The University of Nottingham

research paper series

Globalisation, Productivity and Technology

Research Paper 2006/08

The productivity spillover potential of foreign-owned firms: Firm-level evidence for Hungary

by

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The Centre acknowledges financial support from The Leverhulme Trust under Programme Grant F114/BF

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Acknowledgements

Financial support from the European Commission (Grant No. SERD-2002-00077) and the Leverhulme Trust (Grant No. F114/BF) is gratefully acknowledged

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Abstract

This paper analyses the potential for productivity spillovers from inward foreign direct investment using administrative panel data for firms for Hungary. The productivity spillovers potential (PSP) is expected to be a function of the importance of firm-specific assets (FSA) within multinationals and the extent to which they are transferred to foreign affiliates. We hypothesise that the presence of FSA is related to observable characteristics of the production process of foreign affiliates. We further explore the role of competition in explaining productivity spillovers within industries. We find that productivity spillovers depend on its potential, the degree of competition and absorptive capacity. Firms that relocate labour-intensive activities to Hungary to exploit differences in labour costs are not found to generate productivity spillovers, while spillovers increases in the capital and material intensity of foreign affiliates. Second, we find that foreign presence tends to affect the productivity of domestic firms negatively whenever they compete in the same market, be it the local or export market. Finally, larger exporting firms appear better able to absorb productivity spillovers in the industry.

JEL classification: F23

Keywords: FDI, productivity spillovers, firm specific assets, exporting, competition

Outline

Non-Technical Summary

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 introduce higher levels of competition in the economy. This 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 inflow of foreign knowledge may benefit domestic firms as they may learn from multinationals, allowing them to upgrade their own production process and as a result increase productivity. This potential for learning 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 multinationals' firm specific assets (FSA) which give it a superior technology. 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 indeed be one of the main virtues of foreign entry in a transition context.

The aim of the present paper is twofold. First, we attempt to improve our understanding of productivity spillovers potentials (PSP) in an industry by looking at the role of firm specific assets in foreign plants. Second, we explore the role of competition, one of the channels through which productivity spillovers may occur, in explaining productivity spillovers within industries. We analyse the potential of productivity spillovers as well as the role of competition using firm-level data for the period 1995-2001 for Hungary.

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. We find that productivity spillovers depend on its potential, the degree of competition and absorptive capacity. First, while in the literature the potential for productivity spillovers is typically assumed to be proportional to the foreign presence in an industry 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 productivity spillovers, while PSP increases in the capital and material intensity of foreign affiliates. Second, we find that foreign presence tends to affect the productivity of domestic firms negatively whenever they compete in the same market, be it the local or export market. Finally, larger exporting firms appear better able to absorb the PSP in the industry.

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 introduce higher levels of competition in the economy. This 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 inflow of foreign knowledge may benefit domestic firms as they may learn from multinationals, allowing them to upgrade their own production process and as a result increase productivity. The theoretical argument for why one may expect such "productivity spillovers", as they are usually referred to, from foreign multinationals is straightforward. Given the multinationals' limited knowledge of the local market, and distance from their parent firm, they are generally at a disadvantage compared with local firms in the host country. Hence, multinationals will only be able to locate profitably abroad if they have some sort of offsetting advantage. This takes the form of a "firm specific asset" (FSA), such as superior production technique, know-how or management strategy, which has at least to some extent the characteristics of a public good and enables the firm to locate profitably abroad (Caves, 1996). These FSAs can be transferred at low or zero cost between subsidiaries of the same firm.

The possibility of productivity spillovers arises because multinationals may find it difficult to protect a leakage of an FSA 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 indeed be one of the main virtues of foreign entry in a transition context.

The aim of the present paper is twofold. First, we attempt to improve our understanding of productivity spillovers potential (PSP) in an industry by looking at the role of FSA in foreign plants. Second, we further explore the role of competition, one of the channels through which productivity spillovers may occur, in explaining productivity spillovers within industries. We analyse the potential of productivity spillovers as well as the role of competition using firm-level data for the period 1995-2001 for Hungary. Note that as Hungary is a leading transition economy for which the discipline of the market may already be well established by the time of the start of the sample period, the positive effect of competition may be relatively less important. We will now motivate each of those aims 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 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. 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[1], 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 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. The role of materials in the production of foreign affiliates is ex ante unclear. To the extent that materials are imported from the home country they may reflect the extent to which FSA are transferred within the firm. The purchases of materials

[1] 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.

in the host economy may also be expected to yield significant benefits to locals firms as demonstrated by Javorcik (2004) for Lithuania.

