Title: Competitiveness Gap and Host Country Effects of FDI in the New OECD

Abstract

This paper analyses the relationship between foreign direct investment intensity and labour productivity of manufacturing industries in fourteen OECD countries including the recent OECD members from Central Europe: the Czech Republic, Hungary, Poland and Slovakia. I find the relationship between industry-level FDI intensity and labour productivity in Central European OECD members was significant and positive in 1992-2003 but weaker than in other OECD nations. The study relates to the FDI spillover literature analyzing the "technology gap" between foreign and local firms. I introduce a novel concept of a "competitiveness gap" between foreign entrants and all firms in the local industry (including foreign incumbents) and show how it offers additional insights into FDI host country effects. I present a theoretical argument and empirical findings suggesting that industries with a low competitiveness gap benefited most from FDI in Central Europe in the medium run.

Keywords: foreign direct investment, host country effects of FDI, competitiveness gap, technology gap, Central and Eastern Europe, OECD

INTRODUCTION

The countries of Central Europe that are the focus of this study—the Czech Republic, Hungary, Poland and Slovakia—have successfully transformed from central planning to market economies and joined the OECD between 1995 and 2000 and the European Union in 2004.[1] This study analyzes the role of investment by multinational enterprises in this successful catch-up story.[2] The four countries analysed in this study accounted for about 70% of the total inward FDI stock of the 12 new EU members in 2010 (UNCTAD 2011). The new EU members' ratio of FDI stock to GDP was 45% in 2006 (up from 0.3% in 1990 and 28.5% in 2000), higher than the 24% ratio for developed countries and the 31% ratio for developing countries in 2006 (Table 1). Central Europe also had a 25% contribution of FDI to annual capital formation in 2005 compared to 9% in developed countries and 15% in developing countries (UNCTAD 2007). This resulted in significant share of GDP being attributed to foreign-invested firms (over a quarter of Czech GDP, for example, could be attributed to FDI in 2004, according to UNCTAD).

Rising FDI inflows to Central Europe reveal that the region has become an attractive location for multinationals. For example, when General Motors, a US car producer, announced in 2004 that it would cut 12,000 jobs at its European units, almost one fifth of its workforce in the region, Germany was labeled as the likely loser and Poland as the country to benefit from the move in terms of new jobs created.[3] In spite of new jobs created by multinational enterprises in Central Europe, some observers have expressed doubts that the impact of FDI on local industries, and particularly more technologically intensive industries, was positive. For example, Srholec (2006) suggests that the Czech electronics industry has not benefited from the entry of multinational corporations such as Philips and Panasonic. These companies largely undertook contract manufacturing and invested little in R&D, according to his analysis. The R&D intensity of foreign affiliates (overall, not just in electronics) is substantially lower than that of domestic firms and below the average for the Czech manufacturing, according to Srholec (2006). For the economy as a whole, foreign ownership was found to have a significant negative impact on propensity to conduct R&D (Srholec, 2006).

It is hardly a new finding that multinational enterprises don't tend to locate their R&D intensive activities in emerging economies. However, a negative effect of FDI on local R&D can be linked to the potentially negative effect of FDI on productivity of local firms in these industries. Using evidence on the effects of FDI in the Czech Republic between 1995 and 1998, Kinoshita (2000) fails to find positive spillovers to local industry from inward FDI. However, there is a robust effect if the FDI variable is interacted with the local firms' R&D spending, which may be understood as a precondition for technology spillovers from FDI, according to Kinoshita. Kosová (2010) finds some evidence of a short-term crowding out effect that is robust across different industries in the Czech Republic, but her results also suggest that there are positive technology spillovers in the medium term. She shows that in 1994-2001, the primary beneficiaries of lagged technology spillovers were firms in relatively more technologically advanced industries in the Czech Republic.

There is a new, broader interest in politics, business and academia in the potential benefits of investment in industries with high levels of intangible assets, most notably R&D (UNCTAD, 2005). Technology spillovers from foreign to local companies and their impact on the host country's policy and the multinational enterprise's strategy are key concerns for scholars in the fields of political economy of FDI (host country effects of FDI) and competitive strategy in emerging economies (Blomstrom, Kokko, Zejan, 2000). Although technology transfer has been subject to numerous economic analyses, the implications for corporate strategy of inter-firm learning and technological convergence of emerging and developed economies is still relatively under-researched (Peng, 2000).

This study is inspired by the theoretical literature on the technology frontier (Aghion et al., 2005, 2009). Sabirianova Peter, Svejnar and Terrell (2005a and 2005b) suggested that local firms in industries closer to the technology frontier are more likely to benefit from FDI. They found some evidence for this hypothesis in the context of the transition economies of Central Europe. Tian (2007) found that in China, a high technology gap (measured as labor productivity gap between foreign and domestic firms) is negatively related to FDI spillovers to local firms. My paper contributes to these debates by refining the

concept of the technology gap to include broader measures of competitiveness (e.g. intangible assets such as R&D and brand equity). I test the hypotheses about the FDI effects on productivity in industries with relatively intensive in R&D, intangibles and a relatively low labour productivity gap between MNC entrants from OECD and firms (both local and foreign) already present in Central Europe's industries. I find that the FDI effects on productivity are concentrated in industries with a relatively low labor productivity gap (positive or negative) between Central Europe and the rest of OECD. My findings also offer more cautious conclusions about the positive effect of FDI on productivity of R&D-intensive industries than Kosová (2010) and Kinoshita (2000). I also do not find robust support for positive effects on industries intensive in intangibles.

