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Keywords: foreign direct investment, productivity spillovers, exporting, competition

JEL classification: F23

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1 Introduction

There seems to be a widely held assumption on the part of policy makers that inward foreign direct investment (FDI) brings benefits over and above the additional investment to the host country. In particular, multinational enterprises (MNEs) are seen as being vehicles for inflow of new technology, which may "spill over" to domestic firms and, hence, foster development and assist catching up in less developed economies. Furthermore, MNEs are said to enhance efficiency by introducing higher levels of competition in the economy. Despite these benevolent perceptions towards inward FDI, it is however also possible that domestic firms are forced to decrease their production below the minimum efficient scale, which leads to decreasing productivity. Both arguments may be particularly relevant for transition economies which, after opening up markets aim at increasing productivity growth and levels of competition in the economy.

The possibility of productivity spillovers arises because multinationals may find it difficult to protect a leakage of their "firm specific asset" FSA (Caves, 1996), such as superior production technique, know how or management strategy, to other firms in the host country. The public good characteristics imply that once the FSA is out on the external market it can be used by other firms as well, due to it being to some extent non-rival and non-excludable. The inability of the multinationals to protect the asset is due to a number of reasons. Firstly, labour may move from multinationals to domestic firms, taking with them some of the knowledge of the FSA. Secondly, domestic firms supplying to or purchasing inputs from multinationals may be exposed to the superior technology used in the foreign firm. Thirdly, domestic firms may be in competition with multinationals on the final product market, hence being able to learn from the foreign competitor. These mechanisms may be particularly important in transition economies, which are likely to have fairly high levels of human capital but lack up to date technology and management practices. The crux however of transition is the introduction of market discipline to domestic firms and this may be the main virtue of foreign entry in a transition context.

However, while foreign competition can be a stimulant for domestic productivity it may also easily lead to the fall of productivity of domestic firms. Strong competition drives down the market shares of domestic firms, consequently they may not be able to enjoy

economies of scale; their productivity may decrease. This explanation was suggested by Aitken and Harrison (1999). Also, firms in transition economies used to produce very low quality and obsolete goods. Competition of foreign firms may force them to produce more up to date products. As these firms are not experienced in the production of these goods, changing their production may also lead to a temporary productivity decrease.

Whether the positive spillover effects or the negative competition effects dominate is an important empirical question. The aim of the present paper is twofold. First, we attempt to improve our understanding of horizontal productivity spillovers potential (PSP) in the industry by looking at the role of FSA in foreign plants. In this paper the proxy for PSP is the technology used by the MNEs. Second, we further explore the role of competition, one of three channels through which productivity spillovers may occur, in explaining productivity spillovers within industries. We analyse the potential for productivity spillovers as well as the role of competition therein using firm-level data for the period 1992-2003 for Hungary. Note that during the sample period the Hungarian economy underwent fundamental changes as part of its transition process. Because of this, we examine whether the estimates are different in different phases of the transition process. We will now motivate the two principal aims of this paper in more detail.

Surprisingly little attention has been paid in the literature to the potential for productivity spillovers based on the importance of FSA of foreign owned affiliates. So far one generally seems to have taken the presence of FSA for granted and assumed that the PSP is simply proportional to the output presence of foreign-owned firms in the industry.[1] Presumably, this is due to the idea that FSA are unobservable. In the present paper we hypothesise that i) there exists substantial heterogeneity in the importance of FSA across multinationals generally, and particularly, in the extent to which FSA are transferred to foreign affiliates[2], ii) the heterogeneous role of FSA in foreign affiliates is related to observable characteristics of the production process of foreign affiliates. Indeed, it has been well established in both the theoretical and empirical literature that multinationals are more technologically

[1] Some notable recent exceptions are Castellani and Zanfei (2006, Ch. 6) and Sembenelli and Siotis (2005) who show that spillovers depend on the R&D intensity of multinationals, using data for Italy and Spain, repectively.

[2] In particular, we would expect that the importance of FSA within multinationals and the extent to which they are transferred to foreign affiliates is expected to depend importantly on whether the FDI is of the horizontal or of the vertical type (Markusen, 2002). For FDI of the former type we would expect the role of FSA in foreign affiliates to be much more important.

advanced among a number of observable dimensions. More particularly, we expect that the potential of productivity spillovers increases in the capital intensity of foreign multinationals in the industry. This approach may shed light on the importance of the different spillover mechanisms, and also lead to important policy lessons about the optimal policy vis-à-vis FDI.

Furthermore, the literature on productivity spillovers in transition economies so far has failed to appropriately disentangle the potential competition effect associated with FDI and the positive productivity effect that may arise when foreign firms fail to effectively protect their FSA. We attempt to decompose the different effects of foreign ownership on productivity by distinguishing between the local presence of MNE and their presence in export markets. The rationale is that we may expect stronger competition effects from domestic market oriented FDI, whereas multinationals that are export oriented may generate positive knowledge spillovers.[3] We also distinguish domestic firms into exporters and non-exporters. The assumption is that the latter are more likely to be in competition with domestic market oriented multinationals. By contrast, the former may avoid such competition. Also, in as far as exporters are generally found to be more technology intensive and productive than non-exporters (e.g., Bernard and Jensen, 1999) we would expect the former to be better able to assimilate the knowledge transferred by multinationals and, hence, may be more likely to benefit from productivity spillovers.

