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Global Supply Chains at Work in Central and Eastern European Countries: Impact of FDI on export restructuring and productivity growth[1]

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Global Supply Chains at Work in Central and Eastern European Countries: Impact of FDI on export restructuring and productivity growth[1]

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Abstract

This paper empirically accounts for the importance of the 'global supply chains' concept for export restructuring and productivity growth in Central and Eastern European Countries (CEECs) in the period 1995-2007. Using industry-level data and accounting for technology intensity, we show that FDI has significantly contributed to export restructuring in the CEECs. The effects of FDI are, however, heterogenous across countries. While more advanced core CEECs succeeded in boosting exports in higher-end technology industries, non-core CEECs stuck with export specialization in lower-end technology industries. This suggests that where FDI flows have been directed is of key importance. Our results show that export restructuring and economic specialization brought about by FDI during the last two decades in the CEECs might matter a lot for their potential for long-run productivity growth. Industries of higher-end technology intensity have experienced substantially higher productivity growth and so have countries more successful in attracting FDI to these industries.

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1. Introduction

Inward foreign direct investment (FDI) has traditionally been treated as an important means of structural upgrading and productivity growth in Central and Eastern European countries (CEECs), in particular in the new member states of the EU. Endogenous growth theory suggests that FDI is an important channel of technology transfer to host countries (see Findlay, 1978, Wang, 1998; De Mello, 1997; Borensztein, De Gregorio and Lee, 1998; Carkovic and Levine, 2005; Barba Navaretti and Venables. 2004; Contessi and Weinberger, 2009). On the other side, international business theory emphasizes the interplay of factors within the OLI (ownership-location-internalisation advantages) paradigm, where technology is also the main ownership-specific advantage of foreign investors transferred to host countries (Dunning and Lundan, 2008). In the context of development economics and based on the *flying geese model* (FGM) tradition, Ozawa (1992, 2000, 2012) proposes a dynamic paradigm of multinational enterprises-assisted development. He identifies three principles that govern the process of rapid growth in the labor-driven stage of economic development, i.e. trade augmentation through FDI, increasing factor incongruity, and localized but increasingly internationalized learning and technological accumulation. Common feature of these theoretical approaches is that FDI positively impacts development of host countries through the technology transferred by multinational enterprises (MNEs). The positive outcome, however, is far from granted and it crucially depends on host countries' absorption capacity.[5]

Yet, in a recent theoretical approach on *global supply chain* (GSC) *economics*, Baldwin (2011, 2012) seems to be less optimistic about technology transfer via FDI. He claims that within the 'vertical specialization' pattern, which is typical for the offshoring of labor-intensive stages from headquarter to factory economies, one cannot really refer to technology transfer but should think more of a technology lending. Investing firms tend to avoid real technology transfer and have due to the ICT revolution better means to ensure this (Baldwin, 2012). With the ICT revolution it became increasingly economical to geographically separate manufacturing stages, i.e. to unbundle the factories. This was, in Baldwin's words, "globalization's 2nd unbundling", where production stages previously performed in close proximity were dispersed to reduce production costs, whereby ICT enabled control over the dispersed manufacturing processes. Economics of GVC unbundling is in fact adjustment of the FGM to the circumstances of 21st century, i.e. to the fact that globalization's 2nd unbundling means offshoring of production stages and not of industries as in the case of FGM. The fact "*that Korea* eventually managed to start exporting *domestically-designed car engines was testimony to its rich-nation status. Now, exporting sophisticated manufactured goods is no longer the hallmark of having arrived. It may simply reflect a nation's position in a global value chain*" (Baldwin, 2012: 19). This, however, suggests that the development impact of FDI on host countries may be limited.

[5] For a comprehensive overview of the benefits and costs of FDI for host countries see OECD (2002).

While there emerged evident and clear pattern of technological upgrading and catching-up in terms of productivity of CEECs during the last two decades, the mechanisms of the underlying economic and technological restructuring in CEECs have not been studied in great detail. For what seems to be indisputable, this process of economic restructuring was related to the inflow of FDI. But what is the exact mechanism by which the FDI impact the development of host economies?

There is a number of studies on productivity spillovers from FDI for CEECs at the firm or sector level, whereby they are inconclusive on whether the spillovers are positive, negative or insignificant.[6] Surprisingly, though, studies that specifically analyse the impact of FDI on structural changes in CEECs' economies, are quite scarce. They mostly notify different (superior) sectoral breakdown of foreign subsidiaries as compared to domestic firms, thus generating a positive restructuring impact of FDI to a host economy. Notable exceptions are WIIW (2000), RWI (2001), Hunya (2000a), Landesmann (2003), Damijan and Rojec (2007) and Kalotay (2010). They all confirm a positive impact of FDI on manufacturing restructuring of CEECs, but much less if at all of other transition countries which lag behind or are outside the EU accession processes. WIIW (2000) and RWI (2001) claim that in the early stage of transition and during the era of mass privatization programs, FDI did not bring immediate changes to the structure of manufacturing sectors. Notably, this is due to the fact that it mostly came via foreign privatizations of existing firms and capacities in well established industries and was primarily motivated by getting access to the local markets. However, higher rate of foreign penetration in individual industries gradually intensified its impact on the pattern of structural change in manufacturing sectors of these countries due to faster growth of foreign subsidiaries as compared to domestic firms. In the next stage of transition, FDI tended to have a stronger impact on restructuring as it has been more concentrated on new and growing industries (automotive industry, for instance) and filling gaps in the production portfolio (RWI, 2001). According to Hunya (2000a), structural change in CEECs' manufacturing is closely linked to the penetration of foreign capital, as the foreign owned firms specialized in industries of higher technology intensity and in export-oriented industries, while domestic firms remained in low-tech and domestic-market-oriented industries. The deeper the foreign penetration, the faster was the speed of structural change (Hunya, 2000b).

