (0.178) | (0.237) |
| **Sector_FDI** | 0.249 | | 0.422** | 0.288** | 0.221 | 0.273* | 0.058 |
| | (0.263) | | (0.172) | (0.144) | (0.179) | (0.148) | (0.205) |
| **Log_Skilled** | -0.093 | -0.024 | -0.041 | | | -0.088 | -0.101 |
| | (0.144) | (0.151) | (0.134) | | | (0.116) | (0.114) |
| **Log_Unskilled** | 0.106 | 0.090 | 0.095 | | | 0.013 | 0.011 |
| | (0.144) | (0.157) | (0.136) | | | (0.103) | (0.102) |
| **Log_Capital** | 0.098 | 0.117 | 0.111 | 0.146*** | 0.138*** | | |
| | (0.075) | (0.079) | (0.070) | (0.051) | (0.052) | | |
| **Log_Materials** | 0.665*** | 0.663*** | 0.655*** | 0.720*** | 0.721*** | 0.725*** | 0.736*** |
| | (0.078) | (0.084) | (0.074) | (0.057) | (0.057) | (0.056) | (0.056) |
| **Plant_FDI*Sector_FDI** | 0.463 | | | | 0.212 | | 0.668* |
| | (0.282) | | | | (0.335) | | (0.377) |
| **Adj. $R^2$** | 0.93 | 0.92 | 0.93 | 0.93 | 0.93 | 0.91 | 0.92 |
| **N Observations** | 1937 | 1937 | 1937 | 3464 | 3464 | 2989 | 2989 |

*** indicates significance at a 1% significance level;** at a 5% significance level, *at a 10% significance level

**Table 4. Regression Results for Change in Sales (log_sales)**

Note: Second 7/21 Model Specifications, depending on using different regressors and control variables: (8) Direct and Indirect effect of Plant and Sector FDI on change in sales including skilled, unskilled labor and capital and materials as control variables; (9) Direct effect of plant FDI on change in sales using all four control variables; (10) Direct effect Sector FDI on change in sales including all four control variables; (11) Direct effect of Plant and Sector FDI on change in sales including capital and materials as control variables; (12) Direct and Indirect effect of plant and sector FDI on change in sales including capital and materials as control variables; (13) Direct effect of Plant and Sector FDI on change in sales including skilled and

unskilled labor and materials as control variables; (14) Direct and Indirect effect of Plant and Sector FDI on change in sales including skilled and unskilled labor and materials as control variables; Method Used: Panel Least Squares, with Period Fixed Effect and Log (GDP_percapita in constant $US 2000) to account for Country Fixed Effects and Cross-section fixed effects to control for different industry sector productivities; Industry Dummies are defined at the three digit ISIC level; All Standard Errors are reported in parentheses.

In general the intercept of the regression has a negative sign and it is significant in the first six regression specifications, as well as regressions (15)-(19). It seems as if in all regressions, except (18), where the control variable *log_materials* is ncluded the intercept becomes insignificant. This probably means that the explanatory role of the intercept in the regression is taken away by the materials control variable. However, the intercept is not of a great importance. Since it is a fixed effects model it assumes that the overall intercept term for the regression is omitted, because it is considered by the individual intercepts in the regression. The intercept in this case is referred to as fixed individual effects and as such it captures all un (observable) time-invariant differences across individuals (Verbeek, 2008). The *log_GDP_percapita* is initially large in value and significant across the first six regressions. In regressions (7)-(14) it is insignificant while in regressions (15)-(17) and (19) it becomes large in value and significant once again. It seems like, once again, the inclusion of *log_materials* makes this variable to become insignificant. The value drops in magnitude as more regressors are included which means that its explanatory power becomes weaker and is shifted towards the newly added control variables. Its value drops from around 9.5 to 5.9 around which level it remans in the later models, which means as more control variables are added in the model the magnitude of importance of the country specific economic development becomes less of an essential factor in explaining changes in output of individual firms.

The variable *Plant_FDI* is unable to explain changes in sales over time for firms in different industry sectors and is as such insignificant in all first seven regressions in Table 3. Putting the significance aside, the value of the coefficient is positive across the first five specifications and largest in specification (5) where a model is run to look at the direct and indirect effect of Plant and Sector FDI on changes in sales combined with the effects of the type of labor employed in the individual plants only. Hence, was this value significant, this would be a pure total factor productivity gain, because of control for differences in inputs, in a setting where only the number of skilled versus unskilled workers is used to control the plant circumstances. This variable becomes significant at the 1% significance level in regression (13) where skilled and unskilled labor in a combination with materials is used to control for the business environment. The point estimate of

0.458 means that the output of a firm where an increase in foreign equity goes from 0 to 100 percent would be 45.8 percentage points higher than any other comparable domestic firm. In addition, in regressions (18), (20) and (21) *Plant_FDI* is also significant at the 10%, 1% and 5% significance levels respectively. The value is positive and varies from 0.337 to 0.472, which in magnitude is not far from the previous point estimate in regression (13). The interpretation is the same, with a difference between the models with respect to the control variables. All of these regressions include log_materials and a different combination of log_skilled and log_unskilled labor in the regression, which leads to the conclusion that plant foreign ownership can explain changes in sales only when changes in materials are taken into consideration to control for the business environment.

The interpretation of the *Sector_FDI* is a bit different. A negative value as seen in the first two regressions without any control variables implies that domestic plants in sectors with more foreign ownership are significantly less productive than those in sectors with smaller foreign presence. However, this value is not significant at neither 1, 5 nor 10% significance levels. In addition, when some control variables are included gradually the value becomes positive and varies in magnitude, however it still remains insignificant. However, in model (7) where the direct effect is only considered and all four control variables are included *Sector_FDI* becomes positive and significant at 5% significance level. This means that an increase in foreign investment from 0 to 10 percent in the sector leads to as much as 4.5 percentage point increase in domestic productivity. This variables is also significant in other regressions, namely (10), (11), (13) and (16) with significance at either 1%, 5% or 10%. Its value goes from the lowest of 0.273 up to 0.483 as a highest value. Moreover, the interpretation remains the same as an increase in the sector's FDI from 0 to 10 percent will lead to an increase of 2.73 or 4.83 percentage points increase in domestic productivity. These results do not confirm the findings of Aitken and Harrison (1999), but it follows some other papers used in the literature review. In addition, the results also confirm the predictions of the theoretical model outlined in the section Theoretical Framework.

The coefficient of the interaction term, *Plant_FDI*Sector_FDI* varies across regressions in magnitude, sign and significance. There are only six out of the twenty one models that use the interaction term in order to look at the indirect impact of plant and sector foreign ownership on changes in sales. Out of these six models, the variable is significant in only two model specifications, namely (14) and (16). The former uses all control variables except for capital and the

latter uses all control variables except for materials. In regression (14) it is only this interaction term that is significant at the 10% level without either plant or sector FDI being significant, while in regression (16) the interaction term is significant at 5% level while at the same time Sector_FDI is significant at 5% level as well. The value changes drastically from 0.668 to -0.638. The positive coefficient suggests that for plants with foreign ownership, there are positive spillovers from FDI compared to domestic firms. Joint ventures hence benefit from foreign investments in the firms as well as foreign investments in other firms within the same sector. So, joint ventures are positively affected by the activities of other foreign firms. On the other hand the negative coefficient shows the exact opposite. This means that the interaction term between plant and sector foreign ownership and its effect on changes in sales is inconclusive.

**Table 5. Regression Results for Change in Sales (log_sales)**

| Variable | (15) | (16) | (17) | (18) | (19) | (20) | (21) |
|---|---|---|---|---|---|---|---|
| **Intercept** | -15.67*** | -15.90*** | -16.04*** | -8.570*** | -15.64*** | -1.322 | -7.934 |
| | (6.006) | (5.952) | (4.522) | (6.132) | (5.823) | (5.723) | (5.266) |
| **Log_GDP_percapita** | 5.851*** | 5.899*** | 5.824*** | 2.879 | 5.883*** | 0.928 | 2.666* |
| | (1.81) | (1.793) | (1.353) | (1.865) | (1.755) | (1.771) | (1.606) |
| **Plant_FDI** | -0.085 | 0.162 | 0.008 | 0.337* | -0.100 | 0.472*** | 0.366** |
| | (0.213) | (0.258) | (0.153) | (0.197) | (0.209) | (0.173) | (0.175) |
| **Sector_FDI** | 0.237 | 0.483** | 0.131 | 0.147 | 0.262 | 0.248 | 0.116 |
| | (0.189) | (0.238) | (0.143) | (0.171) | (0.181) | (0.158) | (0.149) |
| **Log_Skilled** | 0.120 | 0.125 | 0.286*** | -0.045 | | | |
| | (0.116) | (0.115) | (0.089) | (0.115) | | | |
| **Log_Unskilled** | 0.360*** | 0.338*** | | | 0.364*** | 0.048 | |
| | (0.096) | (0.096) | | | (0.093) | (0.095) | |
| **Log_Capital** | 0.337*** | 0.346*** | 0. 405*** | | 0.342*** | | |
| | (0.059) | (0.054) | (0. 044) | | (0.058) | | |
| **Log_Materials** | | | | 0.877*** | | 0.742*** | 0.870*** |
| | | | | (0.050) | | (0.053) | (0.046) |
| **Plant_FDI*Sector_FDI** | | -0.638** | | | | | |
| | | (0.384) | | | | | |
| **Adj. $R^2$** | 0.80 | 0.81 | 0.83 | 0.83 | 0.81 | 0.92 | 0.85 |
| **N Observations** | 2878 | 2878 | 4819 | 5473 | 3026 | 3147 | 6083 |

*** indicates significance at a 1% significance level; ** at a 5% significance level, * at a 10% significance level

**Table 5. Regression Results for Change in Sales (log_sales)**

Note: Third 7/21 Model Specifications, depending on using different regressors and control variables: (15) Direct effect of Plant and Sector FDI on change in sales including skilled, unskilled labor and capital as control variables; (16) Direct and Indirect effect of plant and sector FDI on change in sales including skilled, unskilled labor and capital as control variables; (17) Direct effect of Plant and Sector FDI on change in sales including skilled labor and capital as control variables; (18) Direct effect of Plant and Sector FDI on change in sales including skilled labor and materials as control variables; (19) Direct effect of plant and sector FDI on change in sales including unskilled labor and capital as control variables; (20) Direct effect of Plant and Sector FDI on change in sales including unskilled labor and materials as control variables; (21) Direct effect

of Plant and Sector FDI on change in sales including materials as a control variables; Method Used: Panel Least Squares, with Period Fixed Effect and Log (GDP_percapita in constant $US 2000) to account for Country Fixed Effects and Cross-section fixed effects to control for different industry sector productivities; Industry Dummies are defined at the three digit ISIC level; All Standard Errors are reported in parentheses.