Our results suggest that one should be careful not to exaggerate the positive role of foreign firms in enhancing the productivity of domestic firms in transition economies. First, we show that the productivity spillover potential is importantly related to the production technology of foreign affiliates. Firms that relocate labour-intensive activities to Hungary to exploit differences in labour costs are unlikely to generate positive productivity spillovers, while PSP increases in the capital intensity of foreign affiliates. Second, we find that there are important differences in spillover benefits between the early and later stages of transition in Hungary, suggesting that strong technology transfer took place between multinationals and domestic firms in the early period, while in the later phases (negative) competition effects became more important. Third, spillovers differ between small and

[3] Girma et al. (2008) provide a similar approach using data for the UK.

large domestic firms. Finally, we also find that foreign presence tends to affect the productivity of domestic firms negatively whenever they compete in the domestic market.

The remainder of this paper is structured as follows. In Section 2 we give a brief overview of the evidence on productivity spillovers highlighting also studies that focus explicitly on transition economies. In Section 3 we briefly discuss the data. In Section 4 we set out the econometric methodology. Section 5 presents and discusses the main results. Section 6 analyses the generality of our results by splitting the sample along a number of different dimensions. Finally, Section 7 provides some concluding remarks.

2 Evidence on productivity spillovers

Over the last thirty years, a large body of evidence has been amassed on the role of horizontal productivity spillovers in developing, transition and developed countries. The econometric work provides, at best, mixed results as to the alleged positive role of spillovers. A number of explanations have been offered to explain these mixed results, including methodological differences (Görg and Strobl, 2001) and country characteristics (Lipsey and Sjöholm, 2005). Rather than reviewing all of these papers we focus on a number of particular econometric studies, which can serve to highlight the main arguments.[4]

Aitken and Harrison (1999) use plant level panel data for Venezuela covering the period 1976 to 1989. Estimating an augmented Cobb-Douglas production function and controlling for plant level fixed effects they find some evidence that the presence of foreign multinationals in the same industry has had negative effects on the productivity of domestic firms. They attribute this to a negative competition effect. Domestic firms compete with multinationals on domestic product markets. When multinationals enter, they capture business from domestic firms which due to increasing returns to scale reduces their output and forces them up their average cost curve, reducing productivity. They argue that these effects seem to have more than outweighed any potentially positive productivity spillovers.

[4] A more detailed discussion of a long list of spillover studies is provided by Görg and Greenaway (2004).

By contrast, using data for a developed economy, namely the US, Keller and Yeaple (2008) find that even in a high-income developed country, domestic firms are able to gain in terms of productivity improvements from the presence of foreign multinationals in the same industry. They use firm level panel data for the years 1987 to 1996 and find evidence for substantial horizontal spillovers from multinationals. One of their explanations for such large effects is their measurement of FDI activity in an industry, which is based on the industry classification of the activity of the affiliates' employees, rather than the classification of the affiliate as a whole (by its main line of business).

Turning to the evidence for horizontal productivity spillovers in transition economies a number of studies are worth mentioning. Konings (2001) investigates firm level panel data for Bulgaria, Romania and Poland over the period 1993 to 1997. The data are obtained from the Amadeus database and, hence, includes a sample of large firms. Using a similar approach to Aitken and Harrison (1999) he finds no evidence for positive spillovers from multinationals to domestic plants in any of the countries. Rather, his estimates suggest that in Bulgaria and Romania there are negative effects from the presence of multinationals. Konings, similar to Aitken and Harrison (1999) attributes this to negative competition effects. Djankov and Hoekman (1999) and Zukowska-Gagelmann (2003) come to similar conclusions in their analysis of spillover effects using firm level data for the Czech Republic and Poland, respectively.

Damijan et al. (2003) use firm level data for eight transition countries, Bulgaria, Czech Republic, Estonia, Hungary, Poland, Romania, Slovak Republich and Slovenia. Apart from Estonia and Slovenia, all data are obtained from the Amadeus database. They find some evidence for positive spillovers only for Romania. For other countries, the spillover effect is either statistically insignificant or negative.

The paper by Javorcik (2004) extends the standard approach of searching for horizontal spillovers by developing the idea that spillovers are more likely to occur through vertical relationships, rather than horizontally as has been the predominant view in the literature. Using firm level panel data for Lithuania for 1996 – 2000 she finds evidence consistent with her conjecture. Domestic firms in sector *j* increase their productivity following the establishment of multinationals in industries which are being supplied by *j*. She refers to this as spillovers through backward linkages. While the evidence on such backward

linkages is robust to a number of amendments, there is no robust evidence that domestic firms benefit from horizontal spillovers from multinationals.

Studies that focus specifically on Hungary are scarce. Bosco (2001) analyses the direct and spillover effects of foreign ownership for the period 1992-1997. She finds that horizontal spillovers are either insignificant, or negative. The interpretation offered is that the market-stealing effect overwhelms potential technology transfers. Schoors and Van der Tol (2002) look both at intra-industry spillovers ('horizontal') and inter-industry spillovers ('vertical'). The authors find positive evidence of horizontal spillovers, especially in industries characterised by high levels of foreign competition. They find also evidence of vertical spillovers, but only in the context of forward linkages. However, due to data limitations they are constrained to cross-sectional analysis and are therefore not able to control for time-invariant fixed effects.