The rest of the paper is organized as follows. First I review the relevant empirical and theoretical literature and present my hypotheses. Then I discuss my empirical methodology, including estimation framework and alternative specifications. I also discuss the data and follow with the analysis of the results. Finally, I present my conclusions and regression results and data summaries in the appendix.

LITERATURE REVIEW, THEORY AND HYPOTHESES

The literature on host country effects of FDI initially saw the impact as a positive one. Early industry-level evidence for positive FDI spillovers was found for Mexico by Blomstrom (1986). However, later firm-level panel data research, most notably Haddad and Harrison (1993) for Morocco and Aitken and Harrison (1999) for Venezuela, cast doubt on the hypothesis that domestic firms in developing countries benefit from FDI through technological and knowledge externalities. Some subsequent studies have found evidence of positive spillovers in developing countries (Blomstrom and Sjoholm, (1999) for Indonesia; Chuang and Lin (1999) for Taiwan and Buckley et al. (2002) for China, but other have found negative or insignificant spillovers (Kathuria, 2000 and Feinberg and Majumdar, 2001 for India and Hu and Jefferson, 2002 for China). Thus the literature on FDI spillovers in emerging markets hasn't reached a clear verdict on whether they exist. Studies concentrating on the FDI spillovers in transition economies

have generally been inconclusive as well. Zemplinerova and Jarolim (2001) do find productivity spillovers in the Czech Republic but most other studies of Central Europe did not. Konings (1999) found negative spillovers in Bulgaria, Romania and Poland and Djankov and Hoekman (2000) in the Czech Republic. Studies of FDI spillovers in China also found mixed results (see Tian 2007 for a recent review.)

The debate on FDI productivity effects has gradually moved towards analyzing the channels of FDI spillovers. Smarzynska Javorcik and Spatareanu (2003) analyzed channels of intrasectoral spillovers from foreign direct investment in Romania. Based on a 1998-2000 firm-level panel data, she provides evidence consistent with positive intrasectoral spillovers resulting from fully-owned foreign affiliates but not from joint ventures. Smarzynska Javorcik (2004) enriched the discussion on FDI spillovers by focusing on the understudied issue of intersectoral (vertical) FDI spillovers through backward linkages (as opposed to intrasectoral horizontal spillovers studied by most other researchers). Based on a data set from Lithuania, she finds that a 10 percent increase in the foreign presence in downstream industries is associated with 0.38 percent rise in output of each domestic firm in the supplying industry. Liu and Wei (2006) found that there are positive inter-industry productivity spillovers from R&D and exports, and positive intra- and inter-industry productivity spillovers from foreign presence to indigenous Chinese firms within regions. Tian (2007) has distinguished between FDI spillovers from tangible and intangible capital and found that the former played a relatively more important role in China.

Time effects appear to matter for FDI spillovers, too, but empirical studies haven't reached a clear verdict on them. Aitken and Harrison (1999) found a robust negative impact of industry FDI on productivity of local firms in one- to four-year difference versions of their productivity function. However, Hu and Jefferson (2002) found that the negative same-year spillover effect they found in China's textiles and electronics industries disappeared when they specified a four-year difference model. Kosová (2010) theoretically explains why local firms can benefit from FDI spillovers only after a time, while short-run effects may be insignificant or negative ("crowding out"). She found insignificant results

at the time of entry (for most industries) but a positive effect on one-year growth (although this held mostly in industries where Czech firms had a higher ratio of intangibles to all assets than foreign firms).[4]

Aghion et al. (2009) tackle this issue of the technology gap and explain why domestic firms in technologically advanced industries react positively to foreign entry, but firms in technologically lagging industries do not. They introduce entry into a Schumpeterian growth model with industries with varying distance to the technological frontier. They show that threat of technologically advanced foreign entry spurs innovation in sectors close to the world technological frontier—successful innovation allows domestic incumbents to prevent entry.[5] However, in laggard industries foreign entry discourages innovation. Domestic firms further from the frontier have no hope to win against a potential entrant; an increased entry threat reduces the incumbents' expected payoff from investing in R&D.[6] The effects of foreign entry on local firms' productivity growth in industries near/further behind the technological frontier mirror the heterogeneous pattern of entry effects on innovation incentives.

Competitiveness gap and FDI spillovers

FDI theory predicts that if we see an investment by a foreign firm, that firm must have some sort of competitive advantage over local firms, sufficient to overcome the "liability of foreignness".[7] A corollary argument is that the foreign firm must have firm-specific resources that produce advantages over local firm. Traditionally, the FDI literature has identified resources like proprietary technology, brand name, management skills and access to export markets, as the kind of intangible assets that could grant an MNC advantages over local firms.[8] In my framework, the MNC can be said to have firm-specific advantages that are transferable to the host country through ownership and that will result then in a higher productivity in that environment than what local firms can attain with their own resources.

It is important to distinguish between the absolute levels of domestic and foreign competitiveness and the gap between the two. In Aghion's (2005) model, it is not the overall technological intensity of an industry that matters but the "technology gap" between foreign and local firms (or distance of local firms

from the world technology frontier, assumed to be the more productive foreign firms) that affects productivity gap between the firms before and after foreign entry. Similarly, it is the "competitiveness gap" between foreign and local firms that affects the incentives of local firms to invest in R&D and other intangible assets following the foreign entry.