The findings of large negative spillover effects is in line with the findings of Aitken and Harrison (1999), which is in contrast with some other econometric studies and literature. The reason they give for this contrast in results lays in the methodological approach to the results. Previous econometric studies that find positive spillovers used data which was aggregated at the sectoral level and hence were unable to control for productivity differences across sectors. Why is this important? Because if foreign investors are attracted towards more productive industries then a positive association between FDI share and the domestic firms productivity will be present even without any spillovers, but just because this sectors or industries were more productive to start with. Aitken and Harrison (1999) were able to prove this limitation by running a Hausman test for equality of the coefficients across the two different specifications and found a test statistic that rejects the null hypothesis, confirming that the productivity differences across different sectors are statistically significant. However, in this research, there are controls for productivity differences across sectors and still positive spillovers are found in only one instance, which is of course not enough to make a valid conclusion.

When looking at the control variables it is interesting to note that *log_materials* is always positive and significant at the 1% level and this variable increases the adjusted R-squared to 93% in some cases which shows that out of the four control variables it has the largest impact on the explanatory power of the model employed. The other three control variables vary in terms of significance and only *log_capital* and *log_unskilled* maintain their positive signs across all different specifications while this is not the case with *log_skilled* which varies between positive and negative sign. The interpretations of these variables depend on the model in which they are used and their role in explaining the changes in log sales but of course the main purpose of them being in the regressions is to make sure that there is some control for differences in the business environment of the firms. These interpretations are not of a great importance for capturing the main conclusions and message of the models.

### 4.4.2 Robustness Checks of the General Results

In order to test for the robustness of the previous estimates, different model specifications with first differences transformations were run. As noted earlier because of the limitation of the data set with respect to the number of observations second and third differences were not run. The results are presented in Tables 6 and 7 below.

**Table 6. Regression Results for Difference in Sales(diff_sales)**

| Variable | (22) | (23) | (24) | (25) | (26) | (27) | (28) |
|---|---|---|---|---|---|---|---|
| **Intercept** | -0.470*** | -0.512*** | -0.389 | -0.407 | -0.482*** | 0.149 | 0.062 |
| | (0.128) | (0.188) | (0.249) | (0.268) | (0.206) | (0.201) | (0.160) |
| **Diff_log_GDP_perc apita** | 3.923*** | 3.952*** | 3.329*** | 3.475*** | 3.350*** | 0.656 | 0.942 |
| | (0.512) | (0.726) | (0.949) | (1.029) | (0.815) | (0.971) | (0.796) |
| **Diff_Plant_FDI** | 0.003 | -0.193 | -0.105 | -0.085 | -0.209 | -0.084 | 0.148 |
| | (0.148) | (0.189) | (0.240) | (0.248) | (0.233) | (0.248) | (0.197) |
| **Diff_Sector_FDI** | 0.024 | 0.146 | 0.360* | 0.305 | 0.473** | 0.448** | 0.278** |
| | (0.113) | (0.167) | (0.212) | (0.227) | (0.229) | (0.185) | (0.142) |
| **Diff_Log_Skilled** | | 0.247** | | 0.125 | 0.090 | -0.046 | |
| | | (0.106) | | (0.146) | (0.118) | (0.136) | |
| **Diff_Log_Unskilled** | | | 0.301*** | 0.322** | 0.373*** | 0.104 | |
| | | | (0.109) | (0.116) | (0.010) | (0.138) | |
| **Diff_Log_Capital** | | | | | 0.323*** | 0.116* | 0.147*** |
| | | | | | (0.063) | (0.070) | (0.048) |
| **Diff_Log_Materials** | | | | | | 0.640*** | 0.698*** |
| | | | | | | (0.072) | (0.060) |
| **Diff_Interaction** | | | | | -0.394 | | |
| | | | | | (0.417) | | |
| **Adj. $R^2$** | 0.067 | 0.079 | 0.091 | 0.095 | 0.45 | 0.88 | 0.86 |
| **N Observations** | 783 | 398 | 190 | 175 | 95 | 34 | 63 |

*** indicates significance at a 1% significance level;** at a 5% significance level, *at a 10% significance level

**Table 6. Regression Results for Difference in Sales(diff_sales)**

Method Used: Panel Least Squares, without Period Fixed Effect and without Cross-section fixed effects to control for different industry sector productivities; Variable log_GDP_percapita is still used in the regression to account for country specific fixed effects.All Standard Errors are reported in parentheses.

The coefficient of *Plant_FDI* becomes positive and significant only in the last three regressions with differences. The counterparts of regressions (31) and (32) in Table 5, which correspond to regressions (18) and (20) also report positive and statistically significant results for the coefficient of *Plant_FDI*. Although the significance drops to 10% from 1% in one instance only, the coefficient value becomes larger marginally larger in magnitude. This means that the positive own plant effects do not just arise from the fact that foreign investors are only investing in the

most productive firms. This is confirmed even more because compared to the counterpart of regression (33), which is regression (13) the coefficient of Plant_FDI remains positive, with similar magnitude and statistically significant at 5% level.

**Table 7. Regression Results for Difference in Sales(diff_sales)**

| Variable | (29) | (30) | (31) | (32) | (33) |
|---|---|---|---|---|---|
| **Intercept** | -0.342*** | -0.483*** | -0.069 | 0.146 | 0.119 |
| | (0.143) | (0.197) | (0.192) | (0.176) | (0.172) |
| **Diff_log_GDP_percapita** | 2.762*** | 3.376*** | 1.428* | 0.762 | 0.971 |
| | (0.564) | (0.777) | (0.841) | (0.755) | (0.744) |
| **Diff_Plant_FDI** | 0.130 | -0.204 | 0.351* | 0.478* | 0.483*** |
| | (0.164) | (0.227) | (0.196) | (0.169) | (0.165) |
| **Diff_Sector_FDI** | 0.207 | 0.365** | 0.145 | 0.240 | 0.003 |
| | (0.137) | (0.177) | (0.170) | (0.155) | (0.182) |
| **Diff_Log_Skilled** | 0.235*** | | -0.065 | | -0.115 |
| | (0.088) | | (0.113) | | (0.108) |
| **Diff_Log_Unskilled** | | 0.376*** | | 0.041 | -0.022 |
| | | (0.095) | | (0.094) | (0.097) |
| **Diff_Log_Capital** | 0.406*** | 0.329*** | | | |
| | (0.044) | (0.060) | | | |
| **Diff_Log_Materials** | | | 0.881*** | 0.737*** | 0.735*** |
| | | | (0.047) | (0.047) | (0.046) |
| **Diff_Interaction** | | | | | 1.033*** |
| | | | | | (0.370) |
| **Adj. $R^2$** | 0.42 | 0.45 | 0.79 | 0.84 | 0.85 |
| **N Observations** | 185 | 99 | 141 | 69 | 65 |

*** indicates significance at a 1% significance level;** at a 5% significance level, *at a 10% significance level

**Table 7. Regression Results for Difference in Sales(diff_sales)**

Method Used: Panel Least Squares, without Period Fixed Effect and without Cross-section fixed effects to control for different industry sector productivities; Variable log_GDP_percapita is still used in the regression to account for country specific fixed effects.All Standard Errors are reported in parentheses.

The coefficient of Sector_FDI when compared to specifications (3) and (19) where it is insignificant and positive now becomes significant and positive at 5% and 10% levels. In the other three specifications corresponding to (7), (11), and (16) the coefficient of the variable Sector_FDI in the models with first differences maintain the same sign, magnitude and 5% significance level. This means that the positive impact of foreign investment on domestic competitors does not disappear and is maintained over time. It would be interesting to see what happens if second and third differences are taken, but if this pattern remains in the coefficient then it would suggest a long lasting positive impact of foreign investment on domestic firms.

The coefficient of the interaction term remains positive, increases in magnitude and even with an improved significance at 1% level, compared to the 10% level in regression (14). This suggests that the benefits of joint ventures are concentrated in sectors with a high share of foreign investment. In addition, in the other regression, (16), in which the interaction term was significant and negative, now by taking the differences this coefficient becomes insignificant which makes it difficult to have a conclusive word on the development of this variable over time and its right direction of impact on sales.

As another robustness check additional seven regressions are run with a dataset which is adjusted by taking out eight out of the twenty seven countries. These eight countries are taken out on the condition that they have more than 50% of their sectors with zero foreign ownership. It is interesting to check whether the results and the significance of Plant_FDI, Sector_FDI and the interaction term will improve by taking out those countries which are dominated by domestically owned sectors. Since the rest of the countries that remain have mostly foreign owned firms and sectors the results can be more convincing with respect to the ways in which plant and sector foreign ownership affect changes in sales over time. Hence, with this adjustment, the dataset and the results become less biased. These regressions are presented in Table 8 below.

**Table 8. Regression Results for Change in Sales (log_sales) with 19 non-zero countries only**

| Variable | (34) | (35) | (36) | (37) | (38) | (39) | (40) |
|---|---|---|---|---|---|---|---|
| **Intercept** | -7.539** | -3.252 | -1.027 | -2.827 | -1.074 | -0.432 | -4.522 |
| | (3.796) | (3.538) | (4.503) | (4.600) | (4.385) | (4.918) | (3.115) |
| **Log_GDP_percapita** | 3.628*** | 1.255 | 0.885 | 1.435 | 0.889 | 0.730 | 1.875** |
| | (1.062) | (1.028) | (1.288) | (1.324) | (1.255) | (1.407) | (0.892) |
| **Plant_FDI** | -0.133 | 0.444 | -0.113 | -0.227 | | -0.147 | 0.573*** |
| | (0.275) | (0.341) | (0.490) | (0.486) | | (0.536) | (0.209) |
| **Sector_FDI** | 0.290 | 0.356** | 0.481** | 0.232 | 0.482** | | 0.400** |
| | (0.261) | (0.180) | (0.220) | (0.284) | (0.215) | | (0.172) |
| **Log_Skilled** | 0.268 | | -0.117 | -0.158 | -0. 110 | -0.106 | -0.083 |
| | (0.169) | | (0.153) | (0.153) | (0.146) | (0.168) | (0.116) |
| **Log_Unskilled** | 0.328*** | | 0.031 | 0.010 | 0.016 | 0.044 | -0.085 |
| | (0.131) | | (0.166) | (0.163) | (0.148) | (0.182) | (0.105) |
| **Log_Capital** | | 0.185*** | 0.091 | 0.068 | 0.092 | 0.078 | |
| | | (0.059) | (0.081) | (0.081) | (0.079) | (0.088) | |
| **Log_Materials** | | 0.653*** | 0.629*** | 0.628*** | 0.631*** | 0.648*** | 0.681*** |
| | | (0.075) | (0.085) | (0.084) | (0.083) | (0.093) | (0.050) |
| **Plant_FDI*Sector_FDI** | | | | 0.677 | | | |
| | | | | (0.501) | | | |
| **Adj. $R^2$** | 0.50 | 0.93 | 0.92 | 0.93 | 0.93 | 0.93 | 0.93 |
| **N Observations** | 3812 | 3050 | 1730 | 1730 | 1730 | 1730 | 2645 |

*** indicates significance at a 1% significance level;** at a 5% significance level, *at a 10% significance level

**Table 8. Regression Results for Change in Sales (log_sales) with 19 non-zero countries only**

Note: 7 Model Specifications, depending on using different regressors and control variables: (1) Direct effect of Plant and Sector FDI on change in sales including skilled, and unskilled labor as control variables; (2) Direct effect of plant and sector FDI on change in sales using capital and materials as control variables; (3) Direct effect of Plant and Sector FDI on change in sales including all four control variables; (4) Direct and Indirect effect of Plant and Sector FDI on change in sales including all four control variables; (5) Direct effect of sector FDI on change in sales including all four control variables; (6) ) Direct effect of plant FDI on change in sales including all four control variables; (7) Direct effect of Plant and Sector FDI on change in sales including skilled and unskilled labor and materials as control variables; Method Used: Panel Least Squares, with Period Fixed Effect and Log (GDP_percapita in constant $US 2000) to account for Country Fixed Effects and Cross-section fixed effects to control for different industry sector productivities; Industry Dummies are defined at the three digit ISIC level; All Standard Errors are Reported in parentheses.

