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THE EFFECT OF FOREIGN DIRECT INVESTMENT ON LABOUR PRODUCTIVITY: EVIDENCE FROM ESTONIA AND SLOVENIA

Priit Vahter[1]

Abstract

This paper studies the effects of foreign direct investment on labour productivity in manufacturing industries of two transition countries, Estonia and Slovenia. The emphasis is on the dimension of export/local market orientation. The study is based on firm-level panel data. It is shown that in Estonia the export oriented foreign investment enterprises have on average

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much lower labour productivity level than the domestic market oriented foreign affiliates. In Slovenia, on the contrary, the export orientation of a foreign affiliate is not correlated with lower labour productivity. No horizontal spillovers of foreign direct investment to domestic firms are detected in Estonia. In Slovenia, however, positive spillovers to domestic firms are found but there is no indication of spillovers to other foreign affiliates. The findings show that different types of foreign direct investment can have different effects on the host country and that the existence of positive spillovers may depend on the level of economic development of the host country.

Keywords: foreign direct investment, productivity, spillovers, export oriented FDI

JEL Classification: F10, F21, F23

CONTENTS

1. Introduction

Foreign direct investments (FDI) have had a significant role in enterprise restructuring of transition countries in Central and Eastern Europe (CEE). Governments in CEE also provide a lot of incentives for FDI. Justifications for these special incentives are traditionally the possible beneficial effects caused by the transfer of technology from the parent company to its local affiliate and the related positive spillover effects to the domestic owned firms of the host country. However, empirical literature on spillovers (e.g. Aitken and Harrison on Venezuela in 1999, Djankov and Hoekman on the Czech Republic in 2000, Smarzynska on Lithuania in 2002) shows that there is not much conclusive evidence to support this view.

The aim of this paper is to study the effects of FDI on labour productivity in Estonia and Slovenia in the sector of manufacturing. By using data for Estonia and Slovenia we can study the effect of FDI on labour productivity in these two countries that have had different stages of development, i.e. implying also substantially different effects of FDI. Slovenia has the highest gross domestic product (GDP) per capita among the CEE transition economies. In Estonia the level of GDP per capita is lower, the inward FDI penetration rates have been far higher. In Estonia also the attitude, the government policies and the privatisation methods have been more FDI friendly. Hence, the reasons why investors choose the host country are different for Slovenia and Estonia.

The research is based on firm-level panel data of the manufacturing industries of Estonia and Slovenia from the second part of 1990s until 2001. We study the correlation between foreign equity participation in the firm and the firm's own productivity, i.e. "own firm" effect—in the terminological tradition of Aitken and Harrison (1999). We endeavour to investi-

gate whether there exist intra-industry (within the same sector) spillovers from foreign affiliates to the firms with no FDI and to other foreign affiliates.

We also focus on the issue whether the "own firm" productivity effects are dependent on the type of FDI. More specifically: is there a difference in "own firm" effects between the export oriented and the domestic market oriented FDI? The exporting/local market orientation dimension is usually (except e.g. Kokko *et al.* 2001, Sgard 2001 or Harris, Robinson 2001) discarded in the analysis of effects of FDI on productivity. The effects of these two types of FDI on the host economy may be fairly different. This distinction is also relevant for the debate on how should governments design their policies to attract FDI and if the export oriented FDI is preferable for the host economy as the policy literature sometimes assumes (e.g. *World Investment Report 2002*).

Employing panel data techniques we account for the firm-specific time-invariant effects and also for the sample selection bias. Another important issue mentioned by several authors is the non-random selection of FDI recipients. In the case the most productive local firms receive FDI and unless we account for this, the positive productivity effects of FDI might be overestimated. To account for this possibility, in addition to the usual methods of econometrics of panel data, we also employ a two-step procedure to correct for the sample selection bias.

This study of the "own firm" and horizontal spillover effects of FDI on productivity endeavours to contribute to the rapidly growing literature, it has the benefits of adding the export/local market orientation dimension to the analysis and using enterprise-level panel data for two different CEE countries. One interesting finding in this paper is that in Estonia the export oriented foreign investment enterprises have on average much lower labour productivity level than the domestic market oriented foreign affiliates. In Slovenia, however, the faculty of export orientation of a foreign affiliate is not correlated with lower labour productivity. We detect no horizontal spillovers of

FDI to domestic firms in Estonia. In the case of Slovenia positive spillovers to domestic firms were found, nevertheless no spillovers to other foreign affiliates were detected. The remainder of the paper is organised as follows: Section 2 discusses briefly the theoretical relations between FDI and productivity; Section 3 surveys the most relevant findings of empirical literature in this field; Section 4 gives the data overview and studies the average characteristics of different types of foreign affiliates and domestic firms; Section 5 presents the general model estimated and discusses various econometric problems of estimation; Section 6 gives the estimation results of the regression analysis; Section 7 concludes.

2. Theoretical Background

In order for the FDI to materialise, the multinational enterprises (MNEs) must possess some firm-specific competitive advantages that allow them to compete successfully in the foreign environment. These advantages—the firm-specific assets—can constitute of production technologies, but they may also be related to special skills in management, distribution, product design, marketing, and other links in the value chain, or be made up of brand names and trademarks (Caves 1996; Kokko *et al.* 2001). One can argue that, in the case of export oriented FDI, a significant part of the firm-specific advantages of a foreign firm is made up of networks, relations or other export related know-how. The theory of FDI stresses the positive links between firm-specific knowledge based assets and the decision to invest abroad (e.g. Dunning: 1988: 1–5; Blomström, Kokko 1996: 2; Harris, Robinson 2001: 3). These firm-specific assets have some characteristics of a public good and can be transferred at low cost between the subsidiary of the MNE and its parent company.

Technology transfer by FDI could result in “own firm” and spillover effects on host economies:

1) the "own firm" effect, i.e. the average performance characteristics of foreign enterprises differ from those of the domestic enterprises (DE) in the host country (are presumably better than these of the DEs);
2) various spillover effects from the presence of foreign firms affect the performance of domestic firms (and other foreign affiliates active in the host country, spillovers are also usually presumed to be positive, at least for the DEs) (Aitken, Harrison 1999: 605–608; Blomström, Kokko 1996: 7, Smarzynska 2002: 1–5).

The extent of technology transfer to a local affiliate depends on the reasons why FDI was made into the country (host country advantages), what role and probably also what extent of autonomy the local foreign investment enterprises (FIE) have in MNEs value added channel. If the main reasons for investment were the low cost level of the host economy, including cheapness of labour or other factors of production, then it is less likely that higher value-adding activities would be transferred to a local FIE. Thus the "own firm" or "own-plant" effect of FDI depends on the international competitive advantage of the host country and the reasons why FDI was undertaken by this particular MNE. Higher value creating activities (e.g. R&D) are more likely to be allocated to local FIE in case there exists high enough level of absorptive capacity in the local firm and/or host economy as a whole (Damijan *et al*. 2003: 18).

The advantages of FDI that presumably result in better performance (incl. productivity) of FDI affiliates, if compared to domestic enterprises, are well documented in literature (see e.g. Aitken, Harrison 1999; Blomström, Kokko 2003; Smarzynska 2002, Görg, Strobl 2001). The well-known paper by Aitken and Harrison (1999) summarises the most important reasons why economists usually assume that foreign owned firms will have higher productivity than the rest (Aitken, Harrison, 1999: 605). Firstly—superior (and possibly newer) production equipment can be transferred from the parent company to its FDI affiliate. Secondly, the foreign affiliate also receives an inflow of non-tangible assets from its parent—in the form of

technological know-how, management and marketing capabilities, trade contracts, co-ordinated network of relationships with suppliers and customers abroad etc. This all can, assuming that the local affiliate has sufficient absorptive capabilities to use this know-how, give them significant competitive advantages over domestic enterprises. Oulton (1998: 122, 144) also argues that foreign enterprises may enjoy lower cost of capital as they are not constrained to borrow from the local financial system. The possible inability of domestic enterprises to borrow cheaply from abroad may reduce their ability to invest in superior technology (Oulton 1998: 144; Harris, Robinson 2001: 4).

The overwhelming majority of authors stress positive "own firm" effects of FDI. However, one may find also literature indicating the possibility of some FIEs having lower productivity than DEs. According to Harris and Robinson (2001: 4) foreign-owned plants may have lower productivity levels (at least in the short run) caused by the time lag in assimilating new plants into the FDI network. This may be caused by big cultural differences between the host and home countries or also by hostile policies of the host country governments towards FDI.