It is also important to note that Aghion's assumption that the foreign entrant is more productive than the local firm may not always be valid (although it is in line with the traditional FDI theory). Local firms may perform better than foreign entrants, as explained theoretically by Nachum (2003) and documented empirically in Zaheer (1995) and Miller and Eden (2006).[9] This does not affect the key hypotheses emerging from my theoretical discussion: a small (although now negative) "competitiveness gap" will still spur innovation (now of foreign entrants) and a large (negative) competitiveness gap will discourage innovation of foreign entrants.[10]

Whether local firms from the host country are falling behind the MNC entrants a little (low positive competitiveness gap), a lot (high positive competitiveness gap) or not at all (negative competitiveness gap) in industries with low or high levels of domestic, foreign or overall R&D and/or other intangible assets is an open question. In some industries competitive advantage is derived mostly from these intangible assets; in others they don't matter that much (perhaps because competitive advantage in those industries is based on a superior access to tangible resources, see for example Villalonga, 2004). [11]

The competitiveness gap between foreign and local firms may differ by industry, but also by the characteristics of home and host country, and the two factors will be inter-related. In developed countries, the most internationally competitive industries are generally the industries with high firm-specific advantages. There might be some "competitiveness gap" but it generally shouldn't be large enough to preclude catch-up by local firms. On the other hand, the OECD industries where competitive advantage isn't derived so much from intangible assets, i.e., industries with low levels of R&D, advertising, etc.,

maypossibly be "uncompetitive" (with domestic firms' initial performance lagging substantially behind foreign entrants).[12] In these industries, MNCs from developing countries and emerging economies are potentially more competitive than OECD firms).[13]

The average technology and competitiveness gaps between MNCs and local firms in transition/emerging economies and developing countries may be expected to be higher than those for MNCs investing in most industries in developed countries. Thus one would expect lower or even negative overall FDI spillovers in developing countries compared to developed countries, as empirical studies starting with Aitken and Harrison (1999) suggest. This is also in line with macro-economic endogenous growth theories of "absorptive capacity", suggesting that developing countries with relatively low levels of human capital are less likely to benefit from FDI (Bosworth & Collins, 1999). They highlight the roles of not only the introduction of a more advanced technology, but also the country's capacity to absorb that technology, as determinants of economic growth. Borensztein, De Gregorio and Lee (1998) suggest that FDI increases economic growth only when the level of education in the host country is relatively high. Kinoshita (2000) stressed R&D at local firms as a precondition for absorptive capacity and positive productivity spillovers.

When it comes to industry-level effects in emerging/transition economies, the competitiveness gap could arguably be highest in industries with high levels of intangible assets where local firms are likely to be less advanced. The competitiveness gap in industries not relying on intangibles for their competitiveness might be small or even non-existent[14]. This would imply higher average FDI spillovers in "low-intangibles" or "low-tech" industries and potentially negative spillovers in "high-intangibles" or "high-tech" sectors, where local firms would not see significant incentives to innovate and catch up. However, a high positive competitiveness gap between foreign and local firms hinges on the assumption that a MNC locates production with a high degree of intangible assets in an emerging economy.

This does not always have to be true as Srholec (2006) showed for the Czech Republic. In fact, Kosová (2010) found that in a majority of the 142 Czech industries that she studied, the local firms had a higher ratio of intangible assets to total assets than foreign firms. This suggests that foreign entry may increase production at the time of entry but may not significantly increase innovation and productivity of local firms following entry. It is therefore an empirical matter whether FDI will have strong and positive effects on productivity of industries with high levels of overall firm-specific advantages and/or R&D, and whether these industries will be the industries with a relatively low competitiveness gap that would be expected to benefit most from FDI.

If we count the new FDI projects in the final productivity calculation, the effect of FDI entry on productivity will depend on the competitiveness gap between foreign and local firms. Industries with a high "competitiveness gap" will see a negative impact on local firms (high positive gap) or on foreign firms (high negative gap) over time and thus the overall effect on productivity growth will be insignificant. Industries with a low "competitiveness" gap will see a positive impact on local firms (low positive competitiveness gap) or on foreign firms (low negative competitiveness gap). Overall effect may be positive in both types of "low-gap" industries but it will more likely be positive in industries with a low positive competitiveness gap because the new foreign entrants will likely represent an additional boost to productivity there.

Two main hypotheses emerge from this theoretical discussion:

Hypothesis 1: The short-run relationship between FDI intensity and industry productivity in the new OECD members from Central Europe will be weaker than in the rest of OECD.

Hypothesis 2: The relationship between medium-term changes in FDI intensity and industry productivity growth in Central Europe will be strong and positive mostly in industries with a low (positive or negative) competitiveness gap between Central Europe and OECD.

ESTIMATION FRAMEWORK

To compare FDI's effect on productivity in new and old OECD members, I use a standard production function framework used in most FDI spillover studies starting with Aitken and Harrison (1999).[15] This production function is traditionally augmented for some measure of the foreign presence. Wang and Blomstrom (1992) argue that technology spillovers should be proportional to the foreign presence in the domestic market. These intra-industry spillovers can be measured by the foreign employment share or a share of foreign-invested enterprises in total national sales or capital (or some composite, weighted measure of the three). A domestic firm can also benefit from intra-firm spillovers if it has some foreign shareholders (Aitken & Harrison, 1999, Kinoshita, 2000). The positive effect of firm innovation on its growth and survival has also been demonstrated (Mowery, Oxley, Silverman 1996).