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. Following previous work for the UK by Girma et al. (2005) 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 net positive knowledge spillovers. 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, while 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., Girma et al., 2004) 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. We find that productivity spillovers depend on its potential, the degree of competition and absorptive capacity. First, while in the literature the potential for productivity spillovers is typically assumed to be proportional to the foreign presence in an industry 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 productivity spillovers, while PSP increases in the capital and material intensity of foreign affiliates. Second, we find that foreign presence tends to affect the productivity of domestic firms negatively whenever they compete in the same market, be it the local or export market. Finally, larger exporting firms appear better able to absorb the PSP in the industry.

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. From our overview we identify two gaps in the literature on productivity spillovers in transaction 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 empirical literature has developed, starting with Caves (1974), Globerman (1979) and Blomström (1986) using data for Australia, Canada and Mexico, respectively. Since then, their empirical models have been extended and refined although the basic approach is still, by and large, similar. Most econometric analyses are undertaken in a framework in which labour productivity or total factor productivity of domestic firms is regressed on a range of independent variables. To measure productivity spillovers from multinationals a variable is included which proxies the extent of foreign firms' penetration, usually calculated as the share of employment or sales in multinationals over total industry employment/sales in a given sector. In other words, the regression allows for an effect of FDI on productivity of domestic firms in the *same industry*, i.e., horizontal spillovers. If the regression analysis yields a positive and statistically significant coefficient on the foreign presence variable, this is taken as evidence that spillovers have occurred from MNEs to domestic firms.

A large body of evidence has been amassed in terms of studies of horizontal productivity spillovers for many developing, transition and developed countries. Much econometric work has been completed that provides, at best, mixed results as to the importance of spillovers. There is some supportive evidence from case studies of spillover benefits to domestic firms (e.g., Moran 2001) although there is, even at that level, disagreement in particular instances.[2] 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

[2] For example, Larrain, Lopez-Calva and Rodriguez-Claré (2000) conclude that the location of Intel in Costa Rica has had positive effects on the local economy, Hanson (2000) argues that there is little evidence for spillovers from Intel on domestic firms. Hanson (2000) also argues that the location of Ford and General Motors in Brazil have failed to show the expected spillover benefits.

focus on a number of particular econometric studies, which can serve to highlight the main arguments.[3]

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.

By contrast, using data for a developed economy, namely the US, Keller and Yeaple (2003) 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

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

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) present an early study that looks 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 will make use data for Hungary for the period 1995-2001. 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. Changes in the ownership structure prior to 1995 make it difficult to consistently track changes in foreign ownership over time. Foreign ownership is defined as the share of equity held in foreign hands.[4]

Table 1 provides some summary statistics on the main variables of interest used in this study, distinguishing purely domestic oriented firms (DOM), permanent exporters (EXP) and firms switching into or out of exporting (SW). 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 estimate intra-industry productivity spillovers due to the presence of foreign multinationals we choose, in line with the literature, a Cobb-Douglas specification of a production function for firm *i* in industry *j* at time *t*,

$$\ln y_{ijt} = \alpha_o + \sum_{m=1}^{M} \beta_m \ln z_{ijt} + \sum_{f=1}^{F} FPI_{jt} + d_j + d_t + \varepsilon_{it}$$

[4] Capital stock data is problematic due to high inflation and inefficient accounting standards which needs to be kept in mind for the interpretation of results. This is also one reason why we limit ourselves to relatively standard econometric techniques, as opposed to, for example, the Olley-Pakes (1996) or Levinsohn-Petrin (2003) sophisticated procedures which put much higher requirements on the data.

We assume three factors of production *z*: labour (L), capital (K) and materials (M).[5] Labour is measured by the number of employees, capital by fixed assets, and materials by the difference between turnover and value-added. The regression includes a full set of industry, region and time dummies. The error term consists of a time-invariant firm specific effect and a remaining white noise error term. The first error component is purged in a within transformation of equation (1). The endogeneity of input quantities with respect to unobserved productivity shocks is accounted for to the extent that endogeneity problems only arise from the time-invariant differences in unobserved productivity. We justify this assumption on the basis of the relatively short time period of our data.