Along the same lines, Landesmann (2003) finds that in the Czech Republic, Hungary, Poland and Slovenia, foreign subsidiaries account for a higher share of sales in the medium and high-tech than in the low-tech or the resource-intensive branches, while the presence of FDI across other CEECs is very uneven and so is its role in facilitating the upgrading of the

[6] Compare Konings, 2001; Djankov and Hoekman, 2000; Kinoshita, 2000; Damijan, Rojec, Knell, Majcen, 2003a, 2003b, 2013; Smarzynska Javorcik and Spatareanu, 2002, 2009; Tytell and Yudaeva, 2005; Nicolini and Resmini, 2006, 2010; Arnold and Smarzynska-Javorcik, 2005; Gorodnichenko, Svejnar and Terrell, 2006; Halpern and Murakozy, 2006; Schoors and van der Tol, 2001; Sgard, 2001; Toth and Semjen, 1999; Torlak, 2004.

CEECs' industrial structures. For six CEECs,[7] Damijan and Rojec (2007) show that in the first decade of transition, in the period 1993-2001, productivity growth was generally positively correlated with foreign penetration.

[Insert Figure 1]

Figure 1 provides some useful stylized facts regarding the economic restructuring and technology upgrading through FDI and trade in 14 CEECs (see Table 1 for the list of countries) over the period 1995-2007. Upper left panel indicates that long-run productivity growth in particular industry is weakly, but positively, associated with the changed importance of FDI in that particular industry. A closer look shows that it was most likely low-tech (LT) and medium-low tech (ML) industries that suffered relative productivity declines. These industries have also mostly lost their importance in terms of FDI shares (relative to total manufacturing) over the period. Yet, also in the case when they retained or increased their FDI shares their productivity increases remained very modest and well below the productivity growth of medium-high (MH) and high-tech (HT) industries. The superior performance of the latter, however, is not necessarily associated with their increased FDI shares. What matters might be how successful were industries in boosting exports. Upper right panel of Figure 1 demonstrates that FDI had a strong impact on export restructuring of CEECs' economies. Winners again are industries of higher technology intensity, but there are also some "outliers" to be found among low and medium-low tech industries that made it to boost exports substantially. This picture is further diversified when observing the lower panel of Figure 1, which shows a positive relationship between the export growth and productivity increases. However, one cannot find many low-tech and medium-low tech industries in the top right quadrant, i.e. among the top performers in terms of productivity. There are quite a few that succeeded in substantial export increases, but only few matched this with comparable productivity increases.

This suggests that FDI had a quite heterogeneous impact on productivity growth in CEECs. No doubt, winners in the transition process were countries that succeeded in attracting FDI into industries of higher technology intensity since this resulted both in increased exports and productivity levels. The question whether in general, industries that were successful in attracting FDI also succeeded in boosting productivity along the increased export performance is, however, less clear. The Figure 1 implies that FDI inflow and export growth do not necessarily translate into higher productivity growth. What seems to be important is not the quantity, but the 'content of exports'. To put it in the words of Hausmann, Hwang and Rodrik (2007) – what countries export seems to matter. One needs to account for heterogeneity among the industries (as well as among particular product groups) to be able to evaluate how induced technological change through both FDI and exports changed the

[7] Czech Republic, Estonia, Hungary, Poland, Slovenia and Slovakia.

landscape in the CEECs in terms of technology upgrading and aggregate productivity growth.

This paper aims to fill the gap in the literature by explaining the mechanism through which FDI contributed to economic and technological restructuring in CEECs. We build on the idea that during the last two decades CEECs were used as an export platform for advanced EU countries, which enabled them to relocate lower technology intensive stages of production to the next-door lower-wages countries. This idea fits well into the global value chain concept developed by Baldwin (2011, 2012).

Our prior is that – while the mechanism of economic restructuring through FDI and exports may be similar in different countries – it is the industry and technology segment within the industries picked by MNEs that matters in the long-run for relative performance of industries and overall productivity growth. In other words, relative performance of industries may depend on their positioning within the global value chains of MNEs. Firms in industries at either technology level are likely to increase their export performance if they succeeded in attracting FDI. Yet, technology upgrading and productivity growth took place only if they were plugged into 'right' specific production stages of – regionally or globally – dispersed production processes of MNEs. To demonstrate this fact it is useful to take an example of Apple's iPhone global value chain. A teardown analysis by Rassweiller (2012) shows that Apple's implied margin with the entry model of iPhone 5 sold at $649 peaks at 68% (and even more with high-end models), while total value of material inputs, such as semiconductors, processors, displays, etc., provided by dozens of Korean, Japanese, Taiwanese, German and U.S. firms totals to only $199 (less than 31 %). The final assembly cost by the Chinese Foxconn, however, equals a meager $8 (1.2%), whereby Foxconn itself is owned by a Taiwanese firm.