3. Data

For the analysis of intra-industry productivity spillovers due the presence of foreign multinationals we make use of data for Hungary for the period 1992-2003. The Hungarian data comprise approximately 20%-30% of all manufacturing firms which account for about 90% of sales (and 98% of exports). It is officially reported balance sheet data. These data represent a considerable improvement to the data that have been used in previous studies for Hungary both in terms of sample size and data quality, and it is arguably one of the best suited for studying spillovers in a transition economy. Foreign ownership is defined as the share of equity held in foreign hands.

Table 1 provides some summary statistics on the main variables of interest used in this study. In general, foreign-owned firms tend to be larger, more capital-intensive and have a higher propensity to export than their domestic counterparts. They also grow more quickly in terms of both size and productivity. These differences are also observed when distinguishing between non-exporting and exporting firms. However, it is worthwhile noting that the differences are to some extent driven by the higher propensity to export of foreign-owned firms. Domestic exporting firms appear to be larger than non-exporting foreign-owned firms. Foreign-owned non-exporting firms dominate their domestic exporting counterparts in terms of capital-intensity and performance measures.

[insert Table 1]

4. Econometric methodology

To investigate intra-industry productivity spillovers due to the presence of foreign multinationals we assume that the presence of foreign firms in an industry affects total factor productivity of domestic firms in the same industry. This, in line with the literature, can be represented in the following way using an augmented Cobb-Douglas specification of a production function for firm *i* in industry *j* at time *t*,

$$\ln y_{ijt} = \alpha_o + \sum_{m=1}^{M} \beta_m \ln z_{ijt} + \sum_{f=1}^{F} \gamma_f FPI^{f}{}_{jt} + d_j + d_t + \varepsilon_{it} \qquad (1)$$

We assume two factors of production *z*: labour (L) and capital (K).[5] y_{ijt} is real value added. Labour is measured by the number of employees and capital by fixed assets. All nominal variables are deflated using an appropriate producer price index. FPI^{f} represents indices of foreign presence. The regression includes a full set of industry and time dummies (*d*). The error term consists of a time-invariant firm specific effect and a remaining white noise error term. The first error component is purged by using a within transformation. The second error component is clustered around industries in order to take account of the fact that our variables of interest are constant within industries (Moulton, 1990). Finally, the regressions are only conducted for domestic firms to prevent any bias in the results due to cherry-picking behaviour by acquiring firms.

In the recent productivity measurement literature the endogeneity of input choices is a central concern. A standard solution to this problem is to use the semi-parametric approach proposed by Levinsohn and Petrin (2003). This method relies on the assumption that firms respond to positive productivity shocks by expanding output and consequently use more materials. The Levinsohn-Petrin estimator uses intermediate inputs as a proxy for the unobserved productivity shock. By controlling for the shock, the method also controls for

[5] In alternative regressions we estimated production functions using output, capital, labour and material inputs. Results of these estimations are largely similar to those reported below.

the endogeneity of input choices. Based on this methodology, we use a two-step method. In the first step, we estimate the basic un-augmented production function

$$\ln y_{ijt} = \alpha_{ijt} + \sum_{m=1}^{M} \beta_m \ln z_{ijt} + \varepsilon_{it} \qquad (2)$$

separately for every two digit industry using the Levinsohn-Petrin semi-parametric approach. Then we calculate the total factor productivity for firm *i* as a residual using the estimated coefficients ($\overline{TFP_{ijt}} = \ln y_{ijt} - \sum_{m=1}^{M} \beta_m \ln z_{ijt}$), and use this estimate as the dependent variable in the second step, where we estimate the effect of the different foreign presence indices on the productivity of domestic firms:

$$\overline{TFP_{ijt}} = \alpha_0 + \sum_{f=1}^{F} FPI^{f}{}_{jt} + d_j + d_t + \varepsilon_{it} \qquad (3)$$

Another important concern in the productivity literature is the problem of simultaneity of FDI. To correct for this, we also estimate the model with lagged explanatory variables as a robustness check.

The regression is extended with relevant indicators of foreign presence, constructed at the 4-digit level of NACE industry classification. The Foreign Presence Index (*FPI*) is obtained by dividing the sum of turnover produced by multinationals over total turnover in industry *j*.

$$FPI_{jt} = \frac{\sum_{i=1}^{F} y_{ijt}^{f}}{\sum_{i=1}^{N} y_{ijt}} \qquad (4)$$

The overview in the previous section concluded that the evidence on intra-industry spillovers is ambiguous. A potential explanation could be that foreign presence is associated with offsetting effects. In an effort to disentangle the different effects we exploit information on both input and output side of foreign-owned firms: i) we analyse the role of

production technology in foreign affiliates to analyse the potential of productivity spillovers, ii) we analyse the role of competition as a channel of productivity spillover. While previous work for a number of developed countries has taken account of the output market orientation of foreign firms no efforts have been made to explicitly analyse the role of the production technology of foreign firms.