In general the intercept term is only significant in the first regression, which is the same in the counterpart regression in the general results (4). Log_GDP_percapita is significant in two instances. In the first regression it is significant at 1% level which has not changed when compared to the general regression results, although it significantly drops in value. In regression (40) the coefficient is significant at 5% level, which is different from the reported coefficient in the general results. The interpretation of this variable remains the same and it shows the ability of a country to turn foreign investments into increased productivities through an already existing level of economic development. The significance drops in between the regressions just because of the different specification of the model and the explanatory powers of the control variables. *Plant_FDI* is significant and positive in regression (40), with the same significance (at 1% level) and larger in magnitude as compared to regression (13), its counterpart. Its magnitude of 0.573 means that an increase in foreign ownership from 0 to 10 percent will lead to a 5.73 percentage points increase in productivity as measured through sales of a firm compared to a domestically owned firm. Sector_FDI is positive in value and significant at 10% level in four regressions. In the same model specifications in which this variable was significant in the general results is consistent with the results in Table 8. The difference is that this variable is now larger in magnitude, but the interpretation remains the same. If the largest value from Table 8 is taken for interpretation, which is 0.482 from regression (38), it would mean that an increase in the share of foreign investment from 0 to 10 percent would lead to 4.82 percentage points increase in domestic productivity in the sector. The findings for Sector_FDI are in line with the general results outlined above. The interaction term is run in only one regression in Table 8 and is insignificant. This also holds for the general results in Table 4, where the interaction term is also

positive but insignificant. Taking into account the control variables, the log_skilled is never significant while log_unskilled is only positive and significant in the first model specification where the labor variables are only included in the model. The significance of log_usnkilled labor at 1% level means that only the number of unskilled workers matters for consideration of firm characteristics and hence explaining changes in sales. Log_capital is positive and significant at 1% level only in regression (35) when in combination with materials while log_materials is always positive and significant at 1% level with magnitude around 0.6, and highest of 0.681. This pattern again confirms the explanatory power of materials and its importance in explaining and controlling for the business environment in the firm.

In a nutshell, the results from Tables 3-8 show that the positive impact of foreign investment on the productivity of domestic firms must be controlled for productivity differences across different industries. In these countries foreign investors do not just invest in more productive sectors and increases in foreign investments lead to an increase in the productivity of domestic firms, although the overall conclusion for the positive productivity spillovers for joint ventures is inconclusive. The results are robust when taking first differences and are also robust when countries with more than half of the sectors with zero foreign ownership are excluded from the analysis which shows the consistence of the results for this particular dataset.

**Could Spillovers Be Maintained In Manufacturing Sectors Only?**

The following section will focus on the same panel data set but this time only with manufacturing sectors in order to see whether productivity spillovers could also only be maintained in manufacturing. A reason for focusing on the manufacturing sector is because these industries use technology and know- how in order to produce their products and this allows for positive productivity spillovers from foreign owned firms to domestically owned firms either through adopting new technologies, efficiency of the labor force or through training or adopting better management techniques. As some of the literature shows, this really is the case especially for developing economies. John Mylonakys (2009) found that in the Greek manufacturing industry, the higher the degree of foreign ownership, the more efficient production becomes. In addition, Batool, Sadia and Ahmad (2009) reach the conclusion that foreign ownership in sectors that include tobacco production in Pakistan lead to increases in total factor productivity (TFP).

Evidence from British manufacturing firms show to have increasing productivity when owned by foreigners (Harris/Robbinson, 2001). Also according to Abraham, Konnings and Slootmaekers (2008) find that Chinese domestic firms in manufacturing sectors engaged in joint ventures with a foreign partner firm are on average more productive. This also holds for Chinese manufacturing firms engaged in exports and the ones located in special economic zones. Moreover, there is also evidence from Fernandes and Paunov (2011) that 7% of the increase in Chile's manufacturing sector TFP can be explained through FDI in the services sector which shows that some of these spillovers have origins in the services sector. This leads us to conclude that it is not that easy to isolate the manufacturing sector as a whole because service FDI encourages innovation activities in manufacturing. (Fernandes/Paunov, 2011) Table 8 shows the results of the regressions with manufacturing sectors only.

**Table 9. Regression Results for Change in Sales (log_sales) with manufacturing sectors**

| Variable | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
|---|---|---|---|---|---|---|---|
| **Intercept** | -85.69*** | -2.989 | -3.605 | -5.886 | -2.664 | -9.390 | -9.011 |
| | (13.072) | (6.823) | (14.84) | (14.96) | (14.324) | (16.388) | (8.774) |
| **Log_GDP_percapita** | 27.14*** | 1.278 | 1.703 | 2.491 | 1.425 | 3.602 | 3.408 |
| | (3.852) | (2.056) | (4.540) | (4.590) | (4.385) | (5.000) | (2.683) |
| **Plant_FDI** | 0.218 | -0.129 | -0.203 | -0.438 | | -0.010 | 0.461* |
| | (0.629) | (0.279) | (0.335) | (0.405) | | (0.362) | (0.253) |
| **Sector_FDI** | -0.108 | 0.503*** | 0.599* | 0.155 | 0.546* | | 0.398 |
| | (0.614) | (0.183) | (0.301) | (0.525) | (0.288) | | (0.261) |
| **Log_Skilled** | 0.315 | | -0.267 | -0.320 | -0. 268 | -0.478 | -0.091 |
| | (0.452) | | (0.289) | (0.293) | (0.281) | (0.303) | (0.186) |
| **Log_Unskilled** | -0.534 | | 0.105 | 0.026 | 0.065 | 0.083 | -0.068 |
| | (0.380) | | (0.214) | (0.227) | (0.198) | (0.241) | (0.165) |
| **Log_Capital** | | 0.180*** | 0.158 | 0.099 | 0.139 | 0.179 | |
| | | (0.065) | (0.107) | (0.121) | (0.010) | (0.120) | |
| **Log_Materials** | | 0.664*** | 0.604*** | 0.625*** | 0.625*** | 0.539*** | 0.654*** |
| | | (0.079) | (0.147) | (0.148) | (0.138) | (0.161 | (0.073) |
| **Plant_FDI*Sector_FDI** | | | | 0.686 | | | |
| | | | | (0.665) | | | |
| **Adj. $R^2$** | 0.39 | 0.94 | 0.93 | 0.93 | 0.94 | 0.91 | 0.91 |
| **N Observations** | 1681 | 1665 | 1000 | 1000 | 1000 | 1000 | 1515 |

*** indicates significance at a 1% significance level; ** at a 5% significance level, * at a 10% significance level

**Table 9. Regression Results for Change in Sales (log_sales) with manufacturing sectors only**

Note: 7 Model Specifications, depending on using different regressors and control variables: (1) Direct effect of Plant and Sector FDI on change in sales including skilled, and unskilled labor as control variables; (2) Direct effect of plant and sector FDI on change in sales using capital and materials as control variables; (3) Direct effect of Plant and Sector FDI on change in sales including all four control variables; (4) Direct and Indirect effect of Plant and Sector FDI on change in sales including all four control variables; (5) Direct effect of sector FDI on change in sales including all four control variables; (6) ) Direct effect of plant FDI on change in sales including all four control variables; (7) Direct effect of Plant and Sector FDI on change in

sales including skilled and unskilled labor and materials as control variables; Method Used: Panel Least Squares, with Period Fixed Effect and Log (GDP_percapita in constant $US 2000) to account for Country Fixed Effects and Cross-section fixed effects to control for different industry sector productivities; Industry Dummies are defined at the three digit ISIC level; All Standard Errors are Reported in parentheses.

There are seven different model specifications out of which only one looks at the indirect effect of plant and sector FDI on changes in sales through the use of the interaction term *Plant_FDI*Sector_FDI.* The direct effect of plant foreign ownership in only significant in regression (7) where capital is not used as a control variable, but only the labor control variables are combined with materials. The coefficient is positive and significant at the 10% level. The magnitude of the coefficient means that an increase in foreign equity participation in the plant from 0 to 10 percent leads to 4.61 percentage points increase in productivity compared to other domestically owned manufacturing firms. The coefficient of sector foreign ownership is positive and significant at 1% and 10% levels in three model specifications. In model (2), where only capital and materials are used to control for the business environment in the sector, the value of the coefficient is smallest, namely 0.503. This shows that an increase in the share of foreign investment from 0 to 10 percent leads to as much as 5.03 percentage points increase in domestic productivity. In models (3) and (5) the value of the coefficient becomes larger but less significant and the interpretation is the same. To note, in model (5), this coefficient and its significance measure the direct effect of sector foreign ownership on *log_sales* in the absence of *plant_fdi*, which means that *sector_fdi* can explain most of the impact on productivity of domestic firms in the manufacturing sector. The interaction term in model (4) which measures the effect of foreign investments on productivity of already foreign owned firms compared to domestic firms is positive but insignificant. This means that there is no evidence to conclude that joint ventures in manufacturing sectors benefit from foreign investment in the production plant as well as from FDI in other plants within the same sector. Looking at the control variables, it is evident that the labor variables are always insignificant which means that changes in productivity of domestic manufacturing firms are not affected by the type of labor employed in the production process. Since manufacturing is in question, it depends on the type of manufacturing in order to make a prediction of the sign of the two variables. Some manufacturing, like electronics would require more skilled labor while other, such as textile or fabricat would require less skilled labor. In general, these sectors involve highly automated production processes without much labor

requirement and the insignificance of the labor variables is not peculiar. On the other hand capital is positive and significant in only one specification while materials is positive and significant at 1% level in all regressions. The sign of these coefficients is in line with theoretical predictions because better raw materials and better technology(capital investments) used in the production process mean higher output and hence productivity. Finnally, the models with highest explanatory power are (2) and (5) with 94%. Model (2) has high explanatory power because labor is not used in the control variables and model (5) since it only focuses on Sector_FDI and disregards Plant_FDI which was showed to be generally insignificant.