This suggests the importance of industry, technology segment and production stage to which FDI has been attracted. One can talk about so-called 'implanted economic restructuring' through FDI. The higher the technology intensity of the implanted industries and products the higher will be the benefits of the host country, but then again simple assembling process will generate fewer benefits than engagement in design of components. It is difficult to account for the whole complexity of 'implanted economic restructuring' through FDI due to the lack of very detailed data, but we aim to study the impact of FDI on CEECs performance by accounting for the technology intensity of sectors and the trade structure of imported and exported products.

Along the lines of the GSC economics, we will study to what extent FDI has been a factor bringing about structural change and productivity growth in CEECs' manufacturing. We expect a positive contribution of FDI to restructuring and aggregate productivity growth of CEECs', but not necessarily a positive direct effect of FDI on productivity growth of individual industries. We will study to what extent this effect works through 'quality' of the investment in terms of differential technology intensity and through imposed trade specialization. More precisely, we will analyze how FDI has triggered changes in import

and export structures across and within industries and how this in turn contributed to productivity growth of industries.

In the paper, by using the industry-level data for the period 1995-2007, we first estimate the extent of structural change in CEECs in terms of export and employment restructuring as well as productivity growth brought about by massive inflows of FDI. Next, we estimate the impact of FDI on export restructuring and how much of this economic restructuring is in line with technology upgrading. And finally, we check how export restructuring promoted by FDI inflows translated into industries' productivity growth. More specifically, we will test whether structure of exports in terms of technology intensity of industries matters for long-run productivity growth.

Our results show that FDI has indeed significantly contributed to export restructuring in the CEECs, whereby the effects are found to be heterogenous across countries. We find that more advanced core CEECs succeeded at boosting exports in higher-end technology industries, while non-core CEECs sticked to export growth in lower-end technology industries. We find that this dichotomous export restructuring in both groups of CEECs might have played a crucial role in determining their potential for long-run productivity growth. Countries attracting FDI to industries of higher-end technology intensity have consequently succeeded in substantially higher productivity growth.

The outline of the paper is as follows. Next section reviews the related literature and section 3 accounts for the overall structural change in CEECs. In section 4 we estimate the impact of FDI on export restructuring and section 5 tests the impact of changed export structure on industries' total factor productivity growth. Final section concludes.

2. Underlying theoretical concept

The impact of FDI on the restructuring and productivity growth of host country's manufacturing sector has traditionally been dealt with within the Flying Geese Model (FGM) (Kojima and Ozawa, 1985; Ozawa, 1992; Kojima, 2000). The FGM aims to explain the catching-up process in the industrial sector in emergent open economies. The model argues that a lesser developed country is able to catch up, depending on the upgrading process in the lead country. The catching-up process is furthered via trade and FDI, the latter being pro-trade (i.e. trade-creating) in character (Bellak, 2003). According to Ozawa (1992, 2000), the FGM describes the links between various stages of industrial upgrading and related phases of FDI. As the lead country moves on up the technology ladder, it relocates via FDI industries at a lower level of technology to lesser developed countries. Based on the requirements of the differing stages of technology, MNEs shift their manufacturing activities to various developing countries and/or transition economies. Yet, the FGM is suited to explaining the simple (initial) catching-up process as an outcome of the relocation of labour-intensive industries but less so when it comes to the relocation of medium-high and high-tech industries. As developed in Ozawa's structural upgrading model, the FGM does not seem to take into account the fact that as the leader moves up the ladder, it becomes increasingly difficult to recycle comparative advantage, as the latter

now differs from the early stages when it was based on low-cost unskilled labour (Ozawa 2003). In other words, the flying geese pattern of catching-up might mean that as a means of upgrading structures and enhancing productivity growth in host countries, FDI is a powerful factor in industries at the lower end of technology scale, but (much) less so in the industries at the upper end of that same scale.

This is when global supply chains (GSCs) economics comes into play as it seems to better fit into the present-day offshoring of production stages than FGM. Namely, GSCs economics claims to explain offshoring of stages and not industries and goes beyond the labor intensive stages as it explains vertical as well as horizontal specializations. The economics and functioning of global supply chains has been conceptualized by Baldwin (2011, 2012). The starting point of the GSCs economics is the so called globalization's 2nd unbundling which shifted the locus of globalization from sectors to stages of production. According to Baldwin, this requires an analytical focus on fractionalization and dispersion as the very nucleus of supply chains. Fractionalization concerns the functional unbundling of production processes into finer stages of production, dispersion concerns the geographic unbundling of stages of production. Fractionalization is governed by a trade-off between specialization and coordination costs and dispersion is governed by a balance between dispersion forces and agglomeration forces. The dispersion forces that encourage geographic unbundling include wage gaps (fostering North-South offshoring) and firm-level excellence (fostering North-North and South-South offshoring). Since mid 1980s, the ICT revolution enabled certain stages of production, previously performed in close proximity, to be dispersed geographically, offshored and performed at distant locations as it made possible to coordinate complexity at distance and, thus, to reduce the costs and risks of combining developed economy technology with developing economy labor. This is the very essence of global supply chains. ICT made the 2nd unbundling possible and wage differences made it profitable.

FDI is the crucial integral part of the global supply chains. Within the global supply chains trade is not limited to goods, but is an 'intertwining of: (i) trade in goods, especially parts and components, (ii) international investment in production facilities, training, technology and long term business relationships, (iii) the use of infrastructure services to coordinate the dispersed production, (iv) cross border flows of know-how.' Baldwin (2012: 8) calls this trade-investment-services-IP nexus.