In order to analyse how and to what extent the productivity spillover potential (PSP) of multinationals is related to the production technology in foreign affiliates we add two interaction terms to the FPI index. The first of these variables characterise the average labour intensity of the sector (NACE-2)[6] multiplied by the foreign presence index in the industry (NACE4):

$$LI_{jt}^{ind} = FPI_{jt} \frac{\sum_{i=1}^{N} L_{ijt}}{\sum_{i=1}^{N} K_{ijt}} \tag{5}$$

Our prediction is that in labour intensive sectors the PSP of multinationals is less important than in capital intensive industries. This higher PSP in capital intensive industries may facilitate stronger spillovers of technological nature.

We have to note, however, that not only the attributes of the sector matter, but also the characteristics of the foreign affiliates are important. It is often mentioned in Hungary, that while the sectoral composition of FDI is favourable, as a great amount of FDI arrive into high-tech sectors, the within-sector composition of it is not, because high-tech firms locate only low value added activities into Hungary. To look into this, we also construct a measure, which characterize the composition of FDI relative to industry average.

$$LI_{jt}^{firm} = FPI_{jt} \left(\frac{\sum_{i=1}^{F} L_{ijt}^{f}}{\sum_{i=1}^{F} K_{ijt}^{f}} \Big/ \frac{\sum_{i=1}^{N} L_{ijt}}{\sum_{i=1}^{N} K_{ijt}} \right) \tag{6}$$

Thus this variable measures the labour intensity of foreign firms in the NACE-4 industry relative to the sectoral average, multiplied by the foreign presence index.

[6] To use the intensity at the 4-digit level would be a less exogenous measure, as there are very few firms in some industries.

The coefficient on FPI should then be interpreted as the productivity spillover arising from multinationals in that industry had they been using only capital in the production process. The interaction terms show how the spillover effect changes in the average labour intensity of the sector and the multinationals, respectively. These measures thus explicitly take account of the production technology of multinational firms in their foreign plants.

In an effort to disentangle the different effects of foreign presence we may also exploit information on the output or market orientation of foreign-owned firms. For this purpose we construct a measure for foreign presence in the domestic market and one for foreign presence in the export market (Girma et al., 2008). The assumption is that a negative competition effect is strongest from domestic market oriented FDI, while export oriented FDI may be more likely to lead to positive spillovers.

The Foreign Presence Index in the domestic market (FPI^D) is given by

$$FPI_{jt}^{D} = \frac{\sum_{i=1}^{F} y_{ijt}^{f} - x_{ijt}^{f}}{\sum_{i=1}^{N} y_{ijt} - x_{ijt}} \tag{7}$$

where y is total output and x is total exports at the level of firm *i*. Similarly, the Foreign Presence Index in the export market (FPI^E) is calculated as

$$FPI_{jt}^{F} = \frac{\sum_{i=1}^{F} x_{ijt}^{f}}{\sum_{i=1}^{N} x_{ijt}} \tag{8}$$

Following Girma et al. (2008) we also explore the role of the export activity of domestic firms in determining spillovers. The rationale for this distinction is the expectation that competition effects are different between these two types of firms and multinationals as exporters are seen to be less likely to be in competition with domestic market oriented FDI and, hence, should be less exposed to a potentially negative competition effect. Also, export activity of domestic firms can be seen as being an indicator of firms' absorptive

capacity, with exporters being expected to be better able to benefit from spillovers due to their being linked into foreign networks through exporting activities. Consequently, we run each specification for non-exporting firms (DOM), permanent exporters (EXP) and firms that switch between exporting and non-exporting (SW) in addition to using the full sample (ALL).

5. Results

Table 2 reports the baseline results using the aggregate index of foreign presence across domestic non-exporting, domestic exporting, domestic switching firms. In the upper panel of the table we report the results of estimating equation (1) in its simplest form using a fixed effects estimator, while the middle panel reports estimates using the two-step Levinsohn-Petrin (2003) technique (equation 3).

The two estimators yield very similar results. The estimates suggest that horizontal productivity spillovers are either insignificant or negative. For never exporting firms the estimated coefficient is statistically significant and negative, which suggests that these firms are least able to adapt to the changing economic conditions; they are not able to benefit from the presence of more advanced technology, but are hurt by foreign competition in their industry. The fact that the foreign presence index is insignificant in the other columns does not necessarily imply that productivity spillovers are not important for these firms. A potential explanation could be that foreign presence is associated with offsetting positive (spillover) and negative (competition) effects.

The bottom panel reports regressions with lagged explanatory variables in order to alleviate a potential endogeneity problem of the FDI variable. The results show that there are no qualitative changes in the estimates. The only important difference is that the coefficient of lagged FDI is significantly negative in the estimation using all firms, perhaps suggesting that some spillover effects may take time to materialize.[7]

[insert Table 2]

[7] Another robustness check is presented in Appendix A. The concern here is the presence of selection effects. It is easily possible, that foreign investors cherry-pick the best firms, thus the best firms will leave our panel of domestic owned firms. To avoid this, we dropped all firms which were acquired at any point in time by an MNE. This reduces the number of observation by nearly 2000. The main results are robust to this procedure, suggesting that selection is not a serious problem.