Also the usual assumption is that MNEs are more prone to acquire local companies with higher than average productivity (Damijan *et al.* 2003; Aitken, Harrison 1999: 606). Reasons why FIEs may sometimes have even lower productivity levels than DEs include the nature and type of activity undertaken in the foreign-owned plant (Harris, Robinson 2001: 5). Foreign firms might keep most of their high value-added operations at home (e.g. R&D), concentrating lower value-added assembly operations in the host country (e.g. due to cost and labour quality differences). Thus the use of lower-skilled workers and the use of possibly inferior/older technology will contribute to potentially lower productivity. This practice, although not a general one, is for example consistent with some empirical evidence of Japanese *greenfield* investments in the US (Okamoto 1999).

There is also expanding literature that links exporting and productivity (Görg, Strobl 2001: 4, Gestrin 2001, Bernard *et al*. 1999, Delgado *et al*. 2001). The causality can, as in the case of FDI and productivity, run in both ways. There can exist both the learning- by-exporting effect, meaning that exporting causes higher productivity of the firm, and the self-selection effect. Self-selection means that firms with higher than average productivity are more likely to become exporters. Empirical work, for example on USA or Western-European countries, suggests often that the productivity levels in exporting firms are higher than in non-exporting firms (Bernard *et al*. 1999: 1, Delgado *et al.* 2001: 397). This is part of the reasons why export oriented FDI is generally considered to be better for the host country than non-export oriented FDI (Gestrin 2001: 2).

The predominant conclusion from theoretical literature, however, is that the "own firm" effect of FDI on productivity is expected to be positive.

The presence of a MNE in a host country can lead to technology transfer to domestic firms, i.e. to spillovers of FDI to local enterprises (Aitken, Harrison 1999: 605). If foreign firms introduce new products and/or processes in their affiliates in a host country, domestic firms and other FIEs may benefit from accelerated diffusion of new technology. Spillovers are said to take place as MNEs, due to the public good characteristics of their firm-specific assets and due to these assets being at least to certain extent non-excludable and non–rival goods, cannot reap all the benefits of their activities in a foreign location (Caves 1996: 185).

The spillovers from inward foreign investment may be intra-industry (horizontal) or inter-industry (vertical) spillovers (Smarzynska 2002: 1). Intra-industry spillovers take place between companies in the same industry, vertical spillovers flow in direction of suppliers and customers (to backward and forward linkages) of the firm in consideration.

Based on articles by Caves (1974), Blomström and Kokko (1996: 8), Smarzynska (2001: 3), Aitken and Harrison (2001:

606–607), we can distinguish between following main channels for spillovers: demonstration (or imitation), competition, worker mobility and supplier upgrading effects and exporting.

Demonstration effect is perhaps one of the simplest examples of a spillover, for instance the case when a local firm improves its productivity by simply observing nearby foreign firms and copying some technology used by MNE affiliates (Blomström, Kokko 1996: 7, UNCTAD 2001: 131). In other cases diffusion of new technologies and know-how may occur from labour turnover as employees move from FIEs to DEs.

Another type of spillovers is the one that function through competition between enterprises. The competition effect, unlike demonstration and worker mobility effects that are presumably positive, can be both positive and negative (*Ibid.* 1999: 607; Görg, Greenaway 2001: 4). This is an important idea, as it influences significantly the studies on spillovers. Some kind of (competition) spillover is said to take place if the entry of an affiliate leads to more severe competition in the host economy, so that local firms are forced to use existing technology and resources more efficiently or to search for new efficient technologies (Blomström, Kokko 1996). This can have both positive (in the case a local firm manages to implement superior technologies due to the increase in competition) and negative effects on the productivity of domestic (or more generally other local) enterprises. Negative effects exist particularly in the short run (Aitken, Harrison 1999: 607; Smarzynska 2002). Negative effects are possible due to the existence of fixed costs. If imperfectly competitive firms face fixed costs of production, a foreign firm with lower marginal costs will have an incentive to increase production relative to its domestic competitors. In this environment, entering foreign enterprises producing for the local market can draw the sales and the demand away from domestic firms, thus making them cut production. The productivity of domestic firms would, as shown by Aitken and Harrison (1999: 608), fall as they spread their fixed costs over a smaller market, forcing them back up their average cost curves. If the absolute value of this productivity decline due to diver-

sion of demand towards FIE is larger than the positive effect due to transfer of technology from MNE affiliate to domestic firms, net productivity of DEs can decline.

A further indirect source of productivity gain may be via export spillovers (Blomström, Kokko 1996; Görg, Greenaway 2001: 4). Görg concludes that domestic firms often learn from multinationals how to export.[2] It can be argued that productivity spillovers might be different for export oriented and domestic-market oriented FDI, especially when local procurement is widespread among export oriented MNE affiliates. World Investment Report (WIR) 2002 (UNCTAD 2002: 221–248) discusses the possibly large benefits of specifically export oriented FDI. They bring forward two reasons why in their opinion the targeted approach of host countries towards export oriented FDI makes sense. Firstly, the targeted approach can help countries achieve strategic objectives related to such goals as employment, technology transfer, cluster and export development, in line with their overall development strategies. The second reason named in WIR 2002 is the increased competition for export oriented FDI (*Ibid.*: 221). However, we would like to argue here, that the spillover and "own firm" effects still depend largely on the type of activities transferred and this, in turn, depends on the competitive advantages of the host country and not only on whether the affiliate sells to domestic or international markets. One cannot agree that it is automatically true that export oriented FDI is more beneficial. Ari Kokko and Magnus Blomström have demonstrated (1996: 27), that the countries that choose to specialise in labour-intensive processes and components' production for MNEs also have to take into account that these (export oriented) affiliates are relatively "footloose". They have relatively few obstacles to move to the most favourable environment as, for example, the cost level of one host country grows. In addition to that, Gestrin has made a point (2001: 2) that it is difficult to clearly distinguish FDI that

[2] For more reference see also the paper by Greenaway, Sousa and Wakelin (2004).

is export oriented from FDI that is not since this orientation can change over time.

3. Previous Empirical Literature

The important conclusion from both theoretical and empirical literature is that productivity spillovers are difficult to measure (Krugman 1990: 53). Paul Krugman points out: *Knowledge flows… leave no paper trail by which they may be measured and tracked* (Krugman 1990: 53). The empirical literature tries to avoid the issue for the reason that it is difficult to address, namely the issue of how productivity spillovers take place in reality, but rather focuses on the simpler question whether the presence of FDI affects the productivity of domestic enterprises (or local firms, i.e. also other MNE affiliates).

The estimation is usually performed in the framework of econometric analysis, based on the estimation of the production function. Labour productivity or total factor productivity of firms (or only domestic firms) in the host economy is regressed on a number of factors assumed to have an effect on productivity. One of these factors that is used to study the spillover effects is the presence of foreign firms in an economic sector or region. Another factor is the variable indicating FDI presence at the firm level (e.g. FDI dummy that is equal to 1 in case the firm has FDI, Görg, Strobl 2001: 724–725). The presence of FDI at the sectoral/regional level is measured by the share of FDI in assets, sales, employment etc. The estimated econometric models in literature often use log-linear form of Cobb-Douglas production function.

Studies on the direct effects of FDI on its affiliate and spillover effects to the host economy have been made with different techniques, covering both high-income as well as developing and transition countries. Often one may find results significantly different from what one would expect based on theory or policy literature (also for transition countries). Policy makers in

host countries of FDI often just assume, that there exist positive "own firm" and spillover effects of FDI (UNCTAD 2001). The empirical literature with few exceptions usually confirms the former argument that affiliates of MNEs in host country have on average higher productivity levels than purely domestic enterprises (e.g. Harris, Robinson 2001: 7). The picture is, however, far more diverse if one takes a look at the empirical analysis of FDI spillovers.

Empirical literature, including the literature on transition economies, shows that there is little conclusive evidence to support the view that for the host country only beneficial effects of FDI exist. Thus there is little conclusive evidence to substantiate incentives to attract FDI (Görg, Strobl 2001; Smarzynska 2002: 1). Some surveys reveal the existence of positive spillovers, others find negative ones while the rest find "mixed" or not significant results (Görg, Strobl 2001: 724; Chudnovsky *et al.*: 2003: 4).