In general, the significance of the sector foreign ownership gives some conclusive evidence of productivity spillovers being maintained in a particular manufacturing sector itself but the insignificance of the interaction term shows that these spillovers are only within the particular manufacturing sectors and they do not spillover to other manufacturing sectors. The plant foreign ownership is only important for the comparison between the individual plants but its insignificance does not allow to conclude that domestic firms owned by foreign investors are more productive that only domestically owned firms within the same manufacturing sector.

**Small versus Large Firms**

In Tables 10-11 the coefficients from ordinary least squares with fixed effects are reported separately for small and large firms. Small firms are defined as firms with less than 50 employees over the entire sample period while large firms are those with at least 50 employees.

**Table 10. Regression Results for Change in Sales (log_sales) for Small Firms (<50 employees)**

| Variable | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
|---|---|---|---|---|---|---|---|
| **Intercept** | 1.125*** | 1.124*** | 1.124*** | 1.146*** | 1.026*** | 1.578*** | 1.253*** |
| | (0.104) | (0.104) | (0.104) | (0.104) | (0.070) | (0.135) | (0.080) |
| **Log_GDP_percapita** | 0.072*** | 0.072*** | 0.069*** | 0.063*** | 0.080*** | 0.385*** | 0.039* |
| | (0.026) | (0.026) | (0.026) | (0.026) | (0.018) | (0.035) | (0.021) |
| **Plant_FDI** | 0.119*** | 0.122** | 0.108*** | | 0.123*** | 0.145*** | 0.054* |
| | (0.038) | (0.053) | (0.038) | | (0.024) | (0.047) | (0.032) |
| **Sector_FDI** | -0.091** | -0.089** | | -0.075* | -0.045* | 0.013 | -0.096*** |
| | (0.041) | (0.044) | | (0.041) | (0.027) | (0.056) | (0.036) |
| **Log_Skilled** | 0.063*** | 0.063*** | 0.062*** | 0.062*** | | 0.242*** | 0.070*** |
| | (0.023) | (0.023) | (0.023) | (0.023) | | (0.031) | (0.019) |
| **Log_Unskilled** | 0.078*** | 0.078*** | 0.076*** | 0.085*** | | 0.220*** | 0.087*** |
| | (0.023) | (0.023) | (0.023) | (0.022) | | (0.032) | (0.019) |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Log_Capital** | 0.131*** | 0.131*** | 0.132*** | 0.131*** | 0.165*** | 0.516*** | |
| | (0.016) | (0.016) | (0.016) | (0.016) | (0.011) | (0.019) | |
| **Log_materials** | 0.692*** | 0.692*** | 0.690*** | 0.694*** | 0.687*** | | 0.802*** |
| | (0.017) | (0.017) | (0.017) | (0.017) | (0.009) | | (0.011) |
| **Plant_FDI*Sector_FDI** | | -0.012 (0.132) | | | | | |
| **Adj. $R^2$** | 0.87 | 0.87 | 0.87 | 0.87 | 0.87 | 0.64 | 0.86 |
| **N Observations** | 768 | 768 | 768 | 768 | 1936 | 1158 | 1347 |

*** indicates significance at a 1% significance level; ** at a 5% significance level, * at a 10% significance level

**Table 10. Regression Results for Change in Sales (log_sales) for Small Firms (<50 employees)**

Note: 7 Model Specifications, depending on using different regressors and control variables: (1) Direct effect of Plant and Sector FDI on change in sales including all control variables; (2) Direct and Indirect effect of plant and sector FDI on change in sales using all control variables; (3) Direct effect of Plant FDI on change in sales including all four control variables; (4) Direct effect of Sector FDI on change in sales including all four control variables; (5) Direct effect of plant and sector FDI on change in sales including capital and materials as control variables; (6) Direct effect of plant and sector FDI on change in sales including skilled, unskilled labor and capital as control variables; (7) Direct effect of Plant and Sector FDI on change in sales including skilled and unskilled labor and materials as control variables; Method Used: Panel Least Squares, with Period Fixed Effect and Log (GDP_percapita in constant $US 2000) to account for Country Fixed Effects and Cross-section fixed effects to control for different industry sector productivities; Industry Dummies are defined at the three digit ISIC level; All Standard Errors are Reported in parentheses.

Firstly, the intercept term and the *log_GDP_percapita* are all significant and positive which is different than in the regression results with the unadjusted panel data set. *Plant_FDI* now becomes significant for all regressions which was unobserved before. The coefficient becomes positive and significant at 1%, 5% and 10% across the different regressions. The smallest value is 0.054 and the largest is 0.145 which means that there exists a positive own plant effect which is robust for small plants. The magnitude of the coefficient shows at least a 0.54 percentage points increase in productivity and this increase in sales can go up to 1.45 percentage points driven by 10 percentage points increase in foreign ownership in the plant.

**Table 11. Regression Results for Change in Sales (log_sales) for Large Firms (≥50 employees)**

| Variable | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
|---|---|---|---|---|---|---|---|
| **Intercept** | -6.951 | -6.972 | -5.946 | -7.191* | -2.998 | -9.445*** | -4.946* |
| | (4.408) | (4.434) | (5.257) | (4.245) | (3.515) | (3.381) | (2.808) |
| **Log_GDP_percapita** | 2.649** | 2.686** | 2.274 | 2.709** | 1.459 | 3.773*** | 2.001** |
| | (1.287) | (1.296) | (1.532) | (1.243) | (1.024) | (0.947) | (0.823) |
| **Plant_FDI** | -0.128 | -0.273 | 0.379 | | -0.120 | -0.232 | 0.458** |
| | (0.335) | (0.373) | (0.339) | | (0.247) | (0.269) | (0.192) |
| **Sector_FDI** | 0.659*** | 0.421 | | 0.611*** | 0.576*** | 0.341 | 0.495** |
| | (0.234) | (0.353) | | (0.192) | (0.198) | (0.225) | (0.207) |
| **Log_Skilled** | -0.157 | -0.161 | -0.007 | -0.134 | | 0.046 | 0.024 |
| | (0.184) | (0.185) | (0.210) | (0.168) | | (0.166) | (0.124) |
| **Log_Unskilled** | 0.173 | 0.155 | 0.187 | 0.163 | | 0.508*** | -0.042 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | (0.224) | (0.226) | (0.268) | (0.216) | | (0.150) | (0.111) |
| **Log_Capital** | 0.106 | 0.076 | 0.066 | 0.092 | 0.090 | 0.314 | |
| | (0.085) | (0.091) | (0.100) | (0.074) | (0.067) | (0.070) | |
| **Log_materials** | 0.516*** | 0.533*** | 0.570*** | 0.523*** | 0.596*** | | 0.663*** |
| | (0.096) | (0.098) | (0.112) | (0.091) | (0.076) | | (0.051) |
| **Plant_FDI*Sector_FDI** | | 0.434 | | | | | |
| | | (0.478) | | | | | |
| **Adj. $R^2$** | 0.91 | 0.91 | 0.87 | 0.92 | 0.92 | 0.91 | 0.92 |
| **N Observations** | 1169 | 1169 | 1169 | 1169 | 1527 | 1169 | 1642 |

*** indicates significance at a 1% significance level; ** at a 5% significance level, * at a 10% significance level

**Table 11. Regression Results for Change in Sales (log_sales) for Large Firms (≥50 employees)**

Note: 7 Model Specifications, depending on using different regressors and control variables: (1) Direct effect of Plant and Sector FDI on change in sales including all control variables; (2) Direct and Indirect effect of plant and sector FDI on change in sales using all control variables; (3) Direct effect of Plant FDI on change in sales including all four control variables; (4) Direct effect of Sector FDI on change in sales including all four control variables; (5) Direct effect of plant and sector FDI on change in sales including capital and materials as control variables; (6) Direct effect of plant and sector FDI on change in sales including skilled, unskilled labor and capital as control variables; (7) Direct effect of Plant and Sector FDI on change in sales including skilled and unskilled labor and materials as control variables; Method Used: Panel Least Squares, with Period Fixed Effect and Log (GDP_percapita in constant $US 2000) to account for Country Fixed Effects and Cross-section fixed effects to control for different industry sector productivities; Industry Dummies are defined at the three digit ISIC level; All Standard Errors are Reported in parentheses.

As it can be seen from Table 11, for large plants the coefficient of *Plant_FDI* is not robust across the different specifications and it is insignificantly different from zero when firm-specific effects are taken into account. It is only positive and significant at 5% in the last specification with a value of 0.458. This value when compared to the one with small plants is significantly higher and it shows a much higher increase in productivity coming from an increase in foreign ownership. This indicates that apparently for large plants the same increase in foreign ownership has a larger impact on sales of a domestic firm. The effect is three percentage points higher for large plants. This also means that in the general results with the unadjusted dataset the effect of plant foreign ownership on sales is mostly due to the existence of small sized firms, which might be more productive and are hence targeted by foreign investors.

The spillover effects of FDI, which are captured by *Sector_FDI* vary across small and large plants. For small plants the coefficient becomes negative and significant with smallest value of -0.045 and highest value of -0.096. Hence the magnitudes are not large but it is the opposite effect of the one for all firms, small and large. This sign of the coefficients and their significance indicates that an increase in the share of foreign investment from 0 to 10 percent leads to at most 0.96 percentage points decline in domestic productivity. This result indicates negative spillovers to domestic firms in the sector, while positive spillovers were found in the previous results including all firms. For

large firms this variable is positive and significant with values higher than those for all firms. Hence, for large firms positive spillovers to domestic firms are found in the sector. Since the coefficients are significant in most cases for both, small and large firms it cannot be said whether spillovers are concentrated more towards smaller or larger plants. However, since the positive magnitudes of the coefficients for *Sector_FDI* are larger for large firms than the negative magnitudes of the coefficients for small firms, it can be concluded that the market stealing effect is larger for large firms which can compete as effectively with foreign entrants as their larger domestic competitors. Since the interaction term is insignificant for both, small and large firms, there is no discussion on its effect on the change in output for these firms.