We also analyse whether the spillover effects differ in different phases of transition. To see this, we split the time period into two: between 1992-1997 and 1998-2003. The estimates suggest that exporting firms were able to benefit from spillovers in the earlier period, while in the second period all types of firms were hurt by foreign competition. This finding suggests that in earlier phases of transition strong technology transfer took place between MNEs and the more innovative and dynamic Hungarian firms, while in the later phases competition became more important.

[insert Table 3]

In further analysis we exploit information on the input side of foreign-owned firms to examine the role of production technology in foreign affiliates in the potential of productivity spillovers. The results are represented in Table 4. Once we control for the production technology of foreign firms we find that productivity spillovers are markedly different in different sectors. The more labour intensive the sector is, the lower the PSP of MNEs, and the more negative the spillover effect is. This is true for the whole sample, but the effect is only statistically significant for exporting firms. Hence, the impact of foreign presence on the productivity of domestic firms is more positive the higher the capital-intensity of production. In labour intensive sectors technology transfer is less important, and the negative competition effect dominates. This is often hypothesised in the literature, but to the best of our knowledge no direct evidence has been provided to sustain this claim. Interestingly the labour intensity of MNEs relative to sectoral average does not appear to be significant for the whole sample. The technology used in the sector is the main determinant of the magnitude of spillover effects.

[insert Table 4]

In Tables 5 and 6 we analyse the role of production technology in some more detail.[8] Table 5 splits the sample according to observations for the earlier and latter years of transition. We find that in the earlier phase of transition the production technology of the sector was only important for exporting firms, and not for others. This result corraborates our previous finding: in the earlier period, exporting firms were able to learn from MNEs, but only in capital-intensive sectors, where the PSP of MNEs was more important. In the second sub-period the FPI on its own is statistically insignificant for all types of firms. However firms in more labour intensive sectors are hurt from the presence of MNEs. In this sub-period, not only is the nature of the sector important, but also the production technology of entering MNEs, as indicated by the coefficients on the second interaction term. Firms that relocate labour-intensive activities (relative to sectoral average) to Hungary to exploit differences in labour costs are unlikely to generate technology spillovers, while at the same time they are expected to intensify competition for domestic firms and bid up wages in local labour markets.

[insert Table 5]

We also split the sample by firm size in Table 6. This split is motivated by Aitken and Harrison (1999) who suggest that small firms may have lower absorptive capacity and are thus less able to benefit from technology transfer. Small firms are firms that employ less than average number of employees, and large firms employ more than this.[9] While the pattern for small firms is similar to the pattern in the baseline model, in the case of larger firms the sector seems to be less important than the technology of the particular MNEs that enter. This finding suggests that the productivity of smaller firms is mainly determined by industry conditions (thus pecuniary externalities, like product and input prices), while technological externalities may play a more important role in the case of larger firms. These firms may have more resources to copy the technology or product or marketing strategy of

[8] Our main conclusions are robust to using lagged explanatory variables; see Appendix B. Also, in Appendix C we present regressions which also include the labour intensity of the sector on its own in the regression in order to combat concerns that the interaction term of FPI with labour intensity only picks up sectoral differences in labour intensity. Reassuringly, results remain robust to this alteration. Furthermore, in Appendix D we take into account findings in earlier papers by Castellani and Zanfei (2006) and Sembenelli and Siotis (2005) who find that spillovers differ according to the R&D intensity in the industry. Inclusion of an interaction term of R&D intensity * FPI does not change the conclusions on the interaction terms of FPI and labour intensity.

[9] We also used experienced with other thresholds: the median number of employees and 250 employees. The results were very similar.

a particular MNE, thus the production technology of these firms may affect larger domestic firms more directly. For large exporting firms, we find that the more capital intensive the MNEs are, the more domestic firms can benefit from their presence. Interestingly, for large, non-exporting firms the coefficient of the interaction term is positive and highly significant. The class of large non-exporting manufacturing firms represents a small group of unreformed former communist firms. The number of these firms was decreasing heavily as time, as they either studied how to export, or went under. One possible explanation is that these firms were not able to absorb any knowledge from capital-intensive MNEs, only from labour-intensive ones, which used similar technology.

To conclude, production technology and thus PSP of MNEs is an important determinant of productivity spillovers. While overall the labour intensity of the sector appears to be more important than the labour intensity of multinationals, in later stages of transition and especially for large firms the production technology of the MNEs seems to matter. The results suggest that the composition of FDI might be more important, than its sheer size: FDI in capital intensive sectors and of high-tech firms may induce positive spillovers.

[insert Table 6]

In Table 7 we turn our attention to the role of competition in explaining productivity spillovers. For this purpose we decompose our measure of foreign presence into the foreign presence in the domestic and export market. Overall, it appears that foreign presence tends to affect the productivity of all types of domestic firms negatively when foreign firms produce for the domestic market; and there are no spillovers from export platforms. These results differ somewhat from previous findings for developed economies such as the UK where domestic exporting firms generally appear to benefit from export-oriented MNEs in their markets. This is usually explained by pointing at the role of knowledge of foreign markets that may spillover to domestic exporters. The difference in the case of Hungary might be explained by the different nature of the products being exported. In developed economies both domestic firms and affiliates of MNEs export very similar products, while in Hungary it is likely that the exports of domestic firms are markedly different from the exports of MNEs. Most exporting Hungarian manufacturing firms export low value-added homogenous goods, while MNEs mainly export high value-added, highly differentiated

goods. This fundamental difference may explain the lack of spillovers from export platforms.