The regression is extended with relevant indicators of foreign presence, constructed at the 3-digit level of NACE industry classification.[6] The Foreign Presence Index (*FPI*) is obtained by dividing the sum of turnover produced by multinationals over total turnover in industry *j*.

$$FPI_{jt} = \frac{\sum_{i=1}^{F} y_{ijt}^{f}}{\sum_{i=1}^{N} y_{ijt}} \qquad (2)$$

The fact that our FPI variables are constant within industries leads us to cluster the error term around industries (Moulton, 1990). The regressions are only conducted for domestic firms to prevent any bias in the results due to cherry-picking behaviour by acquiring firms.[7]

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.

[5] In alternative regressions we estimated production functions using value added, capital and labour. Results of these estimations are largely similar to those reported below.
[6] While higher levels of disaggregation may in principle be desirable it has been noted that for the countries of interest many firms are incorrectly or inconsistently classified.
[7] Strictly speaking, in order to overcome cherry-picking one would have to use a balanced panel to avoid composition effects due to cherry-picking.

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 PSP based on the production technology of foreign firms.

In order to analyse how and to what extent the PSP of multinationals is related to the production technology in foreign affiliates we add two interaction terms to the FPI index which are obtained by multiplying the share of sales of multinationals in industry j by the average intensity of input *v* in the production by multinationals in that industry,

$$FV_{jt} = FPI_{jt} \frac{\sum_{i=1}^{F} v_{ijt}^{f}}{\sum_{i=1}^{F} y_{ijt}^{f}} \qquad (3)$$

where *v* refers to capital or materials respectively. The coefficient on FPI should then be interpreted as the productivity spillover arising from multinationals in that industry had they been using only labour in the production process. The interaction terms show how the spillover effect changes in the average capital and material intensity of multinationals in the industry. These measures thus explicitly take account of the production technology of multinational firms in their foreign plants.[8]

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., 2005). 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

[8] While we emphasise here the potential for spillovers these measures may also be considered proxies of the strength of different spillover channels.

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

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

$$FPI_{jt}^{F} = \frac{\sum_{i=1}^{F} x_{ijt}^{f}}{\sum_{i=1}^{N} x_{ijt}} \quad (5)$$

Following Girma et al. (2005) we also explore the role of the export activity of domestic firms in determining spillovers. The export activity of domestic firms is 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. Also, 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. 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 results using the aggregate index of foreign presence across domestic non-exporting, domestic exporting, domestic switching firms. The results suggest that horizontal productivity spillovers are either insignificant or negative. Distinguishing for the export status of domestic firms does not appear to play an important role. However, these results do not necessarily imply that productivity spillovers are not important. A potential explanation could be that foreign presence is associated with offsetting effects.

[insert Table 2]

In an effort to disentangle the different effects we exploit information on the input side of foreign-owned firms to analyse the role of production technology in foreign affiliates in the potential of productivity spillovers. The results are represented in Table 3. Once we control for the production technology of foreign firms we find that productivity might spillover from foreign affiliates to domestic firms if the potential for such spillovers exists in the first place. While we did not find any significant results on average (see Table 2) we find that both in the aggregate and for exporting firms PSP is importantly related to the production technology of foreign plants.

The foreign presence index (in Table 3) now gives the impact of foreign presence on the productivity of domestic firms where foreign firms are assumed to be producing using labour only. The effect of this is negative as one would expect. Firms that relocate labour-intensive activities 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.

Importantly, the impact of foreign presence on the productivity of domestic firms is more positive the higher the capital-intensity of production. This is often hypothesised in the literature, but to the best of our knowledge no direct evidence has been provided to sustain this claim. These effects appear to be particularly important for domestic exporters.

Material intensity also appears to have a positive effect on PSP. This may reflect three different channels. First, it may reflect the positive effect of backward linkages in facilitating productivity spillovers as documented in Javorcik (2004) and Halpern and Muraközy (2005). Second, foreign firms may increase the demand for sophisticated and high quality intermediate inputs. The availability of larger quantities and more varieties of sophisticated intermediate inputs may also be of benefit to domestic firms. The conditions for this are analysed in the vertical linkages literature (e.g. Markusen and Venables, 1999, Rodriguez-Clare,1996). Third, it may reflect the role of imported intermediate inputs in facilitating technology transfer (Amiti and Konings, 2005; Görg et al., 2005).