The way the research is conducted vastly influences the results obtained and therefore the policy implications made. The findings of the literature overview by Görg and Strobl (2001: 723) underline that the results may be influenced by the ways of defining the presence of MNEs and by employing either cross-section or panel data. In the works where case studies and/or cross-section data were used, significant positive spillover effects related to FDI were found. On the other hand, newer studies based on panel data, that account for firm-specific time-invariant effects often find also insignificant spillovers to DEs or negative spillovers (Smarzynska 2002: 2).

Whereas the analysis of intra-industry spillovers is already well established in literature, the analysis of vertical spillovers is quite a new field with one of the most important papers written by Beata Smarzynska from World Bank (2002). One result of Smarzynska that is especially interesting for this analysis concerning Estonia is that by using Lithuanian data Smarzynska found that greater productivity benefits are associated with the domestic market rather than the export oriented foreign com-

panies (Smarzynska 2002: 1, 16–17). Similar results are presented by Kokko *et al.* (2001) on Uruguay.

In very recent literature (e.g. Wei, Liu 2003 or Driffield, Love 2003) also the so-called reverse spillovers are discussed, i.e. spillovers from the DEs to the FIEs. One issue that is totally discarded in the literature on the effects of FDI on productivity is the influence of transfer pricing on FDI related productivity effects. This area deserves further theoretical analysis. To our knowledge there are no articles that connect these two fields. Transfer pricing may have some importance in the case relatively large differences exist in taxes between host and home countries of FDI. Transfer pricing is probably not a problem for looking at spillovers, however, in a productivity comparison of foreign and domestic firms it probably might be, it might affect the analysis of differences of productivity in FIEs and DEs (and between export oriented and domestic market oriented FIEs).

4. Data and Descriptive Statistics for Estonia and Slovenia

Slovenia as a transition economy is more developed than Estonia. This is evident based on the comparison of GDP levels of these two countries. GDP per capita of Slovenia was, according to the Transition Report Update of European Bank for Reconstruction and Development (2004), estimated to be 13,851 USD in 2003. The corresponding level for Estonia was 6,120 USD. These facts are supported by the investment development path theory of Dunning and Narula: in addition to the higher GDP per capita, Slovenia also started investing abroad long before Estonia and has far different track record of internationalisation (Varblane *et al*. 2001: 18–19; Rojec, Svetličič 2003). Estonia and Slovenia have also adopted different privatisation strategies, have had different attitudes and policies towards FDI: Estonia has been much more FDI friendly than Slovenia (see

e.g. *Index of Economic Freedom 2003*). Thus based on these differences, one can argue that the effects of FDI on productivity can differ between Estonia and Slovenia and studying these two countries can offer interesting results and policy implications.

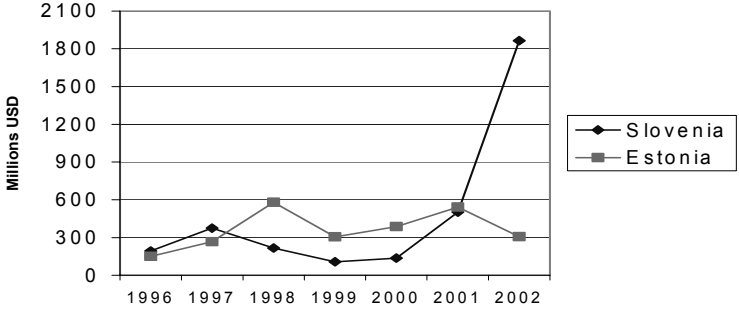

Figure 1. FDI inflows in Estonia and Slovenia, 1998–2002, mill. USD (UNCTAD 2003).

If one takes a look at the general FDI inflow data for the economy, one can see that FDI indeed has a stronger role in Estonia. Inward FDI stocks reach 65.9% of GDP in Estonia and only 23.1% of GDP in Slovenia in year 2002 (UNCTAD 2003). The FDI stock in Slovenia was 3.209 billion dollars in 2001 and 5.074 billion dollars in 2002. The corresponding figures for Estonia were 3.160 billion USD in 2001 and 4.226 billion USD in 2002. These figures also illustrate, if compared to the ratio of FDI stocks to GDP, the big differences between the GDP level (and per capita GDP) of Estonia and Slovenia. Figure 1 shows the inflows of FDI in both countries, in millions USD.

The government policy has been traditionally much more FDI friendly in the case of Estonia. For example, the corporate income tax on reinvested earnings in Estonia is postponed. This, however, applies to all firms, not only FIEs. In year 2002 one can observe a huge jump in FDI inflows into Slovenia, to a truly

unprecedented level for the country—almost 2 billion EUR. A great amount of that was accounted for by the take-over of *Lek*, a blue-chip pharmaceuticals enterprise (Slovenia—Your Business Partner 2004: 8). The majority of FDI inflows to both Estonia and Slovenia originate from the neighbouring Western-European countries.

We take a look at whether the "own firm" productivity effects depend on the type of FDI. I.e if there is a difference in the "own firm" effects of export oriented versus domestic market oriented FDI. We distinguish between two dimensions: ownership, market (abroad, local): DE denotes a domestic enterprise ($DUMF_{ijt}$ = 0[3]); FIE denotes a foreign investment enterprise ($DUMF_{ijt}$ = 1); DM denotes domestic market orientation ($DUMEXP_{ijt}$ = 0); FM is foreign market orientation ($DUMEXP_{ijt}$ = 1). Based on these two dimensions, we distinguish between four types of firms: domestic market oriented DEs ($DUMF_{ijt}$ = 0, $DUMEXP_{ijt}$ = 0); foreign market oriented DEs ($DUMF_{ijt}$ = 0, $DUMEXP_{ijt}$ = 1); domestic market oriented FIEs ($DUMF_{ijt}$ = 1, $DUMEXP_{ijt}$ = 0); foreign market oriented FIEs ($DUMF_{ijt}$ = 1, $DUMEXP_{ijt}$ = 1).

Enterprise-level panel data on manufacturing industries in Slovenia and Estonia are used in order to study the productivity effects of FDI. The data from the Statistical Office of Slovenia and the Statistical Office of Estonia are used. For Estonia the (balanced) panel consisted of yearly data of 326 firms over period 1996–2001. The initial number of enterprises in panel was 382; over 50 firms were excluded for the purposes of econometric analysis, since these firms either did not exist during the whole period of 1996–2001 (less than 10% of firms) or their field of activity was not manufacturing for the whole period. According to Olley and Pakes (1996: 1265) a traditional way of accounting for entry and exit when using firm-level data, is to

[3] FDI dummy $DUMF_{ijt}$ is equal to one if the firm *i* (in sector *j* at time *t*) is foreign investment enterprise, otherwise zero; $DUMEXP_{ijt}$ denotes the export orientation dummy, it takes the value of one if the firm *i* exports at least 50% of its sales and zero if it is more domestic market oriented.

construct a "balanced" panel, keeping only those firms that operate the entire sample period, and then compute either the ordinary least squares (OLS) or some other more suitable estimator of the production function coefficients for panel data. However, we note that this approach might also have deficiencies, as the firms that operate over the whole period are the relatively successful ones. The least successful firms that went bankrupt are left out from this analysis. However, the number of such firms excluded from the analysis is relatively small, and thus the impact on the results small.

The Slovenian panel was significantly larger, it covered the yearly data of period 1994–2000 of 982 firms of manufacturing industry. In addition to the standard financial statement data, the datasets contain information whether foreign capital has been invested in each firm. However, the definitions of a foreign investment enterprise and a domestic enterprise are different for the datasets of Estonia and Slovenia. For Slovenia, the usual definition of FDI recipient firms by OECD, IMF or World Bank is used. FDI recipient firms are defined as firms with foreign share equal to at least 10% of ordinary shares or voting power (IMF 2001: 23). For Estonia, one cannot use the 10% level for all the years. Due to the lack of data it was not possible to calculate the share of FDI in ordinary shares or voting power for years 2000 and 2001. Thus the FDI majority share dummy variable, available from the database of the Statistical Office of Estonia, is applied. Certainly the FDI dummy variable calculated for the 10% level would have been much more beneficial for the analysis since foreign direct investment smaller than the majority shares can still influence the performance of the firm to a significant extent. However, as annual surveys of FDI "Foreign Investor" by Estonian Investment Agency and Tartu University have indicated, there are relatively few firms with FDI in Estonia that have the foreign share below 50% (Varblane 2001). However, in the case of Slovenia, there is a significant number of FIEs with foreign share between 10 and 50%.