In the global supply chains there are 'headquarter' and 'factory' economies. Comparison of supply chain trade between headquarters and factory economies exhibit important differences. The first is that supply chain trade between 'headquarter' and 'factory' economies is dominated by vertical specialization based on wage differences, while supply chain trade between 'headquarter' economies, which is even more intensive, is based on horizontal specialization and firm specific advantages. The second difference relates to the fact that exports of 'headquarter' economies contain relatively little imported intermediates, while exports of 'factory' economies contain a large share of imported intermediates (Baldwin, 2012). Gonzales (2012) finds that as nations get richer they use imported

intermediates ('backward' supply chain trade) more intensively in their exports. But only up to a certain point; beyond a threshold of per capita income of about $25,000 the imports intensity diminishes. For the supply of intermediates to others ('forward' supply-chain trade) the relationship is vice versa. It is low for low income levels but rises beyond a point near $15,000. The above pattern leads to a hub-and-spoke asymmetry in the dependence of 'factory' economies on 'headquarter' economies; exports of 'headquarter' economies contain relatively little imported intermediates, while exports of 'factory' economies contain a large share of imported intermediated. Global supply chains also show strong regional concentration, what Baldwin (2012) calls Factory Asia, Factory North America and Factory Europe. Germany is the hub of Factory Europe, CEECs obviously being factory economies.

What do GSCs economics tell to 'factory' economies? Joining supply chains makes the industrialization process and inclusion in international trade very fast but, as put by Baldwin (2012), industrialization became less meaningful for the same reasons. The 'factory' economies have lots of industry and rapidly growing exports of manufactured goods, but they cannot ensure their place in the supply chain is not supplanted by the next low-wage country. This relates to the application of offshoring firm's technology and know-how in a low wage country. The internationalization of supply chains involves cross-border applications of very specific slices of the parent company's know-how and keeping control over the use of this know-how is of critical importance to the offshoring firms. The result is that there is no proper process of technology transfer of a broad range of productivity enhancing techniques but more of technology lending. A related issue is the pattern exhibited by the so called smile curve, i.e. the fact that lower value added stages of production (assembly, fabrication stages) are offshored while high value added stages (product concept, design, R&D, sales, marketing and after sales services) are kept at home, i.e. stage's shares of product's total value added seemed to shift away from the offshored stages. The conclusion is that fabrication stages in manufacturing may not be the development panacea as they once were (Baldwin, 2012: 17-18).

In principle, countries cannot ensure that their place in the supply chain is not supplanted by the next low-wage country. Following the work of Puga and Venables (1996), Baldwin (2012) claims that productivity/wage growth induces firms to move offshore to a second location once a threshold wage is reached. The key points here are that the spread is not even – the departing industry does not spread out evenly, it concentrates in just one new location to benefit from agglomeration rents. Moreover, the relocation does not empty out the first location/nation but rather slows the growth of new manufacturing activity. As the second location's wages are driven up, a third location/nation emerges for offshoring. This is in fact the FGM pattern.

At the next level, the convergent wages and income level between 'factory' economies and 'headquarter' economies need not reduce the extent of supply-chain trade among them. Indeed, the intensity of such trade among developed nations exceeds that between developed and developing economies since the gains from specialization driven by firm-level excellence is even more important than the gains from specialization due to large wage

gaps. According to Baldwin (2012), such a pattern of development logically follows from the trade theory claiming that nations trade more – not less – as their economies get larger and more similar. In other words, countries develop to a stage when their inclusion in global supply chains will be based on horizontal rather than vertical specialization and will be included more via forward than backward supply chain trade. Theory tends to suggest that income convergence will gradually boost supply-chain trade in that the extra horizontally specialization will more than compensate any reduction in wage-driven, vertical specialization (Baldwin, 2012). GSCs economics, thus, claim to explain the structural and productivity development of 'factory' economies' manufacturing beyond the labor intensive stages but the mechanism of this catch-up is not really obvious as global supply chains promote more technology lending than technology transfer and when the higher value added stages of production remain in 'headquarter' economies.

Based on the FGM and GSCs economics we will test the proposition that CEECs' accession to the EU has not resulted only in the increase of FDI inflows in the new member countries, but also in a structural, export competitiveness and productivity upgrading contribution of FDI. Structural change, export competitiveness and productivity growth in CEECs manufacturing sectors during the pre- and post-accession period is importantly accounted for by FDI because FDI is directed into higher technology intensive industries than domestic firms, because foreign subsidiaries within the same industries exhibit higher export propensity and productivity growth, and because a considerable part of FDI is based on vertical specialization. Still, the fact that an important part of FDI in CEECs' manufacturing is based on vertical specialization and on the offshoring of lower value added production stages may limit the positive impact of FDI. In this regard, one may expect considerable heterogeneity among host countries.

In our analysis we will use two approaches to account for the impact of FDI on the catching-up process along the lines of FGM and GSCs economics. First, we will follow the spirit of the approach by Cutler, Berri and Ozawa (2003) who look at changes/trends in main markets' market shares of individual manufacturing industries of catching-up countries. This eventually indicates the structural changes/trends in their comparative advantages. We modify this approach in the sense that we look for the changes in shares of individual industries in total exports to the main market of CEECs, i.e. OECD countries. However, in order to account for the within changes in the manufacturing comparative advantage, we calculate the shares of individual industries in total manufacturing exports of individual CEECs to the OECD countries. In addition, we will put these trends in export restructuring into the perspective of the changes in the level of FDI penetration in individual industries, as proposed by Dowling and Cheang (2000).