The fact that interacting foreign presence with input use only results in significant findings for the group of permanent exporters may be expected. The reason for this is that productivity potential only matters for firms that have a sufficiently high level of absorptive

capacity. As the group of permanent exporters is typically also the best performing group it does not come as a surprise that controlling for the productivity spillover potential matters only for this group.

From a policy perspective it would be interesting to know what would have to be the average capital-intensity or material-intensity of foreign plants in an industry for there to be positive productivity spillovers. From our estimates the conditions for positive spillovers can be calculated. For all firms, there exists a positive PSP if $0.154 * \mathrm{FM}_{jt} + 0.265 * \mathrm{FK}_{jt} > 0.184$. In our sample, 70 percent of domestic firms operate in industries in which this inequality holds. Consequently for 70% of the firms one can expect a positive spillover from the presence of foreign firms. While this ratio may seem fairly high it still suggests that in 30% of domestic firms where the potential for productivity spillovers is actually negative.

[insert Table 3]

In Table 4 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 domestic firms negatively whenever they compete in the same market. Hungarian firms that never export (DOM) suffer from competition by foreign firms that produce for the local market. Similarly, domestic permanent exporters experience a reduction in productivity when competing with foreign firms that act as an export platform for multinationals. These findings may reflect the crowding out effect of domestic firms by foreign affiliates pushing them back up their average cost curve (Aitken and Harrison, 1999). However, we also find that domestic permanent exporters benefit from foreign affiliates in the industry when these produce for the local market. These results might point at the higher absorptive capacity of domestic exporters, ceteris paribus.

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 MNE's 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 the bulk of exports consist of highly differentiated goods whereas for Hungary exports may largely consist of homogenous goods.[9] To the extent that foreign firms are more productive than domestic firms by combining their FSA with local inputs they may be able to crowd out local exporting firms.

[insert Table 4]

6. The Role of Firmsize and Public Status

In this section we analyse the generality of our results by splitting the sample of domestic firms along a number of different dimensions. In addition to the export status of domestic firms we split the sample into small and large firms and public and private firms. Table 5 provides the results based on information on the input and output side of foreign-owned firms on the productivity of domestic firms for different sets of the population of domestic firms.

[insert Table 5]

Splitting the sample between small and large firms suggests if anything that the negative effects and positive effects related to the presence of foreign firms are not equally distributed across small and large firms. Whereas the small firms appear to be primarily negatively affected by foreign affiliates in their industry, large firms appear to benefit. These results can perhaps be explained by noting that small firms are likely to operate at steeper segments of their average curve making them more sensitive to crowding out, [10] whereas large firms are expected to be the most productive and therefore have a greater absorptive capacity to benefit from PSP in their industry. This is reinforced by the second set of regressions in which we interact foreign presence with input use. Controlling for the potential of productivity spillovers particularly matters for large exporting firms.

[9] It would be interesting to see whether we could support this claim when classifying industries into homogenous and differentiated industries, as in Rauch (1999). However, the classification used by Rauch for the US does not appear appropriate for a transition economy, and no alternative classification is available for Hungary.

[10] Dobrinsky et al. (2005) analyse the role of returns to scale in Hungarian firms for the period 1995 to 2001, but their results do not confirm the presumption that returns to scale are higher for smaller firms.

In the bottom half of Table 5 we split the sample of domestic firms between private and public firms. We would expect that the negative competition effect discussed above is primarily important for private firms as public firms are likely to be relatively isolated from market pressures. This is indeed confirmed by the results. However, this comes at a cost as it also limits the ability of public firms to take advantage of PSP in their industry.

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 firm specific assets (FSA) in foreign plants. Empirically, this was implemented exploiting data on capital and materials intensity of production used by multinationals. Second, we explored the role of competition in explaining productivity spillovers within industries.

On average we do not find any evidence, positive or negative, of horizontal productivity spillovers from foreign affiliates to domestic firms. In an effort to decompose any offsetting effects our first aim was to capture the productivity spillover potential (PSP) in the industry. While in the literature the potential for productivity spillovers is typically assumed to be proportional the output of foreign firms in an industry we show that PSP is importantly related to the average production technology of foreign affiliates in an industry. Firms that relocate labour-intensive activities to Hungary to exploit differences in labour costs are unlikely to generate productivity spillovers, while at the same time they are expected to intensify competition for domestic firms and bid up wages in local labour markets. However, PSP increases in the average capital and material intensity of foreign affiliates in an industry. 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. The positive role of material intensity may either reflect backward linkages or the role of imported intermediate inputs.