Moreover, all control variables for small firms are always significant at 1% level, while for large firms this is true only for *log_materials* as a control variable which supports the previously outlined general results concerning this particular variable.

## 5. Limitations and Further Research

Although the analysis in general and the empirical model have been constructed as complete and comprehensive as possible, there are some limitations, causing suggestions for further research improvements.

Firstly, the analysis presented in this paper only considers Eastern European and Central Asian countries, as they are mostly developing countries undergoing policy changes to attract foreign investors. Other developing regions, such as Latin America and Africa, may also be interesting to study, potentially giving rise to different results.

Secondly, this paper does not consider the link between FDI and total investments in the host country. Carrying out such an analysis may shed more conclusive light on the true channel through which FDI contributes to economic growth, namely either by improving technological progress or by increasing total domestic capital accumulation (or a combination of the two channels).

Thirdly, the dataset is limited in terms of the number of fully recorded available answers to the questions asked in the questionnaire. When a certain filtering is done in the dataset as well as some adjustments to the observations (taking logs of 0s for example) many of the observations fall out of the analysis and that makes the results and the conclusions that follow from the results less generally applicable. Of course, this is a limitation that can rarely be limited by the researcher unless the researcher himself does the study and the collection of the data.

Fourthly, since some variables are created out of the readily available variables in the dataset for the purpose of the analysis, many variables are lost or become unavailable. This is related to the previous limitation with the missing data. Hence, the researches is in a way punished for creating new variables by adding together several different variables and then losses on available observations in the empirical analysis. This can be addressed by the researcher with paying greater attention and care when creating the new variables and making sure that most of the original observations will be kept in the analysis. However, this is again dependent on the completeness of the original dataset which is not really influenced by the researcher.

For robustness purposes in the empirical analysis first difference regressions have been run in order to see the effect of foreign ownership on productivity over time. As a further research improvement second, third and even fourth differences can be taken in order to see a more long term effect of foreign equity participation on output of the firm, sector spillovers and the effects on joint ventures.

Furthermore, the dataset is an unbalanced panel which creates a limitation with the empirical analysis and a balanced panel would add to the reliability and the completeness of the analysis.

As a final limitation, output which is defined as annual sales is defined in current year terms and not in constant terms which means sales for firms concerning the year 2002 and not comparable to sales for firms concerning the year 2007 for example. These sales variables can be deflated by an annual producer price deflator varying across three digit industries, but this was complicated for the analysis. It will make the results slightly more reliable, however the annual sales data can also be taken separately for each year since comparison of the firm's sales over the years is not necessary.

## 6. Conclusions

In this thesis a theoretical and empirical model has been employed to assess the impact of foreign investments and foreign equity participation in domestic firms on their productivity as well as the ability of these foreign owned firms to create positive productivity spillover effects to other domestic firms in the same industry. To theoretically model this analysis a specific dynamic industry model with heterogeneous firms by Melitz (2003) is thoroughly developed in order to look at the impact that entrance of foreign investments have on firm's productivity and intra industry resource reallocations. The model starts with modeling the demand and the production side of the economy separately in order to aggregate them and arrive at several equations indicating revenues, profits, aggregate price and quantity. Afterwards, the firm entry and exit is modeled in order to

derive the two necessary equilibrium conditions, more specifically free entry condition and zero cutoff profit condition. In the end, the country exposure to foreign markets and hence foreign investments into domestic firms is considered in order to determine how the open market equilibrium conditions have to be adjusted and how the revenues of a single firm change with the changes in the average productivity parameter of the industry. The model hence makes three important predictions which are the hypotheses to be tested empirically. Firstly, foreign firms are more productive than domestic firms in the same industry and in turn exhibit higher revenues with more foreign investments. Secondly, foreign ownership in a particular industry affects the productivity of domestically owned firms in the same industry; there is evidence for positive productivity spillover effects. Lastly, foreign owned firms benefit more than domestically owned firms from the presence of other foreign firms; positive impact on joint ventures in the industry from foreign investments.

In order to test the above mentioned hypotheses an empirical analysis using panel regression model with three different fixed effects has been employed. Firm level data including annual sales, skilled labor, unskilled labor, capital and materials as well as plant and sector foreign ownership on 27 countries in East Europe and Central Asia over a period of four non consecutive years (2002, 2005, 2007, and 2009) has been used to conduct the panel regressions. In addition, GDP_per_capita for each country for each year was included in the regression to control for differences in the level of economic development of the countries. For robustness purposes several different regression specifications, namely first differences of the variables as well as an adjusted dataset with inclusion of only 19 countries has been conducted to check the consistency of the results. The results generally show that plants with higher foreign equity participation exhibit positive productivity gains in some specific instances and that these results are sometimes robust to first differences as well as to firms in countries which have more than 50% of its sectors with foreign ownership presence. This is a proof that still in some cases in which the positive effect of Plant_FDI was determined it did not just appear because foreign investors simply invested in the most productive firms. These results are also slightly confirmed when considering only the manufacturing sectors and are largely robust for small firms compared to large firms when they are confirmed in only one model specification. In general firms do not experience productivity declines when foreign investors increase their equity participation in the firm.

The spillover effects, represented by Sector_FDI remained positive and significant throughout the analysis, more often than Plant_FDI and showed to be robust in some cases over time, as well as largely robust when the countries with most zero foreign owned sectors were taken out of the analysis. For the manufacturing sector the positive spillover effects proved to be largest in magnitude which shows that technological spillovers as well as know-how and managerial skills are easily transferred in sectors that are involved with manufacturing of an actual product rather than services sectors. The twist in the analysis came when considering small firms, where negative productivity spillovers were proven to exist while the positive spillover effects for large firms became more dominant. This indicates that the market stealing effect for large firms is more dominant since large firms can compete more effectively with foreign firms in the market.

The consideration of the effects on joint ventures and whether already foreign owned firms benefit more from increase in foreign investments than domestic firms in the sector was determined to be inconclusive.