Table 1.

Data description

	Number of FIEs			FIE share in number of firms	
Year	Estonia*	Slovenia	Slovenia*	Estonia*	Slovenia
1994	…	91	54	…	9.3%
1996	69	101	73	21.2%	10.3%
2000	76	126	91	23.3%	12.8%
2001	85	…	…	26.1%	…

*Majority owned foreign investment enterprises.
Source: own calculations based on panel databases of Slovenian and Estonian enterprises of manufacturing industries.

Table 1 presents the number of FIEs and their share in the total number of firms over the studied period range of the two datasets. Both countries have growing FDI share in the number of firms in the sample. In the case of Estonia the FDI penetration rate is for all years about two times higher than in Slovenia. In 2000, the share of FIEs in the total number of enterprises was 23.3% in the Estonian sample and 12.8% in the Slovenian sample. In Slovenia, inward FDI is far less spread in the economy than in Estonia. Also the penetration of FIEs, measured by various indicators like employment, sales or value added is lower for Slovenia.

The analysis of descriptive statistics of the Slovenian panel of enterprises active in the manufacturing sector shows that the share of FIEs in the number of firms was 12.8% in 2000. These firms accounted for 33.2% of sales, 38.2% of exports, 18.7% of employment, 21.9% of value added and 24.1% of tangible fixed assets. In the Estonian panel of the manufacturing industry firms the share of the FIEs in the number of firms was 26.1%, these firms gave 47% of sales, 58.5% of exports, 39.4% of employment, 42.5% of R&D costs. As in Slovenia, also in Estonia the FIEs are larger than DEs and indeed more export oriented. They also tend to spend more on R&D per enterprise than DEs. Smaller FIEs are quite common in Estonia, whereas

in Slovenia FDI has been concentrated into relatively small number of large enterprises.

Table 2.
Descriptive statistics on the share of FDI in Estonia and Slovenia (%)

Country:	Estonia	Slovenia
Year:	2001	2000
FDI share in sales	46.6	33.2
FDI share in exports	58.5	38.2
FDI share in employment	39.4	18.1
FDI share in value added	48.7	21.9
FDI share in tangible fixed assets	54.4	24.1
FDI share in number of firms	26.1	12.8

Source: own calculations based on enterprise level panel databases of Estonian and Slovenian manufacturing.

In tables number 3 and 4 the descriptive statistics on productivity in the manufacturing sectors of Estonia and Slovenia are presented, based on the enterprise-level panel data. The tables describe differences between productivity levels of four types of firms included in this study. Also information on capital-labour ratio is included. Labour productivity is measured as sales per employee or value added per employee. In the case of Estonia, it is also interesting to take a look at the data, from whose analysis a very large foreign affiliate of Elcoteq (a well known foreign electronics company active in Estonia, among the largest firms in Estonian manufacturing) has been excluded.

The statistics in table 3 show that foreign affiliates have significantly higher labour productivity in Estonia than domestic enterprises. This result holds also for the value added based approach to labour productivity measurement (Vahter 2004). In

2001, the labour productivity of DEs as sales per employee in Estonian manufacturing was (based on the panel of 326 enterprises) on average 479,040 Estonian kroons. In FIEs, however, the same figure amounted to 643,890 kroons, i.e. was 34% higher than the labour productivity level of DEs. In 1996 the corresponding ratio of FIE to DE was higher than in 2001—FIE productivity surpassed that of DEs by 61%.

The big difference in productivity between those two types of enterprises is also seen in the case the value added per employee is studied. These results indicate that the FIE level surpasses the DE level almost by 50%; in 2001 the FIE/DE ratio was 1.457 and in 1996, it was 1.410. This big difference in productivity levels is to a large extent caused by the fact that FIEs employ more capital per employee than local domestic capital based firms. The gap in the capital-labour ratio is even larger than in the productivity of labour. The FIE/DE ratio of the capital-labour ratio is 1.834 in 2001 and at the beginning of the studied period, in 1996, the FIEs used even four times more capital per employee in production than the DEs. This FIE/DE ratio has, however, fallen significantly over the years as the capital-labour ratio of DEs has, due to investments into physical capital, grown rapidly over the years (122% over the period 1996–2001), whereas that of FIEs has stayed roughly the same.

In the case of Slovenia, like in Estonia, we witness that the labour productivity level of FIEs is on an average much higher than that of DEs; in 2000 even 2.25 times higher. In Estonia, in 2000, it was only 1.34 times higher. Thus the difference between those two types of firms is even much larger in the case of Slovenia than in the case of Estonia. Also the capital-labour ratio of FIEs surpasses largely that of the DEs in Slovenia.

Among the four types of firms, in 2001 in Estonia, the lowest productivity is found in domestic enterprises that produce predominantly for export markets—in 2001, sales per employee were 425,090 kroons, value added per employee was 98,750 kroons. The ranking of the four types of firms under consideration in Estonian manufacturing (from the group with the

highest level of the indicator to the one with the lowest level), based on sales per employee as a measure of labour productivity, proved to be the following (2001):

1) domestic market oriented FIEs;
2) domestic market oriented DEs;
3) foreign market oriented FIEs;
4) foreign market oriented DEs.

The highest labour productivity is to be found in domestic market oriented FIEs: even 1,115,550 kroons in 2001. This ranking changes a little bit during the years as for the second and third place, the first and the last places remain the same. The main conclusion from table 3 is that in Estonia export orientation of a firm is correlated with lower labour productivity. In 2001 and 1996, the labour productivity of export oriented enterprises was about 73% of the corresponding level of domestic market oriented firms. What can also be inferred from these results, is that the aim of FDI in the manufacturing sector, except for local market oriented FDI, has been to benefit from the low labour costs of Estonia.

Former empirical studies in Estonia have stressed (see e.g. Hannula, Tamm: 2001), that the FIEs have on average much higher labour productivity levels than the DEs. Now it is possible to see, based on this analysis, that there is this productivity difference in Estonia only due to domestic market oriented firms, whereas export oriented foreign affiliates have more than two times lower indicators (in the case of sales per employee, e.g. in 2001) than domestic market oriented firms with FDI. The productivity level of the export oriented FIEs is comparable to that of the domestic market oriented DEs. In the period 1998–2001 it is even below that already relatively low level.

We have computed the productivity indicator for export oriented foreign affiliates in Estonia also without the electronics manufacturing services provider Elcoteq (a big company: in some years even more than 3000 employees). The reader can witness that without Elcoteq these indicators of export oriented FIEs are much higher than with it (table 3). The labour pro-

ductivity as sales per employee, without Elcoteq, is 588,160 kroons in this group of firms for 2001. Before the exclusion of Elcoteq from our sample, the corresponding figure amounted for 532,200 kroons. This means that Elcoteq, with relatively low productivity, has due to its size, big impact on the analysis of productivity in our framework.

Let us now turn our discussion to Slovenia. The results for this transition country are given in table 4. One can see here significant differences from Estonia. The rankings of firms by type differ also between period 1994–1998 and 1999–2000. In the former period, the ranking, starting from the group of firms with the highest labour productivity (sales per employee) is the following:

Table 3. Estonia, productivity differences between the four types of firms, thousand kroons

Estonia, 1000s kroons			Year						Growth (%) 2001/1996
DUMM	DUMEXP	Data	1996	1997	1998	1999	2000	2001	
0	0	Productivity (sales/empl)	298	398	447	436	499	538	80.7%
0	1	Productivity (sales/empl)	217	275	264	277	350	425	96.3%
1	0	Productivity (sales/empl)	623	739	884	802	944	1116	79%
1	1	Productivity (sales/empl)	335	399	388	374	452	532	59%
TOTAL of DE		Productivity (sales/empl)	253	327	350	349	415	479	89.2%
TOTAL of FIE		Productivity (sales/empl)	407	480	497	475	542	644	58.1%
The (FIE/DE) ratio of productivity (sales/empl)			1.609	1.466	1.420	1.359	1.305	1.344	–16.5%
The (FIE/DE) ratio of capital/labour ratio			4.092	3.014	2.310	2.039	1.812	1.834	–55.2%
DUMEXP=0		Productivity (sales/empl)	341	447	510	507	577	658	93%
DUMEXP=1		Productivity (sales/empl)	249	311	307	315	393	479	92.6%
The (DUMEXP=1/DUMEXP=0) ratio of productivity (sales/empl)			0.730	0.695	0.602	0.621	0.682	0.728	–0.2%
Without Elcoteq:									
1	1	Productivity (sales/empl)	366	458	435	426	522	588	60.6%

Definitions: DUMM denotes the FDI dummy (= 1, if at least 50% of voting power belongs to the foreign investor, else = 0); DUMEXP denotes the export orientation dummy (= 1, if share of exports in sales is at least 50%, else = 0;
FIE – foreign investment enterprise; DE – domestic enterprise; empl – number of employees; capital/labour ratio – tangible fixed assets per employee.
Source: own calculations, based on enterprise-level panel database of Estonian manufacturing, 1996–2001.