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

domestic firms negatively whenever they compete in the same market. This may reflect the crowding out effect of domestic firms by foreign affiliates pushing them back up the average cost curve. However, we also find that domestic permanent exporters benefit from foreign affiliates in the industry when these produce for the local market. These results might either point at the higher absorptive capacity of domestic exporters ceteris paribus or forward linkages from foreign affiliates producing for the local market and domestic exporters. However, the negative consequences of having to compete head on with MNEs in export markets more than offsets the benefits from foreign firms in the industry.

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. About 30% 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 may find it desirable to promote arm's length outsourcing arrangements that make use of existing domestic firms directly but do not 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.

References

Aitken, B and A.E. Harrison (1999), "Do Domestic Firms Benefit from Direct Foreign Investment? Evidence from Venezuela?", *American Economic Review*, vol. 89, pp. 605-18.

Amiti, Mary and Jozef Konings (2005), "Trade liberalization, intermediate inputs and productivity: Evidence from Indonesia", CEPR Discussion Paper 5104

Damijan, Joze P., Mark Knell, Boris Majcen and Matija Rojec (2003): The role of FDI, R&D accumulation and trade in transferring technology to transition countries, *Economic Systems*, Vol. 27, pp. 189-204

Djankov, Simeon and Bernard Hoekman (1999), Foreign investment and productivity growth in Czech enterprises, *World Bank Economic Review*, Vol. 14, pp. 49-64.

Dobrinsky, Rumen, Gábor Körösi, Nikolay Markov, László Halpern (2005), "Price Markups and Returns to Scale in Imperfect Markets: Bulgaria and Hungary", mimeo, Central European University.

Girma, Sourafel, Holger Görg and Mauro Pisu (2005), Exporting, linkages and productivity spillovers from foreign direct investment, GEP Research Paper, University of Nottingham

Girma, Sourafel, David Greenaway and Richard Kneller (2004), "Does Exporting Lead to Better Performance: A Microeconometric Analysis of Matched Firms", *Review of International Economics*, Vol. 12, pp. 855-866

Görg, Holger and David Greenaway (2004), "Much ado about nothing? Do domestic firms really benefit from foreign direct investment?", *World Bank Research Observer*, Vol. 19, pp. 171-197.

Görg, Holger; Aoife Hanley and Eric Strobl (2005), Productivity effects of international outsourcing: Evidence from plant level data, mimeo, University of Nottingham

Görg, Holger and Eric Strobl (2001): "Multinational Companies and Productivity Spillovers: A Meta-analysis". *Economic Journal*, Vol. 111, pp. F723-F739.

Hanson, Gordon H. (2000): "Should Countries Promote Foreign Direct Investment", mimeo, University of Michigan.

Lipsey, Robert E. and Fredrik Sjöholm (2005), The impact of inward FDI on host countries: why such different answers?, in Moran, Theodore H., Edward M. Graham and Magnus Blomström (eds.), *Does Foreign Direct Investment promote development?* Washington DC: Institute for International Economics

Javorcik, Beata Smarzynska (2004): "Does Foreign Direct Investment Increase the Productivity of Domestic Firms? In Search of Spillovers through Backward Linkages", *American Economic Review*, Vol. 94, No. 3., pp. 605-627

Keller, Wolfgang and Stephen Yeaple (2003): "Multinational Enterprises, International Trade, and Productivity Growth: Firm-Level Evidence from the United States", GEP Research Paper 03/03, University of Nottingham.

Konings, Josef (2001)**, "**The Effects of Foreign Direct Investment on Domestic Firms: Evidence from Firm Level Panel Data in Emerging Economies**",** *Economics of Transition*, Vol. 9, No. 3.

Larrain, Felipe B., Luis F. Lopez-Calva and Andres Rodriguez-Clare (2000), “Intel: A Case Study of Foreign Direct Investment in Central America”, Center for International Development Working Paper no. 58, Harvard University.

Markusen, James R. and Venables, Anthony J. (1999), “Foreign Direct Investment as a catalyst for industrial development”, *European Economic Review*, 43, pp. 335—356.