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## Appendix

### Appendix A – Data and Charts on Foreign Investments in Eastern Europe and Central Asia

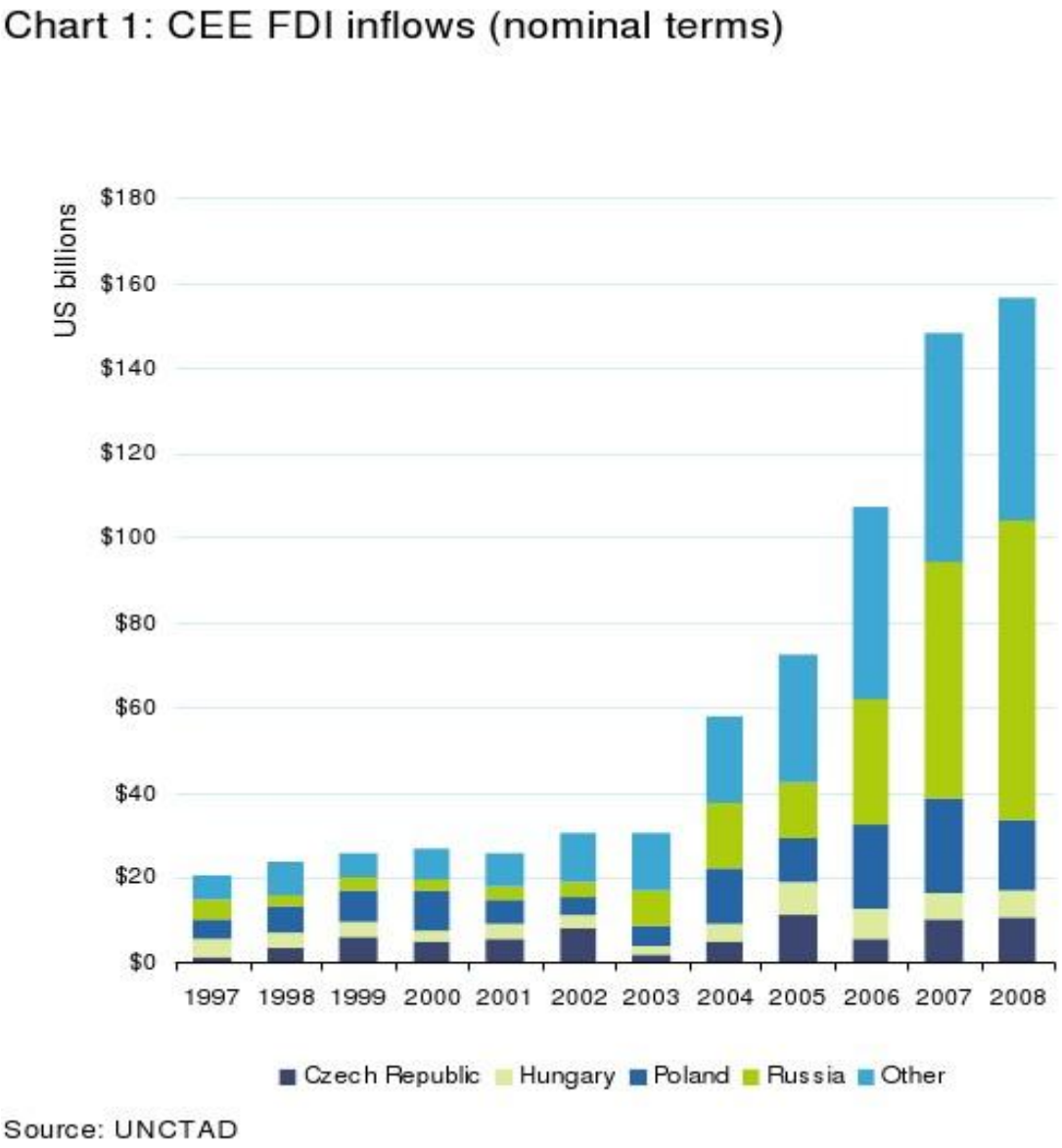


**Chart 2: CEE FDI Inflows in Nominal Terms**

**Source: UNCTAD**

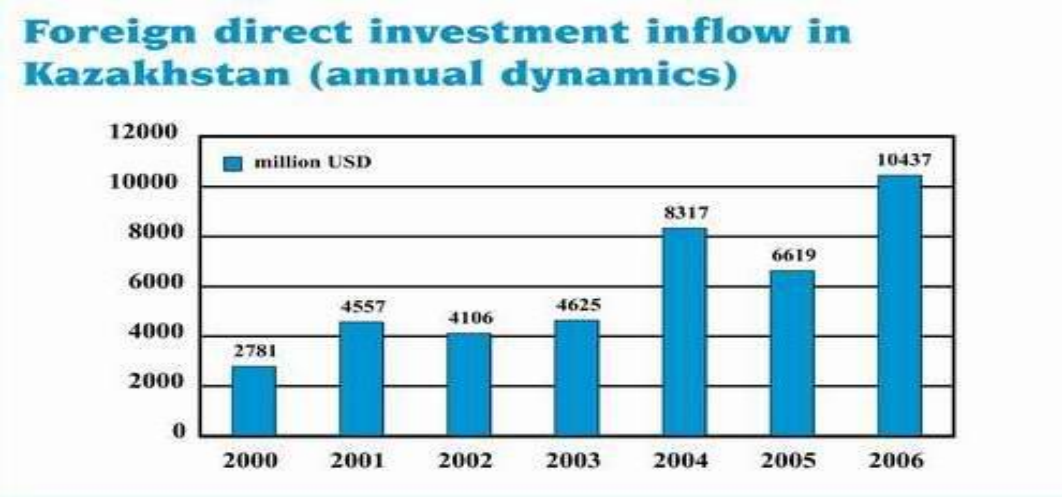


**Chart 3: FDI Inflow in Kazahstan, 2000-2006**

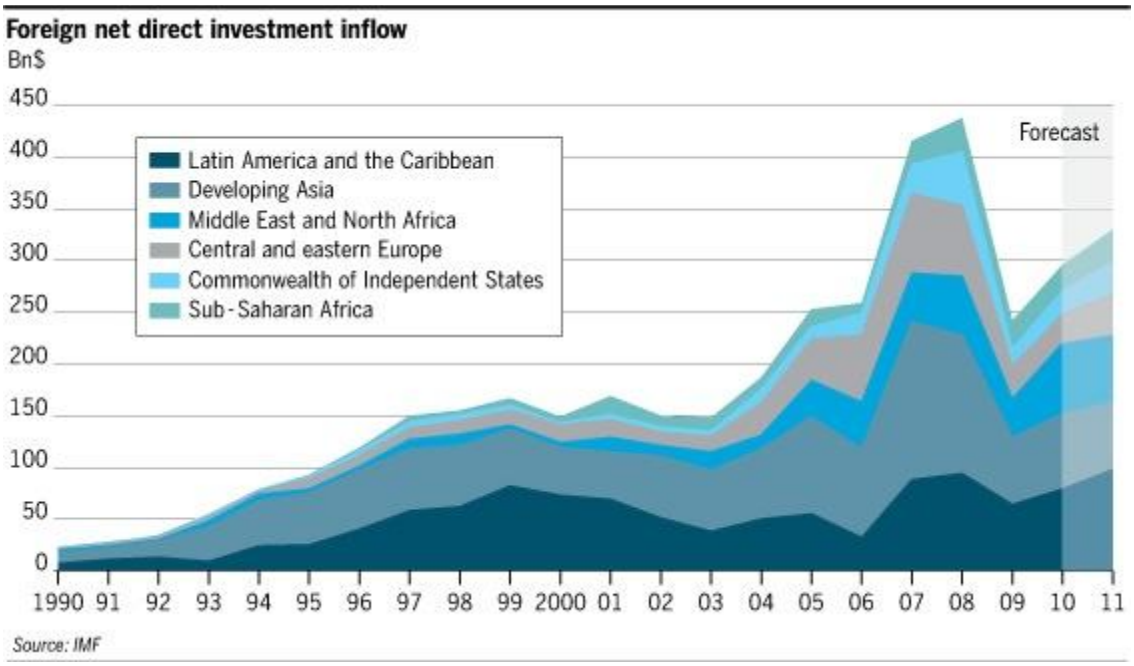


**Chart 4: Net FDI for several regions. Obvious increase in FDI inflows for Central and Eastern Europe over the period.**

**Table 12: FDI Change in twenty largest sectors in Central and Eastern Europe**

| Sector | Annual Change in FDI Inflows in 2009 | Share of Regional FDI Inflows, 2003-2009 |
|---|---|---|
| Real Estate | -71% | 25% |
| Coal, Oil and Natural Gas | -52% | 13% |
| Transportation | -34% | 6% |
| Alternative Energy | 31% | 6% |
| Alternative Equipment | -67% | 5% |
| Metals | -70% | 5% |
| Food and Tobacco | -16% | 5% |
| Building Materials | -60% | 5% |
| Wood Products | -68% | 3% |
| Automotive Components | -81% | 4% |
| Paper, printing and packaging | -49% | 3% |
| Electronic components | 43% | 3% |
| Consumer products | -52% | 2% |
| Consumer electronics | -82% | 2% |
| Hotels and Tourism | -17% | 2% |
| Communications | 14% | 1% |
| Industrial machinery | -34% | 1% |
| Warehousing and storage | -42% | 1% |
| Chemicals | 171% | 1% |
| Rubber | -79% | 1% |

Source: FDI Intelligence from the Financial Times Ltd, PwC analysis; figures may not sum due to rounding

## Appendix B – Descriptive Statistics for the Individual Countries in the dataset

**Table 13. Descriptive Statistics Albania**

| Albania | Mean | Maximum | Std. Dev. | JB | Observations |
|---|---|---|---|---|---|
| **Sales (dollar terms)** | 93735639 | 6.55E+09 | 3.92297148 | 4.88623 | 529 |
| **GDP per Capita** | 1566 | 1857 | 165 | 34 | 732 |
| **Skilled Labor** | 40.3 | 2097 | 151.2 | 170159 | 465 |
| **Unskilled Labor** | 31.233 | 1008 | 84.1 | 64571 | 322 |
| **Materials** | 28310430 | 1.68E+09 | 1.48E08 | 72583 | 222 |
| **Capital** | 6456706 | 7.38E+08 | 45655678 | 511110 | 607 |
| **Plant_FDI** | 0.202 | 1 | 0.366726 | 142.267 | 401 |
| **Sector_FDI** | 0.0024 | 0.01 | 0.025 | 145.0434 | 401 |

**Table 14. Descriptive Statistics Armenia**

| Armenia | Mean | Maximum | Std. Dev. | JB | Observations |
|---|---|---|---|---|---|
| **Sales (dollar terms)** | 1583850. | 5.16E+08 | 18554325 | 18385434 | 798 |
| **GDP per Capita** | 1125.901 | 1302.457 | 191.6974 | 119.2435 | 896 |
| **Skilled Labor** | 42.88672 | 1088.000 | 107.7112 | 27333.09 | 512 |
| **Unskilled Labor** | 22.54434 | 455.0000 | 54.16803 | 12135.56 | 327 |
| **Materials** | 227891.0 | 5000000. | 555166.4 | 18590.84 | 414 |
| **Capital** | 53088.81 | 643126 | 315128.2 | 2100325. | 896 |
| **Plant_FDI** | 0.116845 | 1.000000 | 0.283154 | 847.7072 | 561 |
| **Sector_FDI** | 0.003491 | 0.600000 | 0.029506 | 2637218 | 561 |

**Table 15. Descriptive Statistics Azerbaijan**

| Azerbaijan | Mean | Maximum | Std. Dev. | JB | Observations |
|---|---|---|---|---|---|
| **Sales (dollar terms)** | 1442490. | 58266650 | 5357141. | 113002.9 | 469 |
| **GDP per Capita** | 1562.332 | 2259.882 | 613.3511 | 117.2510 | 900 |
| **Skilled Labor** | 65.07241 | 3000.000 | 203.5400 | 222523.6 | 580 |
| **Unskilled Labor** | 21.44077 | 897.0000 | 59.25895 | 273525.9 | 363 |
| **Materials** | 873219.2 | 17305195 | 2343611 | 3448.166 | 120 |
| **Capital** | 64128.41 | 9624951. | 477021.1 | 2819998. | 900 |
| **Plant_FDI** | 0.167940 | 0.974545 | 0.150482 | 985.5045 | 543 |
| **Sector_FDI** | 0.142192 | 1.000000 | 0.317053 | 490.2806 | 543 |

**Table 16. Descriptive Statistics Belarus**

| Belarus | Mean | Maximum | Std. Dev. | JB | Observations |
|---|---|---|---|---|---|
| **Sales (dollar terms)** | 3.19E+09 | 2.28E+11 | 1.48E+10 | 438753.3 | 658 |
| **GDP per Capita** | 1950.977 | 2539.509 | 447.0908 | 76.34772 | 848 |
| **Skilled Labor** | 71.74237 | 1645.000 | 189.0627 | 27320.37 | 590 |
| **Unskilled Labor** | 30.53020 | 576.0000 | 73.66692 | 8133.914 | 298 |
| **Materials** | 1.73E+09 | 9.33E+10 | 9.23E+09 | 43744.50 | 220 |
| **Capital** | 1.35E+08 | 2.50E+10 | 1.07E+09 | 4466112. | 834 |
| **Plant_FDI** | 0.152368 | 1.000000 | 0.316196 | 362.1467 | 511 |
| **Sector_FDI** | 0.177760 | 0.966608 | 0.198738 | 327.0719 | 511 |

**Table 17. Descriptive Statistics Bosnia**

| Bosnia | Mean | Maximum | Std. Dev. | JB | Observations |
|---|---|---|---|---|---|
| **Sales (dollar terms)** | 3320413 | 1.19E+08 | 8603180. | 120715.4 | 596 |
| **GDP per Capita** | 1942.193 | 2161.600 | 231.7174 | 84.44700 | 743 |
| **Skilled Labor** | 60.13739 | 1242.000 | 148.4155 | 21275.46 | 444 |
| **Unskilled Labor** | 31.74009 | 712.0000 | 74.04470 | 32676.42 | 227 |
| **Materials** | 773422.6 | 15395352 | 1680440. | 9295.343 | 215 |
| **Capital** | 167750.9 | 13995775 | 748405.8 | 1031022. | 743 |
| **Plant_FDI** | 0.154493 | 1.000000 | 0.335650 | 248.2738 | 345 |
| **Sector_FDI** | 0.227704 | 0.945626 | 0.228682 | 3.311046 | 345 |

**Table 18. Descriptive Statistics Bulgaria**

| Bulgaria | Mean | Maximum | Std. Dev. | JB | Observations |
|---|---|---|---|---|---|
| **Sales (dollar terms)** | 4831832. | 3.40E+08 | 20124937 | 1163218. | 1681 |
| **GDP per Capita** | 2352.324 | 2527.317 | 252.5886 | 640.0226 | 1853 |
| **Skilled Labor** | 59.74609 | 2700.000 | 163.7817 | 388872.5 | 1024 |
| **Unskilled Labor** | 27.77196 | 1156.000 | 71.98212 | 296226.3 | 592 |
| **Materials** | 1711229 | 1.03E+08 | 7198338. | 348730.9 | 823 |
| **Capital** | 299769.8 | 69976558 | 2601249. | 16882812 | 1838 |
| **Plant_FDI** | 0.133638 | 1.000000 | 0.319853 | 1433.830 | 1366 |
| **Sector_FDI** | 0.272386 | 0.990000 | 0.226589 | 411.1465 | 1366 |