Table 4. Statistics - Slovenia, productivity differences between the four types of firms, thousand tolars

Slovenia, 1000s tolars			Year							Growth (%) 2000/1994
DUMF	**DUMEXP**	**Data**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	
0	**0**	**Productivity (sales/empl)**	6759	7553	8724	10509	10883	11639	13321	97.1%
0	**1**	**Productivity (sales/empl)**	5498	6065	7044	8356	9222	9483	11779	114.2%
1	**0**	**Productivity (sales/empl)**	11849	14702	16198	18420	20522	22633	42820	261.4%
1	**1**	**Productivity (sales/empl)**	13985	15137	18683	20456	22941	21987	25074	79.3%
TOTAL of DE		**Productivity (sales/empl)**	6011	6643	7672	9096	9827	10296	12349	105.4%
TOTAL of FIE		**Productivity (sales/empl)**	13339	15025	18079	20071	22513	22118	27793	108.4%
The (FIE/DE) ratio of productivity (sales/empl)			2.219	2.262	2.357	2.207	2.291	2.148	2.251	1.43%
DUMEXP=0		**Productivity (sales/empl)**	7181	8106	9315	11107	11622	12831	15794	119.9%
DUMEXP=1		**Productivity (sales/empl)**	6562	7264	8641	10236	11711	12279	14821	125.9%
The (DUMEXP =1/DUMEXP=0) ratio of productivity (sales/empl)			0.914	0.896	0.928	0.922	1.008	0.957	0.938	2.7%
The (FIE/DE) ratio of capital/labour ratio			1.623	1.535	1.671	1.723	1.567	1.423	1.441	–11.2%

Definitions: DUMF denotes the FDI dummy (= 1, if at least 10% of voting power belongs to foreign investor, else = 0);
DUMEXP denotes the export orientation dummy (= 1, if share of exports in sales is at least 50%, else = 0;
FIE – foreign investment enterprise; DE – domestic enterprise; empl – number of employees; capital/labour ratio – tangible fixed assets per employee.
Source: own calculations, based on enterprise level panel data of Slovenian manufacturing 1994–2000.

1) foreign market oriented FIEs;
2) domestic market oriented FIEs;
3) domestic market oriented DEs;
4) foreign market oriented DEs.

In 1999, the first and second of these groups changed their positions (notice also differences in sales per employee in 1999 and 2000 from the table):

1) domestic market oriented FIEs;
2) foreign market oriented FIEs;
3) domestic market oriented DEs;
4) foreign market oriented DEs.

Based on these figures, the conclusion is that in Slovenia export orientation—unlike in Estonia—is not associated with lower labour productivity levels. Export oriented and domestic market oriented firms have on average about the same level of productivity. If the years of 1999 and especially 2000 with peculiarly high indicators are excluded, we can conclude that export oriented FIEs have the highest level of productivity among the four types of firms. Quite similar levels (in 1999 and 2000 also higher) are found for the domestic market oriented FIEs. The DEs, regardless whether export oriented or domestic market oriented, lag far behind. The export oriented DEs have, however, the lowest productivity level among the firms. In analysis of the results from table 4, some caution is advised for discussing implications concerning the results of 2000. The big leap in productivity level of top 1 group in 2000—domestic market oriented foreign firms, can be attributed to the small number of firms (with minority foreign ownership) and to a possible measurement error in the case of these firms. If we take a look at only foreign investment enterprises with majority foreign share, then there is no that big growth of productivity of export oriented FIEs in year 2000.

The results of the ranking of export oriented FIEs for Slovenia (table 4) and for Estonia (table 3) are in sharp contrast. The reasons for Slovenia having this group of enterprises as a top performer and Estonia having it as a low productivity group

might to a large extent be the result of different location-specific advantages that these two countries provide for the investors. Based on the information from the investor motivation surveys from Estonia and Slovenia, we find that there are large differences in main motives of FDI between those two countries (e.g. survey "Foreign Investor 2000" for Estonia; Foreign direct investments in Slovenia 2002: 14). In Estonia the relatively low production costs, including labour costs, have been one predominant factor affecting investment decisions into Estonia (Varblane 2001).

Surveys on the motivation of foreign investors in investing in Slovenia, on the other hand, show that as far as labour is concerned, it is clearly the quality and not the cost of labour that attracts foreign investors to Slovenia (OECD, 2003). In Slovenia only 1.8% of foreign investors emphasise the motive of low cost of labour as investing in Slovenia, however, quality of labour is a motive for 26.9% of the FIEs (*Ibid.* 2003: 14). This is not surprising, as labour costs in Slovenia are the highest among the transition countries in Central and Eastern Europe. In 2002 the average monthly wages in Slovenian manufacturing were 2.3 times higher than in Estonia (see table 5).

Table 5.

Average monthly wages in manufacturing

	2000	2001	2002
Estonia, EUR	309.6	341.1	376.1
Slovenia, EUR	763.1	820.0	868.0
Ratio SLO/EST	2.47	2.40	2.31

Source: Statistical Office of Estonia, Statistical Office of Slovenia.

The surveys for Estonia also indicate that export oriented investors have different motivation for investing in Estonia than domestic market oriented investors. Exporters are more motivated by the costs of production and the labour force than by the market potential, as they do not plan to supply the domestic market. The non-exporters, in turn, are more motivated in

tapping the new market and benefiting from the expected market growth. Exporters represent mainly the chemical, wood processing and furniture, electronics, textile, machinery and engineering industries, while non-exporters are mainly from the food and beverage and construction material industries (Varblane, Ziazic, 2000).

5. General Model and Econometric Concerns

In order to examine the effects of FDI on productivity, we follow the general model (production function approach) of literature, as specified in e.g. Aitken, Harrison (1999), with some added features. One difference in our study is that the inputs and the dependent variable are given per employee. I.e. the dependent variable is not output as (e.g. in Aitken, Harrison, 1999) but a measure of labour productivity, sales per number of employees. Input variables include thus capital-labour ratio, materials per employee etc. Also the export orientation dummy variable $DUMEXP_{ijt}$ is included in order to account for export oriented firms. The following model is estimated:

$$Y_{ijt} = C + \beta_1 DUMF_{ijt} + \beta_2 DUMEXP_{ijt} + \beta_3 DUMEXP_{ijt} \cdot DUMF_{ijt} + \beta_4 FDI\_sector_{ijt} + \beta_5 DUMF_{ijt} \cdot FDI\_sector_{ijt} + \beta_6 X_{ijt} + \beta_7 Z_{jt} + \varepsilon_{ijt}.$$

Logarithm of sales per number of employees, $Y_{ijt} = log(sales_{ijt}/employees_{ijt})$, for firm i in sector j at time t (deflated by the Producer Price Index) is regressed on vector of inputs/control variables per employee (X_{ijt}, these are given all in logarithms), sector dummies Z_{jt} , export orientation dummy and its interaction dummy with measure of FDI, measures of foreign ownership $DUMF_{ijt}$ and FDI_sector_{ijt}. Vector of control variables X_{ijt} includes variables as $LNTFA_{ijt}$, $LNLABC_{ijt}$, $LNMATER_{ijt}$, $DUMINT_{ijt}$ (for Slovenia) or $DUMRD_{ijt}$ (for Estonia). These variable names used in regression analysis are defined below. C is a constant and ε_{ijt} is the error term.