Second, to account for the impact of FDI on catching-up of industries along the concept of GSC, we will test how changes in export structure impacted at the relative industry performance measured by TFP. Specifically, we will test how changes in export shares of three groups of products (capital, intermediate and consumer goods) and changes in the intra-industry specialization affect productivity growth of industries. We will also test

whether changes in exports of industries of different technology intensity affect industry performance differently.

3. Stylized facts on restructuring along the GSC concept

3.1. Data

To perform our analysis we combine several databases available at the industry level for CEEC countries. The bottleneck data in our case are the data for FDI inflows/stocks and data for productivity, capital and labor. For most of the countries, the availability of FDI data is at the NACE Rev. 1 2-letter level, which comprises 14 industries in the manufacturing sector. This also provided the major limitation to the construction of the dataset as all other data had to be provided at the same level of aggregation or had to be aggregated to 14 NACE Rev. 1 2-letter industries. Data on inward FDI stocks for 14 CEECs[8] is taken mostly from the WIIW Database on Foreign Direct Investment (2012) and combined with the UNCTAD data. FDI data is mainly available between 1995 and 2007, while for a few countries there is also data available back to 1994.

Data for labor productivity is available for 12 out of the 14 countries. Data sources are WIIW Industrial Database Eastern Europe (2010), which was combined with the EU-Klems data (provided by the University of Groningen). Productivity data spans the period 1995-2007. There was bigger problem of gathering data for capital variable. The only consistent data for capital is provided by the EU-Klems. Unfortunately, EU-Klems covers only 8 CEEC countries, i.e. the new EU member states. This limits the empirical tests on catching-up of industries along the concept of GSC in terms of productivity to these 8 countries only.

Data on foreign trade of CEECs was less of a problem, since there is good coverage of trade statistics at any level of aggregation at the Eurostat. In several aspects we also combined these data with the OECD data.

To sum up, due to the data limitations our analysis was carried out for the sample of 8 to 12 CEEC countries in the period 1995-2007 with the data aggregated to 14 NACE Rev. 1 2-letter industries.

3.2. Restructuring along the GSC concept

3.2.1. FDI and trade restructuring

CEECs experienced enormous increases in FDI inflows since the early 1990s. These inflows expanded along with the accession process to the EU. Table 1 shows an obvious 'correlation'

[8] Albania (AL), Bosnia and Herzegowina (BA), Bulgaria (BG), Czech republic (CZ), Estonia (EE), Croatia (HR), Hungary (HU), Latvia (LV), Lithuania (LT), Macedonia (MK), Poland (PL), Romania (RO), Slovakia (SK), Slovenia (SI).

of inward FDI inflows and EU accession process, with gradually increasing relative position of CEECs as recipients of FDI (relative to the total of EU-27) in the pre-accession period, its peak in the accession year (2004), and decrease in the post-accession period. After the accession, CEECs' relative position remains on a much higher level than in the pre-accession period. Countries of the Southern and Eastern Europe (SEE-6) follow similar pattern as CEECs in the pre-accession period. Improved relative position of CEECs as investment location is in line, first, with the general theoretical premise saying that economic integration leads to increasing FDI inflows in member countries and changed perception of member countries in foreign investors' strategy (Dunning, 1993; Baldwin, Francois and Portes, 1997; Rosati, 1998). And, second, it is in line with the transition countries and EU specific premise predicting that attractiveness of a country for inward FDI is co-determined by the quality of business and investment environment in the broadest sense which, in the context of CEECs, means nothing else but a successful accomplishment of transition reforms. Important here is that transition and EU accession processes are two sides of the same coin. The decision for EU accession, more or less also means a decision for specific concept of transition reforms, legal and institutional system. Thus, EU accession process has sped up and converged transition reforms in the candidate countries as opposed to other transition countries. This makes the former more attractive location for FDI than the latter.

[Insert Table 1]

In the course of the accession process, which for some countries started as early as 1991, CEECs have also intensified trade flows with the EU-15 as their main trading partner. In most of the countries, the share of EU in exports increased well above 70% of total exports. At the same time, in line with the GSC concept, increased FDI inflows were also paralleled with extensive trade restructuring. There was immense trade restructuring both across industries as well as within industries that completely displaced the old trade structures inherited from the communist era. One of the key changes was the move from exports in the lower-end technology intensive sectors and product groups towards higher technology intensity of exports. As shown by Figure 2, all of the CEECs have significantly reduced their export shares in low-tech industries. One can, however, spot the difference in export restructuring across countries. Most of the CEECs have moved only one rung up the product ladder from low tech to medium-low tech sectors, while only a group of four core-CEECs (Czech Rep., Hungary, Poland and Slovakia) have shifted their exports to mainly medium-high and high tech sectors.

[Insert Figure 2]

To calculate the extent of overall changes in FDI and export restructuring across technology groups by estimating over the whole period, we estimate the following model:

$$\Delta Y_{ij} = \alpha + \beta_1 ML_{ij} + \beta_2 MH_{ij} + \beta_3 HT_{ij} + \eta_i + \varepsilon_{ij}, \quad (1)$$

where ΔY_{ij} is a change in share of exports and FDI, respectively, of particular industry j in total manufacturing of country i between 1995 and 2007. Explanatory variables include dummy variables for technology groups, whereby ML, MH and HT denote medium-low, medium-high and high-tech industries. Control group is low-tech industries (LT). The model is estimated by OLS, whereby we control for country fixed effects. The coefficients β_1, β_2 and β_3, hence indicate conditional average long-run changes in ML, MH and HT shares of FDI and exports, respectively, relative to the low technology industries.