**Table 19. Descriptive Statistics Croatia**

| Croatia | Mean | Maximum | Std. Dev. | JB | Observations |
|---|---|---|---|---|---|
| **Sales (dollar terms)** | 40145720 | 2.00E+09 | 1.28E+08 | 211757.7 | 1052 |
| **GDP per Capita** | 6278.690 | 6651.741 | 504.9607 | 235.0548 | 1160 |
| **Skilled Labor** | 73.66949 | 2340.000 | 209.7067 | 82808.11 | 708 |
| **Unskilled Labor** | 36.58586 | 502.0000 | 71.43683 | 4424.415 | 396 |
| **Materials** | 15760907 | 5.25E+08 | 53403703 | 38994.07 | 506 |
| **Capital** | 2220322. | 1.70E+08 | 10905333 | 593848.4 | 1052 |
| **Plant_FDI** | 0.129847 | 1.000000 | 0.312488 | 800.6912 | 720 |
| **Sector_FDI** | 0.157885 | 1.000000 | 0.185416 | 1471.569 | 720 |

**Table 20. Descriptive Statistics Czech Republic**

| Czech Republic | Mean | Maximum | Std. Dev. | JB | Observations |
|---|---|---|---|---|---|
| **Sales (dollar terms)** | 8305329. | 4.93E+08 | 33274232 | 371731.7 | 698 |
| **GDP per Capita** | 6897.778 | 7618.458 | 609.1626 | 79.28880 | 861 |
| **Skilled Labor** | 80.85062 | 4875.000 | 314.4927 | 422349.2 | 569 |
| **Unskilled Labor** | 86.11811 | 7600.000 | 518.8371 | 332634.9 | 254 |
| **Materials** | 2571742 | 1.14E+08 | 9469541. | 100540.0 | 395 |
| **Capital** | 438535.2 | 40209590 | 2688588. | 511495.4 | 861 |
| **Plant_FDI** | 0.206764 | 1.000000 | 0.379556 | 140.2303 | 411 |
| **Sector_FDI** | 0.380606 | 0.998135 | 0.325081 | 40.91584 | 411 |

**Table 21. Descriptive Statistics Estonia**

| Estonia | Mean | Maximum | Std. Dev. | JB | Observations |
|---|---|---|---|---|---|
| **Sales (dollar terms)** | 9162860. | 3.89E+08 | 30108022 | 171253.7 | 639 |
| **GDP per Capita** | 5596.794 | 5956.443 | 511.6076 | 146.5930 | 662 |
| **Skilled Labor** | 92.75603 | 3195.000 | 331.9511 | 42029.38 | 373 |
| **Unskilled Labor** | 58.87234 | 2400.000 | 207.0259 | 56665.67 | 235 |
| **Materials** | 3126416. | 75200000 | 8277688 | 11925.48 | 266 |
| **Capital** | 358929.5 | 53097300 | 2378263. | 3873772. | 662 |
| **Plant_FDI** | 0.195357 | 1.000000 | 0.369410 | 158.1450 | 392 |
| **Sector_FDI** | 0.326508 | 1.000000 | 0.273179 | 50.92677 | 392 |

**Table 22. Descriptive Statistics FYROM**

| FYROM | Mean | Maximum | Std. Dev. | JB | Observations |
|---|---|---|---|---|---|
| **Sales (dollar terms)** | 3333318 | 1.12E+08 | 9923913. | 52655.48 | 548 |
| **GDP per Capita** | 1998.145 | 2185.339 | 198.5818 | 86.04748 | 736 |
| **Skilled Labor** | 71.09645 | 2170.000 | 184.3768 | 57528.13 | 394 |
| **Unskilled Labor** | 35.64912 | 740.0000 | 86.81817 | 8733.496 | 171 |
| **Materials** | 1385241 | 45754715 | 5044207. | 26528.47 | 221 |
| **Capital** | 160947.4 | 13263546 | 913428.5 | 795800.6 | 736 |
| **Plant_FDI** | 0.157166 | 1.000000 | 0.322039 | 255.4471 | 367 |
| **Sector_FDI** | 0.276257 | 0.990000 | 0.210454 | 100.4611 | 367 |

**Table 23. Descriptive Statistics Georgia**

| Georgia | Mean | Maximum | Std. Dev. | JB | Observations |
|---|---|---|---|---|---|
| **Sales (dollar terms)** | 2875989 | 3.50E+08 | 17057304 | 2292981 | 552 |
| **GDP per Capita** | 1044.464 | 1194.461 | 169.2976 | 88.82854 | 747 |
| **Skilled Labor** | 67.34603 | 2740.000 | 228.3643 | 72276.76 | 315 |
| **Unskilled Labor** | 27.16854 | 390.0000 | 58.22841 | 2640.767 | 178 |
| **Materials** | 1065696 | 76954084 | 5375192. | 273720.2 | 245 |
| **Capital** | 197479. | 17000000 | 1354479. | 298942.1 | 719 |
| **Plant_FDI** | 0.142145 | 1.000000 | 0.311010 | 351.4285 | 401 |
| **Sector_FDI** | 0.185655 | 0.993377 | 0.233468 | 270.3023 | 401 |

**Table 24. Descriptive Statistics Hungary**

| Hungary | Mean | Maximum | Std. Dev. | JB | Observations |
|---|---|---|---|---|---|
| **Sales (dollar terms)** | 19120718 | 3.12E+09 | 1.52E+08 | 4381126. | 967 |
| **GDP per Capita** | 5467.206 | 5639.395 | 275.4846 | 331.2455 | 1151 |
| **Skilled Labor** | 58.31439 | 5225.000 | 226.0978 | 4018804. | 792 |
| **Unskilled Labor** | 61.13462 | 2800.000 | 222.3677 | 176111.7 | 468 |
| **Materials** | 5249194. | 2.66E+08 | 21169594 | 173277.7 | 564 |
| **Capital** | 477489.5 | 2.18E+08 | 6605257 | 50047470 | 1151 |
| **Plant_FDI** | 0.193102 | 1.000000 | 0.365874 | 299.1382 | 748 |
| **Sector_FDI** | 0.344406 | 1.000000 | 0.280631 | 104.0636 | 746 |

**Table 25. Descriptive Statistics Kazahstan**

| Kazahstan | Mean | Maximum | Std. Dev. | JB | Observations |
|---|---|---|---|---|---|
| **Sales (dollar terms)** | 2138164 | 1.47E+08 | 8232560 | 685610.4 | 1166 |
| **GDP per Capita** | 2042.544 | 2345.864 | 291.5347 | 104.9126 | 1379 |
| **Skilled Labor** | 64.09556 | 3920.000 | 193.1665 | 1349371. | 900 |
| **Unskilled Labor** | 29.97468 | 2940.000 | 128.9567 | 4477834. | 632 |
| **Materials** | 877595.9 | 54669704 | 3692654 | 345431.7 | 597 |
| **Capital** | 1529401. | 1.96E+09 | 52730567 | 1.09E+08 | 1379 |
| **Plant_FDI** | 0.109395 | 1.000000 | 0.287453 | 1508.705 | 843 |
| **Sector_FDI** | 0.130588 | 0.940000 | 0.174352 | 979.2656 | 843 |

**Table 26. Descriptive Statistics Kyrgyz Republic**

| Kyrgyz Rep | Mean | Maximum | Std. Dev. | JB | Observations |
|---|---|---|---|---|---|
| **Sales (dollar terms)** | 715779.0 | 42474785 | 2751874. | 303433.1 | 506 |
| **GDP per Capita** | 335.0739 | 382.4003 | 39.34410 | 72.86538 | 610 |
| **Skilled Labor** | 59.81203 | 1515.000 | 145.9186 | 29462.86 | 399 |
| **Unskilled Labor** | 26.79402 | 948.0000 | 75.38287 | 90075.68 | 301 |
| **Materials** | 271630.4 | 10058000 | 1013856. | 39688.20 | 231 |
| **Capital** | 28489.36 | 3215757 | 173442.5 | 1202872. | 610 |
| **Plant_FDI** | 0.218723 | 1.000000 | 0.342377 | 69.31610 | 274 |
| **Sector_FDI** | 0.248161 | 0.980000 | 0.224691 | 27.92630 | 274 |

**Table 27. Descriptive Statistics Latvia**

| Latvia | Mean | Maximum | Std. Dev. | JB | Observations |
|---|---|---|---|---|---|
| **Sales (dollar terms)** | 9223165. | 7.73E+08 | 47495023 | 838992.7 | 604 |
| **GDP per Capita** | 4702.301 | 5046.862 | 517.2830 | 138.7339 | 652 |
| **Skilled Labor** | 69.12137 | 5850.000 | 318.8962 | 1287476 | 379 |
| **Unskilled Labor** | 42.25463 | 1320.000 | 113.3503 | 53935.85 | 216 |
| **Materials** | 2003051 | 33087341 | 4975457 | 3216.228 | 232 |
| **Capital** | 446015.1 | 57528000 | 3110410. | 1594017. | 652 |
| **Plant_FDI** | 0.202358 | 1.000000 | 0.371960 | 138.8535 | 386 |
| **Sector_FDI** | 0.409152 | 1.000000 | 0.283836 | 23.78442 | 388 |

**Table 28. Descriptive Statistics Lithuania**

| Lithuania | Mean | Maximum | Std. Dev. | JB | Observations |
|---|---|---|---|---|---|
| **Sales (dollar terms)** | 4927433 | 7.44E+08 | 30919400 | 6926593. | 644 |
| **GDP per Capita** | 4670.391 | 5179.582 | 601.4147 | 109.7672 | 681 |
| **Skilled Labor** | 62.39409 | 1092.000 | 130.9376 | 8103.152 | 406 |
| **Unskilled Labor** | 24.44706 | 700.0000 | 60.03611 | 49484.15 | 255 |
| **Materials** | 1895181. | 43590000 | 5392514. | 12448.29 | 260 |
| **Capital** | 408239.5 | 47548763 | 2839834 | 1307067. | 681 |
| **Plant_FDI** | 0.196391 | 1.000000 | 0.372220 | 118.9748 | 302 |
| **Sector_FDI** | 0.272617 | 1.000000 | 0.316303 | 43.10887 | 302 |

**Table 29. Descriptive Statistics Moldova**

| Moldova | Mean | Maximum | Std. Dev. | JB | Observations |
|---|---|---|---|---|---|
| **Sales (dollar terms)** | 1344063 | 65898157 | 4757147 | 270098.3 | 739 |
| **GDP per Capita** | 506.6593 | 556.6079 | 54.63230 | 126.5571 | 887 |
| **Skilled Labor** | 61.85320 | 2134.000 | 155.1858 | 158214.1 | 579 |
| **Unskilled Labor** | 23.30245 | 833.0000 | 63.95442 | 144135.0 | 367 |
| **Materials** | 454742.2 | 14827085 | 1422198 | 46189.32 | 353 |
| **Capital** | 89090.80 | 12355904 | 620152.1 | 1888906. | 887 |
| **Plant_FDI** | 0.132777 | 1.000000 | 0.299389 | 594.7978 | 587 |
| **Sector_FDI** | 0.233559 | 0.990000 | 0.219323 | 132.6130 | 587 |