$DUMF_{ijt}$ indicates a FDI dummy variable. This variable identifies whether or not a firm has FDI (the threshold level is 10% of voting power in the firm for Slovenia and 50% for Estonia); $DUMF_{ijt} = 1$ if the firm is a FIE, $DUMF_{ijt} = 0$ if it is a domestic firm. If foreign ownership in a firm increases that firm's productivity, we should observe a positive coefficient of $DUMF_{ijt}$. Variable $DUMEXP_{ijt}$ is the export orientation dummy. It takes the value of 1 if a firm has the share of its exports in its sales at least as high as 50%, and the value of 0 otherwise. As exporting may have positive effect on labour productivity, we expect this variable to have a positive coefficient. The interaction dummy between $DUMF_{ijt}$ and $DUMEXP_{ijt}$ in order to capture interaction effects is $DUMEXP_{ijt} \cdot DUMF_{ijt}$. It allows us together with the variables $DUMEXP_{ijt}$ and $DUMF_{ijt}$ to distinguish between the four types of enterprises. In case the export oriented FIEs have higher labour productivity level than the domestic market oriented FIEs, the coefficient of this variable would be positive.

FDI_sector_{ijt} is the share of FDI in a sector as measured by the ratio: sum of the assets of the foreign investment enterprises in a sector (with each FIEs own assets subtracted) to the sum of the assets of all firms in the sector.[4] Sectors are defined at

[4] There is a caveat in estimating the model as specified in this section, if the variable FDI_sector_{ijt}, instead of the definition used in this paper, were defined as simply the ratio of sum of FIE assets to sum of total assets of the sector. In that arguably inferior case, there might be difficulties in separating the "own firm" and spillover effects wholly from each other. Particularly this would be a problem for the sectors with a small number of firms and one or a small number of FIEs making up large proportion of that sector, or in the case of one very large FIE entering the sector. Therefore it is crucial to study and compare the estimation results also with the tables of descriptive statistics (tables 3 and 4) and employ the measure of FDI_sector_{ijt} where each FIEs own assets are subtracted from all FIE assets of the sector. Naturally now this sector level FDI penetration variable has different values for different firms, not only for different sectors. We have thus improved the results, by establishing a more clear difference between the „own firm" and spillover effects in the analysis.

NACE double-digit level. This indicator is used for measuring horizontal spillover effects. If productivity advantages of foreign capital spill over to domestic firms in the same sector, the coefficient of this variable should be positive.

The coefficient on the interaction between firm-level and sector level FDI is captured by $DUMF_{ijt}$·FDI_sector_{ijt}. It allows us to determine if the effects of foreign presence on other foreign firms differ from the effects on domestic firms. $LNTFA_{ijt}$ is the log of the tangible fixed assets per employee, a proxy for logarithm of (K/L) ratio. Also a proxy for the skill intensity of the employees of the firm is included and measured by $LNLABC_{ijt}$, log of the labour costs per employee. As the dependent variable is based on sales, the right-hand side of the equation must take account for materials, $LNMATER_{ijt}$ is the log materials per employee. Dummy variable $DUMINT_{ijt}$ takes the value of one if the firm has intangible fixed assets, the value of zero otherwise. An alternative to this variable is $DUMRD_{ijt}$, it is equal to 1 if the firm has R&D expenditures.

Sector dummy variables are also used in the regression model in order to capture sector specific effects and year dummy variables are used in order to account for trend effects. The inverse of Mill's ratio is employed in the Heckman-type two-step procedure in order to account for the sample selection bias in estimation, see more information below.

The use of panel data has several benefits over usual cross section data (see e.g. Chapter 13 in Greene 1993, Wooldridge 2002). By using panel data it is possible to account for individual heterogeneity of objects in the analysis (e.g. the absorptive capacities of the firms etc). The easiest way to account for heterogeneity would be e.g. including a separate dummy variable for each object in the model. Secondly, panel data give simply more information on data, more variety, less collinearity between variables, much more degrees of freedom and better efficiency of estimators (Wooldridge 2002; Greene 1993, Ch. 13; Baltagi 2001).

Some econometric concerns need to be addressed before estimating the general model of our study. The first one is the choice of the method for estimation, based on the panel data for Estonia and Slovenia: whether one should use the simple pooled least squares model (pooled LS) or random effects or fixed effects model. Pooled LS has a multitude of disadvantages when panel data is used. Pooled LS does not take into account the time-invariant firm-specific effects that are likely to exist if the researcher employs panel data. Not taking these effects into account (if they exist), i.e. just running OLS for pooled data, would lead to biased and inconsistent estimation results. The common remedy could be using random effects (RE) or fixed effects (FE) models instead. These both include object-specific time-invariant effects but have different assumptions on the essence of these object-specific effects. The FE model assumes that differences across units can be captured in differences in the constant term. The fixed effects model is a reasonable approach when the researcher can be confident that the differences between firms can be viewed as parametric shifts of the regression function (Greene 1993: 466). In the case of random effects model, individual/firm-specific constant terms are viewed as randomly distributed across cross-sectional units (*Ibid.*: 469). The inevitable question is: which approach should be used? There are different views, as e.g. Mundlak (1978) argues that one should always treat individual effects as random (Greene 1993: 479). On the other hand, the FE models have considerable advantages over RE models, as RE models (in case individual effects are indeed correlated with other regressors, unlike the assumption of the RE model) may suffer from the inconsistency due to omitted variables (Wooldridge 2002).

One way of choosing between the RE or FE model is by looking at the panel data used in the analysis. In the case we have a sample of micro data as a random draw from population, the RE model might be appropriate. Thus this reasoning suggests the RE model for our analysis. In addition, there is a formal approach to the question. To test, whether the RE or FE model is favoured, the Hausman specification test can be used (Wool-

dridge 2002). When choosing between the RE or FE model, we have to keep in mind that for the FE model we cannot find the effect of these variables that are constant for the object over the panel range (in our case possibly the sector dummy variables, for those enterprises that do not move between categories of firms FIE and DE also the FDI dummy) as these are differenced out. In the case of the random effects model one can also find these effects. The implication for our analysis is that FE and RE models are different in the sense that the FE model takes into account only the dummy variables for those firms for which the values of the FDI dummy and the export orientation dummy change over the period. The RE model uses dummy variables of all firms. This means that in the case of the FE model, a substantial part of information in the data is left unused. The fixed effect estimator uses only the across time variation, which tends to be much lower than the cross section one (Arnold 2003: 3). In the following tables the results both for FE and RE models will be presented.

One issue that has been mentioned by several authors is the non-random selection of FDI recipients (Smarzynska 2002: 11; Arnold 2003: 2; Damijan *et al.* 2003, Djankov, Murrell 2002). In case the most productive local firms receive FDI — unless it is accounted for — the overestimation of positive productivity related effects of FDI may be the result. To take account of this possibility, after estimating the usual RE and FE models, the econometric analysis continues with the Heckman-type two-step procedure in order to control for possible sample selection bias (also called Heckman model, see e.g. Heckman 1979, Smarzynska 2002).

At the first stage the probit model is estimated. The dependent variable is the dummy variable $DUMF_{ijt}$ for a foreign investment enterprise (is equal to one if the firm has foreign ownership). Independent variables, that might affect the choice of the foreign investor to invest or not to invest into the firm, include labour productivity, export orientation, skill intensity (labour costs per employee), fixed assets per employee as a proxy for capital-labour ratio. After estimation of this first stage the

inverse of Mill's ratio[5] (also called the nonhazard ratio) is calculated and included as a separate extra variable in the second stage estimation in the regression function. In this second stage the random effects model is estimated (according to the general form presented before, with the inverse of Mill's ratio as an additional variable).

The variables in the probit model of estimating the probability of receiving FDI are given in the footnote[6].

6. Estimation Results

The estimation results for FE and RE model (with and without correction for sample selection bias) are given in tables 6–9 for Estonia and Slovenia. The model selection is based on the F-test, the Breusch-Pagan LM test and the Hausman test:

1) pooled LS vs FE: F-test;
2) pooled LS vs RE: LM test;
3) FE vs RE model: Hausman test.

The following test statistics are given for the model as specified in tables 6 and 7. The value of the F-test statistic is: a) for Estonia F = 8.82 (p = 0.000); b) for Slovenia F = 23.23 (p = 0.000). The null hypothesis (pooled LS) is rejected for both

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[5] Inverse of Mill's ratio is given by: $IMR=f(x)/(1-F(x))$, where $f(x)$ is the probability density function and $F(x)$ is the cumulative density function (Hardin 1997).