In my specification, I measure the foreign presence with the FDI variable, which stands for the share of FDI stock, taken from OECD's International Direct Investment Statistics Database, on the total capital stock.[16] Y is value added, K is capital stock calculated using perpetual inventory method. Following Harrigan (1999), the capital stock is a distributed lag of past investment flows using a depreciation rate δ=15%: $K_{cjt} = \sum_{n=1970}^{t} (1-\delta)^{n-1970} i_{cj,t-(n-1970)}$ where i is real investment in country c, industry j during year t. Variables υ_j, μ_c, ι_t are country, industry and time specific effects.

$$\log Y_{jct} = \alpha + \beta_1 \log K_{jct} + \beta_2 \log L_{jct} + \beta_3 FDI_{jct} + \upsilon_j + \mu_c + \iota_t + \varepsilon_{jct} \qquad (1)$$

To account for the differences in the FDI effects on productivity in the four new OECD members from Central Europe and other 10 OECD nations analyzed in this study, I augment the equation (1) above with

a dummy variable for Central Europe and its interaction with the FDI intensity. I have also tried the specification with one-year lagged explanatory variables and a fourth difference of the equation (1). Moreover, I have included dummy variables for "high-tech" industries, the most R&D intensive industry groups in my sample: chemicals (ISIC 351), rubber (ISIC 355), plastics (ISIC 356), non-electrical machinery and instruments (ISIC 382+385), electrical machinery (ISIC 383) and transportation equipment (ISIC 384).[17] To test the effects on industries intensive in intangible assets including those not associated with R&D, I use dummy variables for food, beverages and tobacco; non-electrical machinery and instruments; and electrical machinery and transportation equipment. Chauvin and Hirshey (1993) and Peneder (2002) have found food, beverages and tobacco to be the most marketing intensive industries in the US manufacturing and machinery, instruments, and equipment most R&D intensive industries.

$$\Delta \log Y_{jct} = \alpha + \Delta\beta_1 \log K_{jct} + \Delta\beta_2 \log L_{jct} + \Delta\beta_3 FDI_{jct} + \Delta\beta_3 FDI_{jct} * D^{Sector} + \upsilon_j + \mu_c + \iota_t + \varepsilon_{jct} \quad (2)$$

Following Tian (2007) and other researchers, I also consider the role of the technology gap between OECD and Central Europe. The technology gap is the difference in the technological capabilities between domestic and foreign firms (Sjoholm 1999, Caves 1999). The technology transfer literature argues that a large gap between technology donor and recipient increases the cost of technology transfer and thus reduces the likelihood of technology transfer. On the other hand, some FDI spillover studies (Haddad & Harrison 1993, Haskel et al 2001) conclude that the larger gap represents more opportunities for technology exchange, and thus more technology spillovers can be generated. Variables like the firm intangible asset ratio (to total assets) can be used to control for firm absorptive capacity and innovation.

Tian (2007) operationalised the technology gap as the ratio of the mean labor productivity of foreign-invested enterprises in the relevant four-digit ISIC industrial sector to the labor productivity of individual domestic firms in that sector.[18] I use the average labor productivity gap between value added per worker in an industrial sector in the Central European country and in the rest of the OECD in that

year. The average gap is 13.3%. This accounts for a difference between total productivity of all (foreign and local) firms in a sector in Central European countries and productivity in the respective sector in the OECD. This measure of the technology gap is novel as most past studies only reflected the gap between indigenous and foreign enterprises, not between all enterprises already present in the country and the new foreign entrants. It can be argued that competitive and other effects of FDI on an industry depend not just on the technology and competitiveness gap between foreign and domestic enterprises, but on the gap between the existing enterprises and the new foreign entrants.

My calculation does not account for non-OECD FDI productivity. However, over 95% of FDI in the Czech Republic, Poland and Slovakia were from the rest of the OECD in 1992-2003, according to the OECD Inward Investment Statistics. The respective OECD share in Hungary was 86%.[19] Moreover, other researchers such as Aghion et al. (2009) used measures of an industry's distance from the world technology frontier as a proxy for the distance of local firms in that industry from the frontier productivity.[20] Tian (2007) tested for the effects of the technology gap by adding the technology gap as another variable in the productivity function with levels. He found a negative coefficient on the gap variable but his other results related to FDI share in capital, employment and output were not affected by the gap. I included a dummy variable for a low productivity gap (all observations where the absolute level of the productivity gap was not more than the average 13.3% for the sample). I also tried other specifications of the "low-gap" dummy with different thresholds and sample splits; the main results were not affected.