Moulton, B. R (1990). “An Illustration of a Pitfall in Estimating the Effects of Aggregate Variables on Micro Unit”, *The Review of Economics and Statistics*, Vol.2(2), pp. 334-38.

Rauch, J.E., (1999). Networks versus markets in international trade. *Journal of International Economics* 48, 7-35.

Rodriguez-Clare, Andres (1996). ’Multinationals, Linkages and Economic Development’, *American Economic Review*, 86, pp. 852—873.

Zukowska-Gagelmann, Katarzyna (2001): Productivity spillovers from foreign direct investment in Poland, *Economic Systems*, Vol. 25

Tables

Table 1:
Summary Statistics

	Obs Domestic firms	Mean	Std. Dev.	Obs Foreign firms	Mean	Std. Dev.
ALL						
Turnover	19948	252.0	2780.8	6640	1688.7	14579.0
Employment	19948	102.6	290.6	6640	227.1	620.5
Materials	19948	140.1	1186.6	6640	1085.4	11505.8
Fixed assets	19948	0.6	6.6	6640	1.5	3.7
Exports	19948	69.1	560.7	6640	1139.5	13191.7
%D turnover	18298	0.0211	0.3116	6128	0.1106	0.3360
%D TFP	18298	-0.0429	0.2787	6128	-0.0185	0.2856
DOM						
Turnover	6945	60.6	115.6	317	118.4	155.8
Employment	6945	37.4	59.0	317	60.7	82.0
Materials	6945	30.1	65.6	317	50.5	77.1
Fixed assets	6945	0.4	1.1	317	1.3	5.0
Exports	6945	0	0	317	0	0
%D turnover	6213	0.0068	0.3147	288	0.0555	0.3748
%D TFP	6213	-0.0438	0.2817	288	-0.0064	0.3341
EXP						
Turnover	6788	507.1	4615.2	5080	2104.6	16640.4
Employment	6788	196.3	451.5	5080	268.0	698.6
Materials	6788	279.5	1817.8	5080	1368.9	13139.2
Fixed assets	6788	0.6	1.2	5080	1.5	3.3
Exports	6788	178.7	889.0	5080	1463.3	15065.1
%D turnover	6334	0.0294	0.2906	4708	0.1218	0.3332
%D TFP	6334	-0.0368	0.2570	4708	-0.0164	0.2707
SW						
Turnover	6215	187.4	1194.4	1243	389.3	872.3
Employment	6215	73.1	171.6	1243	102.1	175.2
Materials	6215	110.7	933.0	1243	190.5	507.0
Fixed assets	6215	0.8	11.7	1243	1.4	4.5
Exports	6215	26.6	354.4	1243	106.5	521.3
%D turnover	5751	0.0275	-0.3296	1132	0.0777	0.3343
%D TFP	5751	-0.0486	-0.2978	1132	-0.0304	0.3289

Table 2:
Basic regression results by export activity

	ALL	DOM	EXP	SW
L	0.244	0.282	0.221	0.234
	(11.64)	(11.35)	(7.73)	(7.04)
	***	***	***	***
K	0.072	0.067	0.061	0.084
	(12.52)	(10.66)	(5.93)	(8.61)
	***	***	***	***
M	0.458	0.444	0.497	0.439
	(19.77)	(17.83)	(15.75)	(12.93)
	***	***	***	***
FPI	-0.034	0.005	-0.40	-0.83
	(-1.00)	(0.11)	(-0.69)	(-1.58)
Constant	0.004	0.045	-0.064	0.018
	(0.61)	(4.91)	(-4.37)	(1.17)
		***	***	
N	21436	7438	7363	6635
R-square	0.632	0.593	0.665	0.640

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 3-digit industry. Error terms are clustered around 3-digit industries.