[6] $DUMF_{ijt}$ – FDI dummy variable (as a dependent variable), in case of Estonia $DUMM_{ijt}$ – the majority FDI dummy variable;
$PROD_{ijt}$ – level of labour productivity;
$EXPSALES_{ijt}$ – share of exports in sales of a firm;
$LABC_{ijt}$ – labour costs per employee of a firm;
$FAPEREMP_{ijt}$ – fixed assets per employee (measures capital-labour ratio);
$TFAPEREMP_{ijt}$ – tangible fixed assets per employee (an alternative measure for capital-labour ratio).

Table 6.
Slovenia – regression results of the estimated model, the effect of FDI on productivity, 1994–2000, the RE and FE models, the dependent variable is the logarithm of labour productivity ($sales_{ijt}/employees_{ijt}$)

	Slovenia					
	RE model			FE model		
	Coef.	Std.Err.	P>|z|	Coef.	Std.Err.	P>|t|
LNTFA	0.1089	0.0158	0.000	0.1042	0.0141	0.000
LNLABC	0.5583	0.0761	0.000	0.5191	0.0707	0.000
DUMF	0.1191	0.0971	0.220	0.0837	0.084	0.320
DUMEXP	–0.0168	0.0262	0.522	0.0196	0.233	0.401
DUMEXP·DUMF	0.1442	0.1089	0.185	0.1839	0.114	0.107
FDI_sector	0.3417	0.1601	0.033	0.3949	0.13	0.002
DUMF·FDI_sector	–0.5287	0.7395	0.475	–0.7182	0.7449	0.335
LNMATER	0.0699	0.0159	0.000	0.0803	0.0153	0.000
DUMINT	0.0204	0.0138	0.140	0.0261	0.0126	0.038
Constant	3.0618	0.5234	0.000	3.1863	0.4905	0.000
Sector dummies	Yes			Dropped		
Year dummies	Yes			Yes		
No. of observations	6780			6780		

Note: heteroscedasticity-autocorrelation robust standard errors.
Source: own calculations, based on the panel data of Slovenian enterprises 1994–2000.

countries, in favour of the FE model. This means that there exists an unobserved heterogeneity effect. The value of the LM-statistic is: a) for Estonia LM = 1316.72 (p = 0.000); b) for Slovenia LM = 10907.99 (p = 0.000). The null hypothesis (pooled LS) is rejected for both countries in favour of the RE model. These results show again that there exists an unobserved heterogeneity effect. The Hausman test enables us to choose

between the RE and the FE model. The Hausman test statistic is: a) for Estonia $\chi^2 = 65.42$ ($p = 0.000$); b) for Slovenia $\chi^2 = 146.99$ ($p = 0.000$). The null hypothesis (RE model) is rejected for the models of both countries, the RE model is not favoured, the FE model is favoured.

The Hausman test indicated that we should prefer the FE model over the RE model. Due to the fact that the FE model considers only these firms that have a change in dummy variables like e.g. $DUMF_{ijt}$ over the period, also the RE model is given, that considers all firms, also those that are FIE or DE for all the period in consideration. The results are not qualitatively very different between these two specifications, both models are presented as they make use of a different amount of information in data, thus both could be of interest. The results of the Heckman-type two-step procedure for accounting for the sample selection bias are given in tables 8 and 9. Note that in this case the random effects probit model over all the years of the sample is used.

Based on the estimation results of the model, as in table 6, but without variables $DUMEXP_{ijt}$ and interaction variable $DUMEXP_{ijt} \cdot DUMF_{ijt}$, we find that in Slovenia foreign equity participation is positively correlated with a firm's productivity level ("own firm" effect). The coefficient of the FDI dummy was positive, relatively large and significant; but after including the export orientation dummy and the interaction dummy between FDI presence in a firm and its export orientation, it proved to be positive but not significant. We test for the differences in productivity related "own firm" effects between export oriented and domestic market oriented enterprises. For that purpose the coefficients of the three variables $DUMF_{ijt}$, $DUMEXP_{ijt}$, $DUMEXP_{ijt} \cdot DUMF_{ijt}$ are studied. In order to find the difference of the productivity of export oriented FIEs from the domestic market DE level productivity, these three coefficients are to be added up; for finding the domestic market oriented FIE effect, the coefficient of $DUMF_{ijt}$ suffices. As in our Slovenian model these variables are not statistically significant, we cannot draw further inference on the differences

of the productivity related "own firm" effects of the export and domestic market oriented FDI, but have to rely on the results presented in former sections of the paper.

Table 7.

Estonia – regression results of the estimated model, the effect of FDI on productivity, 1996–2001, the RE and FE models, the dependent variable is the logarithm of labour productivity ($sales_{ijt}/employees_{ijt}$)

	Estonia					
	RE model			FE model		
	Coef.	Std.Err.	P>|z|	Coef.	Std.Err.	P>|t|
LNTFA	0.0543	0.0141	0.000	0.0371	0.0155	0.017
LNLABC	0.6663	0.0475	0.000	0.6731	0.046	0.000
DUMF	0.0572	0.0685	0.404	0.0128	0.0822	0.876
DUMEXP	0.0603	0.0247	0.015	0.0767	0.022	0.001
DUMEXP· DUMF	–0.1268	0.0556	0.022	–0.1075	0.0667	0.107
FDI_sector	–0.0404	0.0766	0.598	0.0026	0.0715	0.971
DUMF·FDI _sector	0.3018	0.1086	0.005	0.3421	0.1145	0.003
LNMATER	0.3154	0.0306	0.000	0.2936	0.031	0.000
DUMRD	0.000699	0.0205	0.973	–0.0074	0.0194	0.704
Constant	1.0518	0.1603	0.000	1.231	0.173	0.000
Sector dummies	Yes			Yes		
Year dummies	Yes			Yes		
No. of observations	1915			1915		

Note: heteroscedasticity-autocorrelation robust standard errors.
Source: own calculations, based on the panel data of Estonian enterprises 1996–2001.

For Estonia, export orientation together with the majority of foreign capital in a firm indicates, on an average, much lower

labour productivity level — which is a different result from Slovenia (see table 6). This difference shows again the different competitive advantages of these two countries: while Slovenia's advantages are the higher value added, skilled labour and higher productivity related sectors, Estonia is attracting FDI more due to costs lower than in the investors' home countries. Thus the estimation results for Estonia, at least concerning the RE model, affirm the view based on descriptive statistics from table 3.

We also tested for intra-industry (horizontal) spillovers from foreign affiliates to firms with no FDI (domestic enterprises) and to other foreign affiliates. The general assumption based on the theory is that this effect is positive (in the case the negative competition effects do not dominate).

For Slovenia: there were positive (horizontal) spillovers from FIEs to domestic firms; the coefficient of variable $DUMF_{ijt} \cdot FDI\_sector_{ijt}$ indicating spillovers to other FIEs was negative but proved to be not significant after correcting the standard errors for heteroscedasticity. There were positive spillovers to DEs in the meaning that the presence of FIEs in the sector of manufacturing (at Nace double-digit aggregation level) affects the productivity of domestic enterprises in this sector. The results stay the same if a lagged spillover variable is used.

The results for Estonia regarding the spillovers were again, similarly to "own firm" effects, different from the results for Slovenia: actually just the opposite of the results for Slovenia. The spillover effect of FDI penetration in the same sector in Estonian manufacturing was not significant for domestic enterprises in the same sector. Initially, positive and relatively large significant effects for other FIEs in the same sector were found. However, this result, unlike the rest, is not robust to different specifications of the model. Using a lagged variable for spillover analysis indicated no significant spillovers to other FIEs. These results were tested also by splitting the sample and running the regression model again only on domestic enterprises, thus naturally without variables indicating FDI

presence at the firm. The results of that approach confirmed these findings for both Slovenia and Estonia that have been presented here in the last couple of paragraphs.

Table 8.
The first stage of the Heckman-type two-step procedure – the probit model, estimation of the probability of receiving FDI (dependent variable: FDI dummy)

	Probit model*					
	Slovenia			Estonia		
	Coef.	Std.Err.	P>|z|	Coef.	Std.Err.	P>|z|
PROD	1.02E-05	3.68E-06	0.005	0.0004	0.0005	0.345
EXPSALES	2.123	0.3029	0.000	2.4442	0.3747	0.000
LABC	0.0006	7.56E-05	0.000	0.0239	0.0056	0.000
FAPEREMP	–2.66E-06	5.34E-06	0.619	–	–	–
TFAPEREMP	–	–	–	0.0006	0.0008	0.463
Constant	–7.5757	0.4768	0.000	–5.7691	0.4813	0.000
No. of observations	6810			1949		

* Random effects probit.
Source: own calculations, panel data of Slovenian and Estonian enterprises.