DATA

I use data on five groups of major manufacturing industries in the Czech Republic, Hungary and Poland for 1992-2003. Although I have close to 300 observations for factors inputs, due to a worse data availability of FDI stock data I have overall 193 observations for the baseline specification in levels: 42

for the Czech Republic, 37 for Hungary, 84 for Poland and 30 for Slovakia. In some specifications the number of observations is smaller to assure that industry definitions are consistent with the data for rest of the OECD. Specifications with differenced variables have a lower number of observations. All data are from the OECD. The choice of countries, industries and time periods is affected by data availability. The industries were assembled into the 5 groups because this was the breakdown used in OECD FDI database. The industries covered are food, beverages and tobacco (ISIC 31); textiles, apparel and leather (ISIC 32) and wood products and furniture (ISIC 33); chemicals (ISIC 351), rubber (ISIC 355) and plastics (ISIC 356); basic metals (ISIC 37) and metal products (ISIC 381); non-electrical machinery and instruments (ISIC 382+385) and electrical machinery (ISIC 383) and transportation equipment (ISIC 384).

Productivity data are from the OECD STAN database. I have data on value added, number of employees, capital expenditures and total wages to employees. Value added is calculated as the difference between production and intermediate inputs and comprises labor costs, consumption of fixed capital, indirect taxes less subsidies and net operating surplus and mixed income. Number of employees is a headcount, so that those with more than one job (full- or part-time) are counted only once. Hours worked or full-time equivalent jobs where adjustments are made for part-time employment were not available for Central Europe. FDI data are taken from OECD's International Direct Investment Statistics Yearbook. Both FDI stocks and flows were available in constant price PPP US dollars. FDI data are provided only for the industries described above.

ANALYSIS

In my theoretical discussion, I have distinguished between the immediate and lagged impacts of investment by multinational enterprises on productivity of manufacturing industries in transition economies. I hypothesize that in a transition economy, crowding out of local firms by multinationals

(which will lead to an insignificant or negative impact on industry productivity) is a short term effect, particularly in industries with a high competitiveness gap. However, after some time, the industries where the competitiveness gap between foreign and local firms is moderate will experience a positive effect of FDI on productivity growth. Kosová (2010) and Srholec (2006) suggest and document that in "high-tech" industries, foreign firms may actually not tend to locate their high value added activities in transition economies. However, this does not have to decrease productivity of those industries although there may be some skill-stealing and market-stealing effects that will hurt value added per worker in domestic firms. The effect on the overall industry productivity will depend on the competitiveness gap, and where this will be positive and low the overall industry productivity will benefit directly via foreign direct investment and indirectly via improved innovation and productivity of local firms ("spillover effects").

My empirical analysis offers tests of the hypotheses from the theoretical section. Regressions relating FDI intensity to industry productivity levels show that the FDI intensity variable interacted with the Central Europe dummy is not significantly associated with industry productivity in specifications with no or one-year time lags (the coefficient on the one-year lag interacted variable is negative but statistically insignificant, please see Table 4). Moreover, the coefficients on FDI intensity for the 10 OECD countries and Central Europe together drop in value (but stay significant) after the inclusion of the Central Europe dummy. This suggests that short-run effects of FDI in Central Europe are insignificant, as predicted by my theoretical discussion. While the insignificant same-year effect is largely in line with the results of previous studies for Central European economies (for example Kosová, 2010), the insignificant result for the one-year lagged variable may suggest that it takes more than one year for any positive competitive dynamics and effects of FDI to materialize.

To further test the "short-term" crowding out effect and a longer-term "technology spillover" hypothesis presented by Kosová (2010) and also implied in my theoretical discussion based on the Schumpeterian growth model due to Aghion et al. (2009), I test for effects of four-year change in FDI intensity on four-year change in productivity. It is reasonable to expect that it takes more than a year for

FDI to translate into increased production and productivity.[21] For industries with a moderate competitiveness gap, it may also take more than a year and perhaps even more than four years until local firms improve their competitiveness and translate it into a better performance.

Moreover, a long difference specification can deal with endogeneity, as a specification in levels may not tell us much about causality as foreign investors may be choosing less or more productive local industries, and not cause their high or low productivity. Even if the same-year or one-year lagged relationship appears to be insignificant or negative, it is possible that these industries will become more productive after four years when FDI translates into productivity gains. Following Hu and Jefferson (2002), I specified a four-year difference version of the equation (1). The results are reported in Table 5.

The results in column (2) lend some support to the hypothesis that the effect of a four-year change in FDI intensity on productivity growth in Central Europe will be positive. Industries with a growing FDI presence tend to be the industries with growing productivity although the effect in Central Europe appears to be lower than in the rest of the OECD. In OECD, a 10% rise in FDI intensity is associated with 2.75% higher productivity. In Central Europe, an industry that increased foreign share in total capital stock by 10% would be expected to see 1.44% higher productivity than other industries that did not see any change in FDI intensity.

To test for the potential industry-level effects suggested in the Hypothesis 2, I use dummy variables for industries with a high R&D intensity (chemicals, rubber, plastics, machinery, instruments and equipment) and for industries intensive in intangible assets (food, beverages, tobacco, machinery, instruments and equipment). The inclusion of these dummies does not change the positive sign and statistical significance of the coefficient on the FDI, and the sector dummies interacted with the change in FDI intensity are not statistically significant, suggesting that these industry effects do not matter much.

On the other hand, the inclusion of the dummy variable for the industries with a relatively low labor productivity gap between OECD (excluding Central Europe) and a particular observation for

Central Europe makes the coefficient on the FDI intensity insignificant. Moreover, the interacted coefficient between FDI intensity and the dummy variable for industries with a low productivity gap is positive (more so than for the OECD and for the baseline four-year differenced specification for Central Europe) and statistically different from zero at the 5% level. This is in line with Hypothesis 2, where I suggested that a low gap will have a significant positive effect on an industry's productivity.