[Insert Table 2a]

Table 2a shows that the changes in export shares across technology groups in CEECs in the period 1995-2007 went hand-in-hand with the changes in FDI shares. On average of all CEECs (see columns 1 and 2), largest gain is recorded in medium-low tech industries by increasing their shares of FDI in total manufacturing by 32 percentage points relative to the low-tech industries. This was matched with a relative increase of medium-high tech industries' export shares by 35 percentage points. The move towards medium-high tech industries was substantial as well, but to a lesser extent, whereby FDI and export shares increased by 24 and 32 percentage points, respectively. On average, CEECs also increased export shares of high-tech industries by 24 percentage points, but this was not accompanied by corresponding increases in FDI shares (the coefficient on FDI is low and insignificant).

As indicated by Figure 2, there is a lot of heterogeneity among CEECs, where four core-CEECs (Czech Rep., Hungary, Poland and Slovakia) seem to distinguish from the rest of the CEECs. In the subsequent analysis, we will hence differentiate between the group of core-CEECs and rest of the CEECs. Separate results for core and non-core CEECs in Table 2a confirm the differences between the groups. The group of non-core CEECs seems to have attracted most of FDI into the medium-low tech industries, which was matched with corresponding increases in export shares, but less so into medium-high tech industries. The group of core CEECs, however, attracted FDI mainly into medium-high tech sectors (increases by 50 percentage points), which was accompanied by the increased export shares of these industries by 46 percentage points. Core CEECs also increased export shares of high-tech industries by a slightly bigger margin (48 percentage points), which was accompanied by somehow lower and not significant increases in the FDI shares.

[Insert Table 2b]

[Insert Table 2c]

According to the GSC concept, FDI is supposed to facilitate the trade of the recipient countries, but not of any kind of trade. By being included in the global supply chains, firms (foreign subsidiaries) in the CEECs are supposed to increase imports of mainly intermediate goods and increase exports of either processed intermediates or assembled final consumer goods. Tables 2b and 2c reveal these patterns by showing the increases of export and import shares by the three product groups. Table 2b shows that non-core CEECS have increased exports mainly in intermediate and consumer product groups of medium-low and medium-high technology industries. On the other side, core CEECs mostly engaged in exports of intermediates in medium-high tech industries, but also succeeded to significantly increase exports of capital and consumer goods in high-tech industries. On the importing side, Table 2c does not reveal a clear pattern of changed structure in the group of non-core CEECs, indicating a lot of heterogeneity within this group of countries. The pattern, however, is much clearer in the group of four core CEECs, where imports of intermediates of all three technology groups have increased by large margins, but not in the groups of capital and consumer goods. This supports the GSC concept of increased imports of intermediate goods, followed by increased exports of processed intermediates or assembled final consumer goods.

3.2.2. Productivity growth and employment restructuring

Finally, we also account for the long-run changes in labor productivity and employment across the technology groups. Along with the GSC concept, CEECs are expected to increase productivity and employment shares in industries that attracted most of the FDI and that have restructured the most in terms of exports.

We account for these changes by estimating the model (1). As shown by Table 2d, labor productivity in the period 1995-2007 has increased in all industries of higher technology intensity relative to the low-tech industries. In non-core CEECs, relative increases of productivity varies between 40 and 64 percentage points in real terms as compared to the low-tech industries. The extent of the productivity increases seems to be correlated with the technology intensity. In four core CEECs, the relative productivity increases were higher by about 50 per cent relative to the group of non-core CEECs. The highest productivity gain was obtained by the group of medium-high tech industries (by about 100 percentage points more than in the low-tech industries).

[Insert Table 2d]

Economic restructuring In terms of employment did follow the general pattern of export restructuring and productivity growth, but not fully. Non-core CEECs have experienced employment growth mostly in the medium-low tech industries (by 50 percentage points more than in the low-tech industries), while four core CEECs managed to increase employment shares in the medium-high tech industries as well. The extent of increases of employment shares in the latter group, however, is smaller than for the export shares. This suggests increases in capital- and technology intensity within industry groups along with the inflow of FDI and export restructuring.

4. Impact of FDI on trade restructuring along the GSC concept

Previous section provided some stylized facts on how FDI inflows might have changed the landscape of the economies of CEECs. What appears to be undisputable is that FDI played a significant role in this restructuring. In this section we will shed more lights on the underlying mechanism.

In the 1990s, CEECs seemed to be a natural choice of advanced EU countries to relocate parts of the production processes towards cost-efficient economies in the region. Cost-effective manufacturing of intermediates or assembly of final consumer goods from the intermediates produced locally in particular CEECs or imported from headquarters or other subsidiaries was in the forefront of the strategy of Western MNEs. This strategy involves increased trade flows both between CEECs and advanced EU countries as well as among the CEECs themselves. Partly because capital and intermediate goods were imported to set up local production and to support manufacturing of new intermediates or for assembly processes, and partly because produced intermediates or assembled final consumer goods were exported to other CEECs or advanced EU countries. Baldwin (2011, 2012) asserts that a large fraction of these trade flows occurs within the same industry (i.e. intra-industry trade, IIT). Furthermore, he predicts a rise in the vertical intra-industry trade as imported intermediate goods might after processing be shipped back to the headquarters or other subsidiaries in the network of a MNE.