These results stay basically the same for different specifications: for the RE and FE models and the Heckman-type two-step procedure used for accounting for possible sample selection bias in data. Firms with higher labour productivity (see table 8) had higher probability of receiving FDI in Slovenia, but not in Estonia.

The Mill's ratio variable that was calculated and added to the model was significant for Slovenia (at 10% level). This suggests that there exists sample selection bias in the case of Slovenian data. A continuous variable — the share of exports in sales, was also tried instead of export orientation dummy. This change did not alter these basic conclusions given here in former

paragraphs. Also exclusion of a very large electronics manufacturer in Estonia — Elcoteq, from the panel and estimating the same models again did not alter the basic qualitative results obtained here.

Table 9.

The effect of FDI on productivity, the RE model incl. inverse of Mill's ratio; the dependent variable is the logarithm of labour productivity ($sales_{ijt}/employees_{ijt}$)

	Slovenia, RE model			Estonia, RE model		
	Coef.	Std.Err.	P>|z|	Coef.	Std.Err.	P>|z|
LNTFA	0.1089	0.0157	0.000	0.0544	0.0142	0.000
LNLABC	0.5473	0.0759	0.000	0.6670	0.0487	0.000
DUMF	0.1144	0.0976	0.241	0.057	0.0685	0.406
DUMEXP	–0.0164	0.0262	0.531	0.0605	0.0247	0.014
DUMEXP·DUMF	0.1403	0.1083	0.195	–0.1266	0.0555	0.023
FDI_sector	0.3433	0.1601	0.032	–0.0406	0.0767	0.596
DUMF·FDI_ sector	–0.5046	0.7422	0.497	0.3021	0.1085	0.005
LNMATER	0.0704	0.016	0.000	0.3154	0.0306	0.000
DUMINT	0.0195	0.0137	0.154	–	–	–
DUMRD	–	–	–	0.0007	0.021	0.975
Inverse of Mill's ratio	0.0017	0.001	0.073	–0.0034	0.1082	0.755
Constant	3.1188	0.1583	0.000	1.05	0.1641	0.000
Sector dummies	Yes			Yes		
Year dummies	Yes			Yes		
No. of observations	6780			1915		

Note: heteroscedasticity-autocorrelation robust standard errors.
Source: own calculations, panel data of Slovenian and Estonian enterprises.

One consideration that had to be studied more carefully was the year 2000 (the last year in the sample) for Slovenia. The year 2000 looks rather "strange" in Slovenian manufacturing, as there is a very big increase in productivity compared to the year before. This could possibly have been so due to some large

merger or acquisition or measurement error. It proved to be possible to isolate the firms that caused this "leap" in productivity in this year, after excluding these four firms from the sample, the estimation of the models was performed again. The exclusion of these firms affected the values of coefficients in the regression analysis to a small extent but the qualitative interpretation of the results stayed basically the same as with these firms included. This big "leap" in labour productivity levels was peculiar to only one type of enterprises in the Slovenian panel —— the domestic market oriented minority foreign ownership FIEs. One reason for these big effects on the analysis by a single firm or a few enterprises is that both countries are small economies where one big foreign direct investment can affect the average characteristics of firms and sectors to a significant extent.

7. Conclusions

FDI can be an important source for productivity growth and swifter transformation process in transition countries. However, FDI can theoretically cause both positive and negative spillover effects to the host economy. Our analysis of the panel data from Slovenia and Estonia shows, in line with previous empirical studies, that the growing tendency of the governments in Central and Eastern Europe to offer special incentives for FDI has relatively weak grounds. Justifications (at least in policy literature) for these incentives (in countries other than Estonia and Slovenia) have mostly been the possible beneficial effects caused by transfer of technology from a parent company to its local affiliate and the related (positive) spillover effects to the host country.

The different stages of development in Estonia and Slovenia imply also differences in the effects of FDI to the economy. Indeed, as this study indicates, there are different consequences for productivity related FDI effects; particularly when we

employ also the export/local market dimension of the firms in analysis.

Foreign owned firms have, on an average, higher labour productivity levels than domestic enterprises both in Estonia and Slovenia. However the results are more surprising when we divide these firms into subgroups by their export orientation. For Estonia the export orientation together with the majority of foreign capital in a firm indicates a much lower labour productivity level. This is the opposite to Slovenia. Export orientation of a FIE is not correlated with lower labour productivity and until 1998 export oriented foreign affiliates in Slovenia had even significantly higher productivity than local market oriented FIEs. This difference in the findings shows also the different competitive advantages of these two countries, whereas Slovenia's advantage is in higher value added, skilled labour and higher productivity related sectors, Estonia attracts FDI more due to lower costs compared to investors' home countries. This view is also supported by a look at labour cost data and investor motivation survey data from these two countries.

In this study we also tested for the intra-industry spillovers from foreign affiliates to firms with no FDI (domestic enterprises) and to other foreign affiliates. The results for Slovenia are: positive horizontal spillovers from FIEs to domestic firms were found, but no significant spillovers from FIEs to other FIEs were detected. The findings for Estonia regarding spillovers were just the opposite to the Slovenian case. The intra-industry spillover effect of FDI presence in Estonian manufacturing was insignificant for domestic enterprises in the same sector. These results stay basically the same for different specifications of the model.

A policy implication of the analysis of this paper is that providing incentives for FDI in general or specifically for export oriented FDI may be of dubious value in the FDI promotion strategies of many transition economies, at least as far as the productivity is concerned. The existence of positive spillovers may depend on the level of economic development of the host

country. Export oriented affiliates of MNEs are more than local market oriented FIEs interested in exploiting the host country's abundant production factors (see also e.g. Kokko *et al*. 2001). For example, when these advantages have derived from relatively cheap labour rather than capital, then export oriented FIEs are not likely to have more positive effects on productivity of the host country than local market oriented FIEs.

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KOKKUVÕTE

Välismaiste otseinvesteeringute mõju tööjõu tootlikkusele Eesti ja Sloveenia näitel

Käesoleva uurimistöö eesmärk on leida, milline on olnud otseste välisinvesteeringute (OVI) mõju tööjõu tootlikkusele Eesti ja Sloveenia töötlevas tööstuses. Autor analüüsib töös, kuidas mõjutab väliskapitali olemasolu ettevõttes ettevõtte enda tootlikkustaset (nn "oma ettevõtte" efekt) ja kas esineb tööstusharusiseseid OVI välisefekte (i.k. *spillovers*) väliskapitaliga firmadelt kodumaisel kapitalil põhinevatele tootjatele ning teistele välismaise otseinvesteeringuga ettevõtetele (VOE). Kesksel kohal on töös küsimus, kas OVI mõjud tootlikkusele sõltuvad OVI tüübist.

Eesti ning Sloveenia töötleva tööstuse ettevõtete paneelandmete (Eesti 1996–2001, Sloveenia 1994–2000) põhjal läbi viidud tööjõu tootlikkuse näitajate analüüsi alusel leiti Sloveenia osas positiivne OVI "oma ettevõtte" efekt. Ilmnes, et tööjõu tootlikkus oli Sloveenias ekspordile orienteeritud väliskapitaliga ettevõtetes sama kõrge või kuni 1998. a. ka oluliselt kõrgem kui kohalikule turule orienteeritud VOEdes. Kasutades paneelandmete analüüsi meetodeid (sh valimi selektiivsusega arvestavat Heckmani mudelit) leiti positiivseid OVI tööstusharu siseseid välisefekte kohalikul kapitalil põhinevatele firmadele.

Eesti tulemused on vastandlikud Sloveenia omadele, siinjuures omab olulist rolli antud kahe riigi erinev majandusarengu tase. Eesti puhul ilmnes, et tööjõu tootlikkus on ekspordile orienteeritud VOEdes tunduvalt madalam kui kohalikule turule orienteeritud VOEdes. Erinevalt Sloveeniast ei leitud statistiliselt olulisi positiivsed OVI välisefekte kodumaisel kapitalil põhinevatele ettevõtetele.