Several notes of caution are due here. The sample for the four-year differenced specification is very small, only 78 observations, because of the limited data availability. Moreover, the coefficient on labor in these specifications is unreasonably different from the baseline specification and is not statistically significant. This is a result other researchers such as Hu and Jefferson (2002) encountered. One possible explanation is that labor and capital possess different adjustment costs and that there may be some measurement error bias that the long difference operation might have amplified.

One other reason for the volatile coefficient on labor is that while the labor productivity gap between OECD and Central Europe may reflect the "competitiveness gap" central to my theoretical frameworks, it is not a perfect measure because it is perhaps correlated with labor and perhaps also with the productivity variable whose variations I am seeking to explain. Further methodological refinements of the specification based on the labor productivity gap and perhaps more direct measures of the competitiveness gap based on intangibles such as R&D, human capital, and other intangibles will be needed to strengthen the econometric robustness of my results.

CONCLUSIONS

My theoretical discussion suggests and empirical analysis shows support for the hypothesis that FDI intensity is positively and significantly associated with industry productivity in Central Europe only after

a 4-year time lag (rather than a one-year or no lag) in this effect was considered. I theoretically explain how a low competitiveness gap between some OECD and Central European industries may be driving this result, pointing to the conceptual limitations of the technology gap concept stressed in previous literature. I test for one measure of the competitiveness gap: the gap between labor productivity of an industry in Central Europe (including foreign investors already present there) and labor productivity of the same industry in the OECD (excluding Central Europe), departing from past studies that tended to focus on the gap between foreign and local firms only. I find that industries where the competitiveness gap is relatively low are the main beneficiaries from FDI. Contrary to some past research, I don't find evidence for significant and positive FDI spillovers in industries intensive in R&D or overall intangibles.

My paper introduces a novel concept of the competitiveness gap that offers a new way to think about FDI spillovers, going beyond technology based explanations offered by previous researchers such as Kosová (2010) and Srholec (2006). I also focus on an under-researched longer term perspective on FDI spillovers, as suggested in the Schumpeterian theoretical framework explained in the theoretical section of my paper and further elaborated in the empirical section of the paper. Moreover, unlike most present studies, I show that accounting for direct benefits of FDI (rather than just spillovers to local firms) can lead to a more optimistic view of FDI compared to studies that emphasize negative FDI spillovers to local firms. The new OECD members from Central Europe went from almost zero FDI in 1990 to some of the world's highest FDI shares in capital stock in 2006. During the same period, they saw dramatic improvements in living standards that found an expression in the admission of those countries to the OECD and EU. MNCs may hurt performance of some local firms, but Central Europe's story shows that FDI can significantly and positively affect industrial performance and economic development.

APPENDIX

Table 1. Foreign Direct Investment in the New and Old OECD Members, 1990-2006

	Inward FDI stocks as a % of GDP			Inward FDI flows as a % of gross fixed capital formation		
	1990	2000	2006	2004	2005	2006
Czech R.	-	38.9	54.8	17.2	36.1	16.8
Hungary	1.6	48.6	73.0	19.7	30.1	24.8
Poland	0.2	20.5	30.6	29.3	18.1	20.5
Slovakia	-	23.4	55.0	29.9	17.1	28.6
Denmark	6.8	46.0	50.3	-21.5	24.5	11.5
Finland	3.7	20.1	30.5	8.6	12.2	9.2
France	7.0	19.6	35.0	8.2	19.4	17.9
Germany	6.5	14.3	17.4	-1.9	7.5	8.3
Italy	5.3	11.0	15.9	4.7	5.5	10.2
Netherlands	22.4	63.1	68.2	1.8	34.1	3.3
Norway	10.7	15.1	19.8	5.5	11.6	9.4
UK	20.6	30.4	47.8	16.1	52.9	33.9
US	6.8	12.8	13.5	6.2	4.9	6.8
Canada	19.7	29.8	30.4	-0.2	12.3	25.3
All OECD	8.2	16.4	24.2	6.6	9.3	11.8
China	5.4	17.9	11.1	8.0	8.8	8.0
Developing	10.0	27.1	31.0	15.4	14.5	16.4
World	8.4	18.3	24.8	8.5	10.4	12.6

Source: UNCTAD. Notes: Czech Republic, Hungary, Poland and Slovakia are the new OECD members. The other listed OECD members are analyzed in this study as a benchmark specification.

Table 2. Main Variables and Summary Statistics: New OECD Members (Central Europe)

Name	Description	Observations	Mean	s.d.	Min	Max
Log Y	Logarithm of value-added	317	9.965	1.576	4.736	13.172
Log L	Logarithm of labor stock	318	5.770	1.398	1.386	7.902
Log K	Logarithm of capital stock	278	8.799	2.283	2.639	13.317
FDI Intensity	FDI stock/ capital stock	193	0.176	0.270	0	1.905
Technology Gap	OECD/CE gap in Y/L	317	0.133	0.241	-0.2893	0.733

Table 3. A Comparison of Main Industries in Central Europe, Averages for 1992-2003