[insert Table 7]

7. Concluding remarks

This paper analysed the presence of productivity spillovers from inward foreign direct investment in Hungary. We attempted to improve our understanding of the potential of productivity spillovers in the industry by looking at the role of FSA in foreign plants. Empirically, this was implemented exploiting data on labour intensity of production used by multinationals. Second, we explored the role of competition, one of three channels through which productivity spillovers may occur, in explaining productivity spillovers within industries.

On average we do not find any evidence for positive horizontal productivity spillovers from foreign affiliates to domestic firms. In an effort to decompose any offsetting effects our first aim was to capture PSP in the industry. We show that PSP is importantly related to the average production technology of foreign affiliates in an industry. In labour-intensive sectors, FDI is unlikely to generate productivity spillovers, while at the same time it is expected to intensify competition for domestic firms and bid up wages in local labour markets. However, PSP increases in the average capital intensity of industries. While the characteristics of the industry seem to be more important than the attributes of multinationals relative to industry average, for large domestic firms the technology of the MNEs seem to be more important than the industry average. This role of capital intensity has often been hypothesised in the literature, but to the best of our knowledge no direct evidence has been provided to sustain this claim. We also find important evidence that the magnitude of spillovers differs in the early and later stages of transition in Hungary. Specifically, our results suggest that strong (positive) technology transfer took place between multinationals and domestic firms in the early period, while in the later phases (negative) competition effects became more important.

In order to analyse the role of competition in explaining productivity spillovers we decompose our measure of foreign presence into the foreign presence in the domestic and export market. Overall, it appears that foreign presence tends to affect the productivity of all types of domestic firms negatively when foreign firms produce to the domestic market; and there are no spillovers from export platforms. These results differ somewhat from previous findings for developed economies such as the UK where domestic exporting firms generally appear to benefit from export-oriented MNEs in their markets. The difference in the case of Hungary might be explained by the different nature of the products being exported by domestic firms and MNEs.

This study also presents a number of useful insights for policy-makers. First of all, one should be careful not exaggerate the positive effects of foreign affiliates on the productivity of domestic firms. Second, the potential of productivity spillovers depends importantly on the average production technology of foreign plants in the industry. The majority of all domestic firms operate in industries for which PSP is actually negative. This might provide a rationale for discouraging FDI in those sectors or for providing incentives that change the composition of inward FDI towards more capital and material intensive investments.

Alternatively, and perhaps more usefully, one could design policies that target specific types of foreign direct investment. Multinational firms that relocate labour-intensive activities to transition activities are not expected to yield important productivity spillovers, while the negative effect of such moves on existing domestic firms could be substantial. For such cases governments it may find it desirable to promote arm's length outsourcing arrangements that make use of existing domestic firms directly but do have the same disruptive consequences as inward FDI. At the same time, governments may try to attract market-seeking FDI which is more likely to be associated with productivity spillovers and less likely with negative crowding out effects.

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Table 1:

Summary Statistics

	Obs DOM	Mean	Std. Dev.	Obs FOR	Mean	Std. Dev.
ALL						
Value added	41986	69.29	1065.78	12371	313.40	1877.91
Employment	41986	103.80	371.34	12371	211.75	581.36
Intermediate inputs	41986	140.17	1308.47	12371	1058.48	11954.08
Fixed assets	41986	99.30	2268.67	12371	419.13	2925.70
Exports	41986	67.45	625.20	12371	1083.36	13811.34
%D value added	35486	0.03	0.51	10746	0.12	0.55
Non-exporters						
Value added	14812	14.07	31.64	535	27.79	38.39
Employment	14812	32.65	59.96	535	43.77	54.05
Intermediate inputs	14812	25.51	58.19	535	39.14	60.16
Fixed assets	14812	11.62	37.30	535	48.68	163.03
Exports	14812	0.00	0.00	535	0.00	0.00
%D value added	12165	0.03	0.51	433	0.10	0.63
Constant exporters						
Value added	11203	173.79	2048.55	8466	401.92	2255.56
Employment	11203	228.17	616.97	8466	260.11	685.36
Intermediate inputs	11203	331.80	2345.80	8466	1446.48	14429.12
Fixed assets	11203	284.93	4380.84	8466	540.31	3516.98
Exports	11203	207.12	1127.46	8466	1538.22	16673.72
%D value added	9557	0.04	0.49	7375	0.14	0.54
Export switchers						
Value added	15971	47.19	175.19	3370	136.37	317.95
Employment	15971	82.54	276.01	3370	116.94	202.30
Intermediate inputs	15971	112.09	774.18	3370	245.57	598.22
Fixed assets	15971	50.40	184.93	3370	173.53	475.98
Exports	15971	32.03	341.78	3370	112.67	449.46
%D value added	13764	0.03	0.51	2938	0.10	0.55

Notes: Value added, intermediate inputs, fixed assets are real variables, we use 2000 as the basis year.