Table 3:
Regression results by input presence MNEs

	ALL	DOM	EXP	SW
L	0.244	0.282	0.221	0.233
	(11.60)	(11.31	(7.72)	(7.03)
	***	***	***	***
K	0.072	0.068	0.060	0.084
	(12.56)	(10.63	(6.00)	(8.73)
	***	***	***	***
M	0.458	0.445	0.496	0.440
	(19.75)	(17.87	(15.65)	(12.99)
	***	***	***	***
FPI	-0.184	-0.087	-0.365	-0.940
	(-1.90)	(-0.35)	(-2.91)	(-0.47)
	*		***	
*FPI *FM*	0.154	-0.016	0.431	-0.076
	(1.25)	(-0.10)	(2.91)	(-0.27)
			***	
*FPI *FK*	0.265	0.211	0.345	0.185
	(2.48)	(1.42)	(2.12)	(0.89)
	**		**	
Constant	0.003	0.044	-0.068	0.015
	(0.41)	(4.71)	(-4.89)	(0.93)
		***	***	
N	21436	7438	7363	6635
R-square	0.632	0.594	0.666	0.64

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 3-digit industry. Error terms are clustered around 3-digit industries.

Table 4:
Regression results by export and domestic market orientation MNEs

	ALL	DOM	EXP	SW
L	0.244	0.282	0.22	0.234
	11.6	11.37	7.75	7.01
	***	***	***	***
K	0.072	0.067	0.06	0.084
	12.56	10.66	6.03	8.62
	***	***	***	***
M	0.458	0.445	0.496	0.439
	19.71	17.9	15.61	12.94
	***	***	***	***
FPI^D	0.016	-0.111	0.131	-0.022
	0.37	-1.89	1.68	-0.35
		*	*	
FPI^X	-0.037	0.038	-0.111	-0.045
	-1.36	0.93	-2.09	-1
			**	
Constant	0.003	0.043	-0.064	0.018
	0.5	5.24	-4.44	1.14
		***	***	
N	21436	7438	7363	6635
R-square	0.632	0.594	0.666	0.639

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 3-digit industry. Error terms are clustered around 3-digit industries.

Table 5:
Detailed results

	Small				*Large*			
	ALL	DOM	EXP	SW	ALL	DOM	EXP	SW
FPI^D	-0.017	-0.11	0.810	0.01	0.11	-0.22	0.191	-0.122
	(-0.40)	(-1.94) *	(0.83)	(0.15)	(1.38)	(-0.87)	(2.34) **	(-1.03)
FPI^X	-0.036	0.031	-0.159	-0.049	-0.047	0.078	-0.065	-0.061
	(-0.13)	(0.80)	(0.06)	(-1.05)	(-0.86)	(0.67)	(-1.00)	(-0.88)
FPI	-0.07	-0.079	-0.265	0.042	-0.506	0.243	-0.405	-1.207
	(-0.69)	(-0.58)	(-1.52)	(0.21)	(-2.68) ***	(0.58)	(-1.98) *	(-3.92) ***
*FPI *FM*	-0.047	0.022	0.177	-0.247	0.678	-0.397	0.582	1.394
	(-0.34)	(0.13)	(0.69)	(-0.86)	(3.63) ***	(-0.78)	(2.92) ***	(3.77) ***
*FPI *FK*	0.141	0.227	0.2	0.128	0.55	0.117	0.537	1.05
	(1.72) *	(0.16)	(1.13)	(0.60)	(2.37) **	(0.23)	(2.03) **	(3.44) ***
	Private				*Public*			
FPI^D	ALL	DOM	EXP	SW	ALL	DOM	EXP	SW
	0.019	-0.117	0.143	-0.017	-0.137	-0.069	-0.143	0.046
	(0.44)	(-2.01) **	(1.82) *	(-0.25)	(-1.30)	(-0.21)	(-1.40)	(0.22)
FPI^X	-0.039	0.039	-0.121	-0.044	-0.01	0.112	0.06	-0.243
	(-1.39)	(0.04)	(-2.19) **	(-0.97)	(-0.02)	(1.44)	(0.84)	(-1.66)
FPI	-0.155	-0.051	-0.355	-0.007	-0.668	0.204	-0.425	-0.846
	(-1.65)	(-0.38)	(-2.80) ***	(-0.03)	(-1.83) *	(0.41)	(-1.37)	(-1.48)
*FPI *FM*	0.101	-0.012	0.413	-0.225	0.927	-0.162	0.552	1.545
	(0.84)	(-0.07)	(2.66) ***	(-0.85)	(*	(-0.25)	(1.34)	(2.80) ***
*FPI *FK*	0.263	0.206	0.349	0.169	0.322	0.68	0.307	0.256
	(2.46) **	(1.34)	(2.13) **	(0.81)	(0.90)	(1.13)	(0.90)	(0.42)

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 3-digit industry. Error terms are clustered around 3-digit industries.