Industry	Value-added per Worker	Competitiveness Gap	FDI Intensity	Capital-labor Ratio
Food, beverages and tobacco	88.5	0.157	0.162	78.0
Wood, Footwear and Textiles	67.4	-0.195	0.093	55.2
Chemicals, rubber and plastics	97.6	0.053	0.158	108.2
Machinery, instruments and equipment	83.1	0.283	0.200	71.4

Table 4. Productivity and FDI: OLS Regressions for OECD and Central Europe

Explanatory Variables	Dependent Variable: Log Y (Value-Added) in Year t					
	Specifications with no lag			Specifications with a one-year lag		
	(1)	(2)	(3)	(4)	(5)	(6)
	FDI(t)	FDI(t)	FDI(t)	FDI(t-1)	FDI(t-1)	FDI(t-1)
Constant	4.297***	1.683***	2.787***	4.463***	1.581***	1.621***
	(0.478)	(0.177)	(0.319)	(0.556)	(0.162)	(0.166)
Log L(t)	0.354***	0.518***	0.332***	0.342***	0.567***	0.550***
	(0.077)	(0.043)	(0.051)	(0.088)	(0.049)	(0.051)
Log K(t)	0.469***	0.456***	0.500***	0.491***	0.420***	0.427***
	(0.064)	(0.035)	(0.027)	(0.073)	(0.041)	(0.042)
FDI Intensity	0.316***			0.333***		
(OECD)	(0.111)			(0.120)		
FDI Intensity		0.353***	0.326***		0.302***	0.253***
(OECD+CE)		(0.081)	(0.104)		(0.089)	(0.100)
FDI Intensity			0.233			-0.240
$*D^{\text{Central Europe}}$			(0.254)			(0.215)
Dummy for			0.048			0.086
Central Europe			(0.090)			(0.063)
Industry Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Year Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Country Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.88	0.89	0.89	0.89	0.89	0.89
Observations	443	596	596	403	558	558

Notes: Central Europe stands for the Czech Republic, Hungary, Poland and Slovakia. OECD are the 10 developed economies analyzed in Chapter 3 including US, Canada and Western European nations. ***, ** and * denotes coefficients statistically different from zero at the 1%, 5% and 10% levels, respectively.

Table 5. Productivity Growth and FDI in the New OECD: OLS with Industry Dummies

	Dependent variable: Difference of log Y between t and t+4				
Explanatory Variables	Baseline OECD	Baseline CE	High Tech Dummy	High Intangibles	Low Gap Dummy
	(1)	(2)	(3)	(4)	(5)
Change of Log L between t and t+4	0.724***	0.250	0.696	0.409	0.264
	(0.257)	(0.193)	(0.489)	(0.721)	(0.359)
Change of Log K between t and t+4	0.535***	0.550***	0.533***	0.642**	0.550***
	(0.089)	(0.109)	(0.114)	(0.201)	(0.109)
Change of FDI Intensity, t to t+4	0.275*	0.144*	0.183*	0.167*	-0.402
	(0.145)	(0.076)	(0.080)	(0.083)	(0.606)
Change of FDI Intensity* $D^{High\ Tech}$			-0.458		
			(0.765)		
Change of FDI Intensity* $D^{High\ Intangibles}$				-0.196	
				(0.628)	
Change of FDI Intensity* $D^{Low\ Gap}$					0.715**
					(0.314)
Dummy for high-tech sectors			-0.143		
			(0.121)		
Dummy for high-intangibles sectors				-0.063	
				(0.185)	
Dummy for sectors with a low competitiveness gap					0.190
					(0.463)
R-squared	0.44	0.76	0.76	0.76	0.80
Observations	271	78	78	78	78

Notes: ***, ** and * denote coefficients statistically different from zero at the 1%, 5% and 10% levels, respectively. High Tech is a dummy variable for sectors with relatively high R&D. High Intangibles is a dummy for sectors relatively intensive in intangible assets (such as R&D and advertising). Low Gap is a dummy for sectors where labor productivity gap between OECD (foreign entrant) and Central Europe (all firms in industry, including incumbent foreign firms) is relatively low.

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NOTES

1 The Czech Republic in 1995, Hungary and Poland in 1996, Slovakia in 2000.

2 A great book on a closely related topic was written by Paul Lewis. It is titled "How the East Was Won: The Impact of Multinational Companies in Eastern Europe and the Former Soviet Union."

3 Carl-Peter Forster, the president of General Motors Europe, said that GM's German plants need to improve performance against Polish GM plants as well as against rivals. Labor costs at the General Motors plant in Poland are 15% of those in German factories (Bloomberg, October 12, 2004). In 2007, Poland accounted for 11% of cars produced by GM-owned EU facilities compared to 7% in 2004. Germany's share actually rose from 29% to 31% in the same period. Moreover, GM's new design center for the EU is also in Germany. It was the UK and Belgium-based facilities that lost the share in GM's output in 2004-07.

4 Contrary to Kosova (2004), Keller and Yeaple (2002) found productivity spillovers in "high-tech" with no or one-year lag but not with a two-year lag in the US. Their results for "low-tech" industries were statistically insignificant.

5 In their paper, they assume that the US industries represent the world technology frontier and estimate the distance of the UK industry productivity to the productivity of its counterpart industry in the US. The mean distance of UK industries' labour productivity from the US productivity was 21% between 1987 and 1993.