Table 2:

Basic regression results by export activity

	FIXED EFFECTS			
	ALL	DOM	EXP	SW
K	0.699***	0.672***	0.686***	0.715***
	(0.016)	(0.023)	(0.033)	(0.024)
L	0.176***	0.175***	0.184***	0.173***
	(0.007)	(0.011)	(0.014)	(0.011)
FPI	-0.006	-0.104**	0.032	-0.017
	(0.036)	(0.045)	(0.071)	(0.046)
N	41815	14703	11190	15922
R^2	0.41	0.38	0.40	0.47
	LEVINSOHN-PETRIN			
	ALL	DOM	EXP	SW
FPI	-0.052	-0.156***	0.012	-0.070
	(0.033)	(0.041)	(0.071)	(0.047)
N	41815	14703	11190	15922
R^2	0.02	0.05	0.06	0.03
	LEVINSOHN-PETRIN with lagged explanatory variables			
	ALL	DOM	EXP	SW
FPI	-0.073**	-0.148***	-0.006	-0.072
	(0.036)	(0.046)	(0.064)	(0.051)
N	34527	11770	9397	13360
R^2	0.02	0.05	0.03	0.03

Notes: *, **, *** indicate statistically significant at 10%, 5% and 1% respectively. Robust standard errors in parentheses. Regressions include full set of industry, region and time dummies. FPI indices at 4-digit industry. Error terms are clustered around 4-digit industries.

Table 3:

Differences across time

	1992-1997				***1998-2003***			
	ALL	DOM	EXP	SW	ALL	DOM	EXP	SW
FPI	0.049	-0.101	0.195**	-0.029	-0.128***	-0.132***	-0.172**	-0.110
	(0.052)	(0.090)	(0.080)	(0.055)	(0.038)	(0.043)	(0.067)	(0.067)
N	15885	4597	4717	6571	25930	10106	6473	9351
R^2	0.01	0.02	0.10	0.02	0.04	0.07	0.02	0.04

Notes: *, **, *** indicate statistically significant at 10%, 5% and 1% respectively. Robust standard errors in parentheses. Regressions include full set of industry, region and time dummies. FPI indices at 4-digit industry. Error terms are clustered around 4-digit industries.

Table 4:

Regression results by labour intensity of MNEs

	ALL	DOM	EXP	SW
FPI	0.007	-0.105*	0.119	-0.048
	(0.044)	(0.057)	(0.101)	(0.054)
*FPI*labour intensity of sector*	-0.152***	-0.049	-0.302***	-0.063
	(0.049)	(0.088)	(0.090)	(0.057)
*FPI*labour intensity of MNEs relative to sector mean*	-0.012	-0.048	0.013	-0.020
	(0.026)	(0.032)	(0.035)	(0.036)
N	40166	14261	10652	15253
R^2	0.02	0.05	0.05	0.03

Notes: *, **, *** indicate statistically significant at 10%, 5% and 1% respectively. Robust standard errors in parentheses. Regressions include full set of industry, region and time dummies. FPI indices at 4-digit industry. Error terms are clustered around 4-digit industries.

Table 5:

Regression results for different periods

	1992-1997				***1998-2003***			
	ALL	DOM	EXP	SW	ALL	DOM	EXP	SW
FPI	0.090	-0.093	0.322***	-0.014	-0.031	-0.010	-0.051	-0.040
	(0.066)	(0.109)	(0.099)	(0.080)	(0.052)	(0.065)	(0.075)	(0.079)
*FPI*labour intensity of sector*	-0.067	0.043	-0.336***	0.016	-0.214***	-0.259***	-0.236***	-0.179***
	(0.045)	(0.097)	(0.086)	(0.044)	(0.041)	(0.074)	(0.077)	(0.064)
*FPI*labour intensity of MNEs relative to sector mean*	0.006	-0.029	0.038	-0.006	-0.056**	-0.043	-0.022	-0.087**
	(0.030)	(0.048)	(0.053)	(0.036)	(0.025)	(0.039)	(0.025)	(0.038)
N	15042	4438	4392	6212	25104	9823	6248	9033
R^2	0.01	0.03	0.10	0.01	0.04	0.07	0.03	0.05

Notes: *, **, *** indicate statistically significant at 10%, 5% and 1% respectively. Robust standard errors in parentheses. Regressions include full set of industry, region and time dummies. FPI indices at 4-digit industry. Error terms are clustered around 4-digit industries.

Table 6:

Distinguishing small and large firms

	SMALL FIRMS				*LARGE FIRMS*			
	ALL	DOM	EXP	SW	ALL	DOM	EXP	SW
FPI	-0.055	-0.116**	0.029	-0.066	-0.112	-0.139	-0.151	-0.094
	(0.039)	(0.058)	(0.099)	(0.059)	(0.075)	(0.211)	(0.106)	(0.108)
*FPI*labour intensity of sector*	-0.107**	-0.026	-0.262**	-0.075	0.056	-0.386	0.036	0.112
	(0.050)	(0.089)	(0.101)	(0.058)	(0.062)	(0.449)	(0.082)	(0.099)
*FPI*labour intensity of MNEs relative to sector mean*	-0.011	-0.064*	0.022	-0.009	-0.074*	0.382***	-0.095***	-0.085
	(0.025)	(0.033)	(0.032)	(0.035)	(0.044)	(0.141)	(0.036)	(0.094)
N	31910	13476	5837	12597	7373	700	4269	2404
R^2	0.03	0.06	0.07	0.03	0.06	0.24	0.09	0.10

Notes: *, **, *** indicate statistically significant at 10%, 5% and 1% respectively. Robust standard errors in parentheses. Regressions include full set of industry, region and time dummies. FPI indices at 4-digit industry. Error terms are clustered around 4-digit industries.