To our opinion, vertical intra-industry trade is not a very likely outcome of specialization along the global supply chains. A strict definition of the vertical IIT (see Greenaway, Hine, and Milner, 1995; Fontagné, Freudenberg, and Péridy, 1997; and Aturupane, Djankov, and Hoekman, 1999) requires substantial quality and hence price differentiation between the same imported and exported product variety. Usually, a 15 per cent threshold (a difference of ± 15 per cent) between export/import unit values is required, whereby – to ensure the comparability of the imported/exported products – product varieties are defined at the highest possible trade disaggregation level, i.e. at 8-digit Harmonized System (HS) classification. At this level of disaggregation, however, it is difficult to imagine that imported variety can be significantly processed and upgraded, but not to change its nature in the process and to fall into a different HS 8-digit product when being exported. Importing

a set of components in order to assemble them into a more complex intermediate good or into a final good does not meet the requirements of the vertical IIT.

The only way how FDI in the process of the GSC could lead to vertical IIT is importing varieties from the affiliate, relabeling them by the headquarter's brand name and then re-exporting with a substantial mark-up. Certainly, part of the trade flows between affiliates and headquarters may consists of this type of '*pass-on trade*' (see Damijan, Konings and Polanec, 2013), but this is not at the heart of the GSC concept. Similarly, one could "overcome" this problem by accounting for vertical IIT at a higher level of aggregation, such as 6- or 4-digit HS classification, which would allow for comparing import/export unit values of aggregated products. This, however, has nothing to do with the true concept of the vertical IIT. Based on this, we will account for the intra-industry pattern of trade of CEECs by sticking to the overall measure of the IIT, which comprises both horizontal and vertical IIT.

To test whether the GSC concept was at work in the CEECs we estimate the empirical model that accounts for the impact of FDI on export restructuring by controlling for export demand, imports and intra-industry intensity of trade. We estimate a version of the following model:

$$\Delta X_{ijt}^{k} = \alpha + \beta_1 \Delta FDI_{ijt} + \beta_2 shM_{ijt}^{k} + \beta_3 IIT_{ijt}^{k} + \beta_4 Q_{ijt} + \beta_5 M_{jt}^{EU} + \beta_6 EU_t + \eta_i + \delta T + \rho C + \varepsilon_{ijt}, \qquad (2)$$

where ΔX_{ijt}^{k} is an annual change in share of exports of type k products to OECD countries of particular industry j in total manufacturing of country i. ΔFDI_{ijt} denotes annual change in share of FDI stock of industry j in total manufacturing FDI stocks. shM_{ijt}^{k} is a log share of imports of type k products from OECD countries of industry j in total manufacturing, while IIT_{ijt}^{k} is a log of Grubel-Lloyd index of intra-industry trade of type k products in industry j (calculated at the HS 6-digit product aggregation). Q_{ijt} denotes industry's output, M_{jt}^{EU} is total imports of industry j in OECD countries, and EU_t is a dummy variable for EU accession taking value of 0 before accession and 1 afterwards. The model is estimated by OLS, whereby we control for country fixed effects (C) and industry (η_i) fixed effects as well as for time effects (T). The latter controls for common external shocks. Note, however, that we estimate (2) for the period 1995-2007, which spans after the common transition shock (1989-1994) and before the recent great recession (starting in 2009).

Key coefficients in estimating model (2) are β_1, β_2 and β_3, whereby the former indicates whether trade restructuring occurred along the inflow of FDI, and the latter two capture the mechanism of the GSC.

[Insert Table 3]

Table 3 shows results of estimating the model (2) by disaggregating the exports into three BEC groups (capital, intermediate and consumer goods). Results show that GSC concept is hardly able to explain the pattern of export restructuring in non-core CEE countries. The FDI variable is insignificant for all three wide product groups, though only marginally so for final consumer goods. Increased exports also do not seem to be determined by higher shares of imports of capital and intermediate group, the only exception being the imports of capital goods generating higher exports of capital goods as well. This suggests that FDI in non-core CEECs was probably not intended to serve as an export platform, at least not generally.

On the other side, GSC concept seems to be well suitable to explain the pattern of export restructuring in four core CEE countries. Increases in annual FDI stocks by industries can explain increases in the relative exports of intermediate and capital goods. Moreover, increasing shares of imports of capital goods are significantly associated with the export growth of all three types of goods, while increasing shares of intermediates seems to drive the exports of final consumer goods only. This implies that FDI in core CEECs has been used to set up the production of local affiliates involving increasing imports of capital goods (i.e. production lines and equipment). The mechanism of the GSC concept in the core CEECs, however, seem to be mainly working through imports of intermediates used in the assembly processes and exports of assembled final consumer goods. Another mechanism of the GSC at work might also involve exports of intermediates, but this does not seem to be associated with the previous imports of intermediates. This is confirmed by insignificant coefficients on IIT shares in all specifications indicating that increased exports of particular product group are not associated with the simultaneous imports and exports of very similar product varieties within the industry. While IIT shares in all of the countries have increased substantially over the period under examination, this is apparently not due to the working of the GSC. It might have to do with larger general competition within product groups, but apparently not with the exchange of similar product varieties within the network of the MNEs.

Other included variables in the model, such as industry output or industry's imports from the OECD countries do not seem to affect the export growth. The same is true for the EU accession (2004 for most of the countries), which returns mostly insignificant or even negative results for some specifications. This suggests that most of the trade restructuring has occurred before 2004.