6 Interestingly, Keller and Yeaple (2009) show that although FDI spillovers are the strongest in high-technology industries, FDI has a relatively bigger impact within industries on the productivity growth of those firms *most* distant from the productivity frontier, not *least* distant from the frontier, as Aghion et al. (2009) suggest.

7 The earliest discussion of this liability is in Hymer (1966) and Caves (1972); the point is well established in the literature; see for example a review in the special issue of *Journal of International Management* (2002).

8 In Dunning's eclectic framework (1977), these are "ownership advantages." For now, we leave aside his "internalization advantages," which refer to the factors that lead the firm to internalize the transfer of these ownership advantages rather than exploit them through contracts. Since we do not have evidence on contractual transfers, we are in effect assuming that the firm-specific advantages in our model require internalization if they are to yield competitive advantage abroad.

9 Nachum (2003) extends the traditional MNE theory, suggesting that MNE advantages can also be equal to or smaller than advantages of local firms and that the costs of MNEs can also be equal or higher than costs of locals. A negative gap can also occur in the case of knowledge-seeking FDI, where firms invest overseas in order to acquire new advantages rather than to exploit their existing ones (Wesson, 2004).

10 Amaldoss and Jain (2002) give theoretical reasons and experimental evidence showing that as the relative competitive advantage of the lagging firm increases compared to the leading firm, the leading firm increases its investment and innovative efforts. They explain why the firms that lag behind the market leader a little (low gap) will invest more than firms that lag a lot (high gap) in "symmetric games" where players don't behave strategically. They also show that in asymmetric mixed strategy games, it is possible that the lagging firm's innovative effort can be related to the leader's absolute (not relative) competitive advantage. They show that in these games the challengers (not the firms with a competitive advantage) are more likely to aggressively invest in innovation. Their experimental evidence shows that this only occurs after a time (they theorize that adaptive learning accounts for this pattern of investment behavior.)

11 Bandura (1997) uses the concept of "self-efficacy"—a perceived belief in one's capabilities—to explain why some people rebound from defeats and go on to greatness while most others get easily discouraged when they face difficult challenges that can be linked to the "high competitiveness gap" of my theory. People with high assurance in their capabilities approach difficult tasks as challenges to be mastered rather than as threats to be avoided. In contrast, people who doubt their capabilities shy away from difficult tasks which they view as personal threats. When faced with difficult tasks, they dwell on their personal deficiencies, on the obstacles they will encounter, and all kinds of adverse outcomes rather than concentrate on how to perform successfully. They slacken their efforts and give up quickly in the face of difficulties.

12 See Chauvin and Hirshey (1993) for evidence that R&D tends to affect firm and sector performance more in high-tech industries and advertising more in advertising-intensive sectors.

13 In industries with low firm-specific advantages, such as steel, multinationals from emerging economies such as Indian Tata Steel may be more competitive than their OECD rivals because competitive advantage is driven by access to labour and other resources, which may be better in emerging economies than in developed countries. (Tata acquired the Anglo-Dutch steel firm Corus in 2007.) See Khanna and Palepu (2006) for theoretical work on multinationals from emerging markets. They identified a number of generic strategies pursued by emerging-world multinationals, and suggest that they are specific to and build on the "institutional voids" in emerging economies.

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15 Most existing studies of FDI productivity spillovers estimated production functions or total factor productivity (TFP). Kosova (2004) is an exception who calls for alternative methodologies. She suggests that the pitfalls of the TFP-based analysis can be rectified by addressing the FDI spillovers question using models of firm and industry dynamics from industrial organization economics. These models not only provide a general framework to analyze various competitive effects, but incorporate firm learning, innovation and technology imitation. One trouble with a production function approach is that we neither know the firm production function nor the variety of inputs different firms use. Even if we agreed to approximate the production function, e.g. by the standard Cobb-Douglas form, as many of the previous studies have done, there remains the problem of proper input measurement.

16 Tian (2007) found positive FDI spillovers when he used the share of FDI in capital variable but an insignificant effect when he used the share of foreign-invested enterprises in domestic employment and sales. Other researchers who weighted foreign capital presence by employment or sales tended to find negative or insignificant spillovers.

17 Keller and Yeaple (2009) have found these sectors to be most R&D intensive in the US and Zamborsky (2008) have found them to be most R&D intensive in the 10 OECD countries he analyzed in his study.

18 The productivity gap between foreign-invested and domestic firms in his sample in China was 24.7%.

19 For example, Singapore-based Flextronics, the world's largest contract maker of electronics equipment, had a Microsoft's Xbox game console line in Hungary. However, after about one year of operations in 2002 it closed the plant and moved it to China. Thanks to other contracts - including, in a twist, one to assemble TV sets for a Chinese company - employment at the Flextronics Hungarian factory in 2004 was higher than when Microsoft was a customer (International Herald Tribune, 2004).

20 Aghion et al. (2006) used US productivity as the measure of the "technology frontier" for their study of FDI spillovers in the United Kingdom, although according to their data, the US accounted for only 34% of all foreign greenfield entrants in British manufacturing industries in 1986-1992.

21 For example, car-makers PSA Peugeot Citroen (South Korea) and Kia Motors (South Korea) each invested $1.3 billion in their new plants in Slovakia in 2004-2006. PSA annual production tripled to reach 177,000 cars and Kia's output reached 145,000 cars in 2007. Both car-makers plan to reach their full annual capacity of about 300,000 units each in 2009-10, according to Reuters (2008).