**Table 30. Descriptive Statistics Montenegro**

| Montenegro | Mean | Maximum | Std. Dev. | JB | Observations |
|---|---|---|---|---|---|
| **Sales (dollar terms)** | 4029810 | 82120066 | 9967991. | 5652.357 | 118 |
| **GDP per Capita** | 2057.555 | 2173.514 | 208.7392 | 46.54895 | 154 |
| **Skilled Labor** | 39.50000 | 420.0000 | 68.50883 | 632.0481 | 64 |
| **Unskilled Labor** | 20.46875 | 105.0000 | 23.26563 | 37.96966 | 32 |
| **Materials** | 1301389. | 13686678 | 2881102 | 219.1159 | 39 |
| **Capital** | 345498.0 | 9580674. | 1333124. | 6245.878 | 153 |
| **Plant_FDI** | 0.225625 | 1.000000 | 0.369323 | 3.891356 | 16 |
| **Sector_FDI** | 0.257138 | 0.893077 | 0.337849 | 4.188773 | 16 |

**Table 31. Descriptive Statistics Poland**

| Poland | Mean | Maximum | Std. Dev. | JB | Observations |
|---|---|---|---|---|---|
| **Sales (dollar terms)** | 4851829. | 4.79E+08 | 23800044 | 3275908 | 1541 |
| **GDP per Capita** | 5323.504 | 6332.960 | 617.4466 | 174.6080 | 1930 |
| **Skilled Labor** | 51.33289 | 1971.000 | 138.3843 | 251122.4 | 1505 |
| **Unskilled Labor** | 22.08077 | 800.0000 | 55.36553 | 155464.8 | 520 |
| **Materials** | 1321761 | 76048000 | 4248523. | 600760.2 | 890 |
| **Capital** | 155440.1 | 58500000 | 1497168. | 1.19E+08 | 1930 |
| **Plant_FDI** | 0.101893 | 1.000000 | 0.280893 | 3033.712 | 1379 |
| **Sector_FDI** | 0.197684 | 1.000000 | 0.191433 | 1282.650 | 1379 |

**Table 32. Descriptive Statistics Romania**

| Romania | Mean | Maximum | Std. Dev. | JB | Observations |
|---|---|---|---|---|---|
| **Sales (dollar terms)** | 7553357 | 5.74E+09 | 1.61E+08 | 83670753 | 1271 |
| **GDP per Capita** | 2326.548 | 2606.873 | 259.8854 | 93.94381 | 1396 |
| **Skilled Labor** | 94.41424 | 4596.000 | 288.3108 | 318757.6 | 927 |
| **Unskilled Labor** | 21.22245 | 350.0000 | 37.65799 | 15023.27 | 490 |
| **Materials** | 768949. | 29324310 | 2244495. | 115816.7 | 654 |
| **Capital** | 219714.6 | 43881606 | 1576169. | 12636107 | 1396 |
| **Plant_FDI** | 0.135136 | 1.000000 | 0.309824 | 936.3505 | 956 |
| **Sector_FDI** | 0.182711 | 1.000000 | 0.216796 | 898.9529 | 956 |

**Table 33. Descriptive Statistics Russia**

| Russia | Mean | Maximum | Std. Dev. | JB | Observations |
|---|---|---|---|---|---|
| **Sales (dollar terms)** | 7807932. | 1.17E+09 | 44254482 | 7652444 | 1701 |
| **GDP per Capita** | 2501.697 | 2806.073 | 336.8896 | 249.0921 | 2111 |
| **Skilled Labor** | 110.7756 | 8217.000 | 399.0984 | 2263411. | 1399 |
| **Unskilled Labor** | 47.62019 | 2700.000 | 155.6770 | 794304.2 | 961 |
| **Materials** | 3157313 | 3.52E+08 | 16198993 | 2585436. | 952 |
| **Capital** | 359723.6 | 2.42E+08 | 5699423. | 2.10E+08 | 2111 |
| **Plant_FDI** | 0.087627 | 1.000000 | 0.249594 | 4819.540 | 1521 |
| **Sector_FDI** | 0.131340 | 1.000000 | 0.178562 | 1908.645 | 1521 |

**Table 34. Descriptive Statistics Serbia**

| Serbia | Mean | Maximum | Std. Dev. | JB | Observations |
|---|---|---|---|---|---|
| **Sales (dollar terms)** | 8746391 | 7.62E+08 | 38878348 | 1428354 | 637 |
| **GDP per Capita** | 1067.547 | 1178.600 | 116.0805 | 100.4261 | 900 |
| **Skilled Labor** | 86.18934 | 3200.000 | 241.2560 | 111687.1 | 544 |
| **Unskilled Labor** | 39.61859 | 523.0000 | 73.37775 | 3776.290 | 312 |
| **Materials** | 3414090 | 1.50E+08 | 12863567 | 63555.11 | 292 |
| **Capital** | 597719.5 | 2.24E+08 | 7807294 | 20767760 | 900 |
| **Plant_FDI** | 0.205585 | 1.000000 | 0.378466 | 168.6695 | 487 |
| **Sector_FDI** | 0.302972 | 1.000000 | 0.278240 | 51.24157 | 487 |

**Table 35. Descriptive Statistics Slovakia**

| Slovakia | Mean | Maximum | Std. Dev. | JB | Observations |
|---|---|---|---|---|---|
| **Sales (dollar terms)** | 1.12E+08 | 7.32E+09 | 4.90E+08 | 292465.0 | 558 |
| **GDP per Capita** | 7070.857 | 8106.258 | 948.8006 | 66.21940 | 665 |
| **Skilled Labor** | 78.52058 | 1900.000 | 208.2449 | 15985.76 | 413 |
| **Unskilled Labor** | 44.19663 | 1900.000 | 171.3535 | 49558.06 | 178 |
| **Materials** | 39021381 | 3.05E+09 | 2.39E+08 | 137069.5 | 221 |
| **Capital** | 4293376 | 2.44E+08 | 21751781 | 138065.6 | 665 |
| **Plant_FDI** | 0.220207 | 1.000000 | 0.377164 | 82.81662 | 290 |
| **Sector_FDI** | 0.288232 | 0.990000 | 0.273765 | 40.12369 | 290 |

**Table 36. Descriptive Statistics Slovenia**

| Slovenia | Mean | Maximum | Std. Dev. | JB | Observations |
|---|---|---|---|---|---|
| **Sales (dollar terms)** | 17226864 | 1.25E+09 | 66436653 | 1038307. | 660 |
| **GDP per Capita** | 11869.92 | 12613.68 | 771.2855 | 81.87896 | 687 |
| **Skilled Labor** | 58.77880 | 1170.000 | 129.6097 | 8147.864 | 434 |
| **Unskilled Labor** | 54.72689 | 1215.000 | 126.8892 | 12750.26 | 238 |
| **Materials** | 7341520 | 4.22E+08 | 29207527 | 235884.7 | 301 |
| **Capital** | 1033224. | 1.09E+08 | 5511356 | 1704342 | 687 |
| **Plant_FDI** | 0.199185 | 1.000000 | 0.377053 | 102.8110 | 270 |
| **Sector_FDI** | 0.271274 | 1.000000 | 0.283202 | 56.25718 | 270 |

**Table 37. Descriptive Statistics Tajikistan**

| Tajikistan | Mean | Maximum | Std. Dev. | JB | Observations |
|---|---|---|---|---|---|
| **Sales (dollar terms)** | 1695600 | 1.54E+08 | 9028251. | 708383. | 601 |
| **GDP per Capita** | 227.9376 | 265.5934 | 41.16637 | 83.90956 | 736 |
| **Skilled Labor** | 57.16742 | 1300.000 | 130.1519 | 24491.32 | 442 |
| **Unskilled Labor** | 23.30682 | 250.0000 | 37.29718 | 1748.236 | 352 |
| **Materials** | 532286.3 | 19596742 | 1888217. | 44371.65 | 293 |
| **Capital** | 101998.8 | 42000000 | 1586501 | 13845122 | 714 |
| **Plant_FDI** | 0.128923 | 1.000000 | 0.277623 | 283.4416 | 297 |
| **Sector_FDI** | 0.155685 | 0.800000 | 0.178782 | 148.0419 | 297 |

**Table 38. Descriptive Statistics Ukraine**

| Ukraine | Mean | Maximum | Std. Dev. | JB | Observations |
|---|---|---|---|---|---|
| **Sales (dollar terms)** | 10524080 | 3.45E+09 | 99180933 | 61636627 | 1440 |
| **GDP per Capita** | 921.7787 | 991.1003 | 100.9400 | 444.2799 | 1908 |
| **Skilled Labor** | 89.50595 | 8010.000 | 406.5076 | 2485162 | 1344 |
| **Unskilled Labor** | 27.97450 | 1275.000 | 82.20724 | 279753.3 | 745 |
| **Materials** | 5329066. | 1.00E+09 | 49530761 | 3784468. | 801 |
| **Capital** | 183236.1 | 25000000 | 1083983. | 4810421 | 1779 |
| **Plant_FDI** | 0.123843 | 1.000000 | 0.295083 | 1463.601 | 1210 |
| **Sector_FDI** | 0.232866 | 0.990000 | 0.242108 | 287.8552 | 1210 |

**Table 39. Descriptive Statistics Uzbekistan**

| Uzbekistan | Mean | Maximum | Std. Dev. | JB | Observations |
|---|---|---|---|---|---|
| **Sales (dollar terms)** | 1.19E+11 | 1.00E+14 | 3.44E+12 | 25050532 | 846 |
| **GDP per Capita** | 740.2272 | 892.7489 | 128.6765 | 114.8127 | 926 |
| **Skilled Labor** | 97.49490 | 4320.000 | 341.8831 | 124866.7 | 588 |
| **Unskilled Labor** | 41.62500 | 1500.000 | 131.2061 | 60045.79 | 344 |
| **Materials** | 1.76E+08 | 7.00E+09 | 6.84E+08 | 44838.11 | 357 |
| **Capital** | 12418626 | 2.20E+09 | 1.08E+08 | 2239841 | 926 |
| **Plant_FDI** | 0.154304 | 1.000000 | 0.295296 | 354.5643 | 560 |
| **Sector_FDI** | 0.212228 | 0.990000 | 0.212836 | 166.8064 | 560 |