Table 7:

Regression results by export and domestic market orientation MNEs

	ALL	DOM	EXP	SW
FPI^D	-0.151***	-0.080	-0.145	-0.175**
	(0.056)	(0.074)	(0.115)	(0.086)
FPI^X	-0.008	-0.056*	0.002	-0.013
	(0.027)	(0.031)	(0.065)	(0.040)
N	41541	14496	11190	15855
R^2	0.02	0.05	0.06	0.03

Notes: *, **, *** indicate statistically significant at 10%, 5% and 1% respectively. Robust standard errors in parentheses. Regressions include full set of industry, region and time dummies. FPI indices at 4-digit industry. Error terms are clustered around 4-digit industries.

Appendix A:

Results on always domestic firms

	BASELINE MODEL			
	ALL	DOM	EXP	SW
FPI	-0.045	-0.135***	-0.001	-0.041
	(0.035)	(0.043)	(0.081)	(0.048)
N	39598	14465	10065	15068
R^2	0.02	0.05	0.05	0.02
	WITH LABOUR INTENSITY OF MNEs			
	ALL	DOM	EXP	SW
FPI	-0.002	-0.087	0.104	-0.042
	(0.045)	(0.057)	(0.111)	(0.059)
*FPI*labour intensity of sector*	-0.169***	-0.077	-0.362***	-0.070
	(0.050)	(0.084)	(0.094)	(0.058)
*FPI*labour intensity of MNEs relative to sector mean*	0.014	-0.036	0.047	0.008
	(0.022)	(0.033)	(0.030)	(0.034)
N	38089	14029	9611	14449
R^2	0.02	0.06	0.05	0.03

Notes: *, **, *** indicate statistically significant at 10%, 5% and 1% respectively. Robust standard errors in parentheses. Regressions include full set of industry, region and time dummies. FPI indices at 4-digit industry. Error terms are clustered around 4-digit industries.

Appendix B:

Robustness check with lagged explanatory variables

	LAGGED EXPLANATORY VARIABLES			
	ALL	DOM	EXP	SW
FPI	-0.085**	-0.152***	0.009	-0.088*
	(0.039)	(0.051)	(0.081)	(0.051)
*FPI*labour intensity of sector*	-0.069*	0.013	-0.163**	-0.045
	(0.041)	(0.077)	(0.070)	(0.062)
*FPI*labour intensity of MNEs relative to sector mean*	0.008	-0.016	0.004	0.010
	(0.019)	(0.025)	(0.035)	(0.026)
N	32847	11338	8833	12676
R^2	0.02	0.06	0.03	0.03

Notes: *, **, *** indicate statistically significant at 10%, 5% and 1% respectively. Robust standard errors in parentheses. Regressions include full set of industry, region and time dummies. FPI indices at 4-digit industry. Error terms are clustered around 4-digit industries.

Appendix C:

Robustness check: including labour intensity

	LAGGED EXPLANATORY VARIABLES			
	ALL	DOM	EXP	SW
FPI	-0.004	-0.113*	0.193*	-0.072
	(0.048)	(0.062)	(0.100)	(0.069)
*FPI*labour intensity of sector*	-0.123**	-0.056	-0.325***	-0.056
	(0.055)	(0.111)	(0.101)	(0.067)
*FPI*labour intensity of MNEs relative to sector mean*	-0.011	-0.013	-0.028	0.001
	(0.011)	(0.016)	(0.028)	(0.016)
Labour intensity of sector	-0.017	0.010	0.023	-0.006
	(0.019)	(0.052)	(0.047)	(0.023)
N	40166	14261	10652	15253
R^2	0.02	0.05	0.06	0.03

Notes: *, **, *** indicate statistically significant at 10%, 5% and 1% respectively. Robust standard errors in parentheses. Regressions include full set of industry, region and time dummies. FPI indices at 4-digit industry. Error terms are clustered around 4-digit industries.

Appendix D:

Robustness check: including R&D intensity*FPI

	LAGGED EXPLANATORY VARIABLES			
	ALL	DOM	EXP	SW
FPI	0.005	-0.018	0.028	0.006
	(0.013)	(0.022)	(0.025)	(0.019)
*FPI*labour intensity of sector*	-0.268***	0.001	-0.578***	-0.218***
	(0.068)	(0.107)	(0.141)	(0.082)
*FPI*labour intensity of MNEs relative to sector mean*	-0.000	-0.000**	-0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
*R&D intensity of sector*FPI*	0.082	-0.102*	0.306**	-0.025
	(0.051)	(0.059)	(0.124)	(0.074)
N	29408	11020	7233	11155
R^2	0.03	0.06	0.07	0.03

Notes: *, **, *** indicate statistically significant at 10%, 5% and 1% respectively. Robust standard errors in parentheses. Regressions include full set of industry, region and time dummies. FPI indices at 4-digit industry. Error terms are clustered around 4-digit industries.