Next, to account for further heterogeneity within manufacturing sector, we also estimate model (2) by grouping industries into four technology intensity groups. Unfortunately, due to the small number of observations, we had to give up on disaggregating the trade flows into three BEC groups.

[Insert Table 4a]

[Insert Table 4b]

Results for six non-core countries (see Table 4a) are somewhat discouraging, showing no correlation between relative growth of industries' FDI and export shares. Results even suggest a negative correlation between the variables for the group of medium-low tech industries. In addition, imports of capital and intermediate goods are shown either not be correlated with the export growth or even significantly negatively associated for the groups of medium-low and low-tech industries, which indicates that GSC mechanism may be poorly suited for explaining the trade dynamics of the six non-core economies. It is only the group of high–tech industries where export growth is positively associated with the share of imported intermediates.

Situation, however, is different for a group of core CEECs. Results in Table 4b reveal that increased relative exports of high-tech and medium-low tech industries are positively correlated with increased industries' FDI stocks. Mechanism of the GSC seems to work the best in the medium-low and low-tech industries where export growth is associated with either increased shares of imported capital or intermediate goods. Results are marginally insignificant in the high tech industries. Admittedly, these results are less conclusive than results presented in Table 3, arguably due to using aggregated trade data, which hide a lot of heterogeneity between different groups of products. There is a sacrifice to be made when estimating the model by the technology intensity groups as the number of observations per sample is further reduced.

To sum up, the global supply chains concept seems to be suitable to explain the pattern of export restructuring in four core CEE countries, but less so for non-core CEECs. An explanation for this, first, might lie in higher advancement of the core CEECs in terms of their inherited economic structure and, second, in their proximity to the core investing countries with larger industrial base, i.e. Germany. For the other countries, MNEs might had different objectives when investing there. One possible explanation is that MNEs have set up affiliates in individual countries mainly to supply the local and adjacent markets with final consumer goods, but they did not really integrate them into their global supply chains.

It remains to be seen how FDI and export restructuring have affected productivity growth of industries. We account for this in the next section.

5. Impact of trade restructuring along the GSC concept

As argued in the introductory section, large inflows of FDI do not necessarily translate into higher productivity growth. It is essential to note which industries have been attracting the majority of FDI flows. Figure 3 demonstrates that labor productivity growth at the industry level is not correlated with changes in industries' FDI stocks. This holds for both, non-core as well as core CEECs.

[Insert Figure 3]

Previous section has shown that in non-core CEECs FDI did not have a significant effect on export restructuring, while in core CEECs FDI has contributed to faster export growth in high-tech and medium-high tech industries. This distinction between the two groups of countries and industries might be essential for understanding the impact of FDI on aggregate productivity. As industries characterized by higher-end technology tend to grow faster as compared to low and medium-low tech industries, this may imply that countries increasing exports in industries with higher-end technology will experience higher aggregate productivity growth. To put it differently, in line with Hausmann, Hwang and Rodrik (2007), it seems to matter a lot what countries export. In this section, we test this proposition by accounting for differences in technology intensity of industries.

To capture the effect of export restructuring on industry productivity growth, we use the standard growth accounting approach. In the first stage we estimate a production function at the industry level to obtain industries' capital and labor shares:

$$VA_{ijt} = \phi + \alpha L_{ijt} + \beta K_{ijt} + \eta_i + \delta T + \rho C + \varepsilon_{ijt} . \quad (3)$$

This enables us to obtain industries' total factor productivity (TFP) as a residual from (3):

$$TFP_{ijt} = VA_{ijt} - \alpha L_{ijt} - \beta K_{ijt} . \quad (4)$$

Finally, to capture the impact of export restructuring on industry TFP growth we estimate the following model:

$$\Delta TFP_{ijt} = \alpha + \beta_1 \Delta X^k_{ijt} + \beta_2 EU_t + \eta_i + \delta T + \rho C + \varepsilon_{ijt} , \quad (5)$$

where ΔX^k_{ijt} is an annual change in share of exports of type *k* products to OECD countries of particular industry *j* in total manufacturing of country *i* and EU_t is a dummy variable for EU accession taking value of 0 before accession and 1 afterwards. The model (5) is estimated by OLS, whereby we control for country fixed effects (*C*) and industry (η_i) fixed effects as well as for time effects (*T*). The latter controls for common external shocks. We

estimate (5) for the period 1995-2007 and hence avoid the common transition shock (1989-1994) and the recent great recession (starting in 2009).

To capture a differential effect of varying technology intensity, we estimate (5) by segmenting industries into four technology groups. First, we present results obtained with aggregate industry exports and then proceed with results for exports disaggregated into the three BEC groups.

[Insert Table 5a]

[Insert Table 5b]

Table 5a shows that increased exports have contributed to TFP growth in four non-core CEE countries. A closer look, however, reveals that this is exclusively due to the export growth in low-tech and medium-low tech industries (the coefficient for the latter is marginally insignificant, but positive). On the other side, as shown by Table 5b, TFP growth in four core CEE countries is correlated with the growth of exports in the high-tech and medium-high tech industries, but not with the exports in industries with lower-end technology intensity.

Another point of interest is to compare the average effects of exports on TFP growth across country groups. While in core CEE countries each 1 percentage point in growth of exports translates into TFP growth of 0.23 percentage points, this effect is more meager in non-core CEECs – only about 0.16 percentage points. As revealed by Tables 5a and 5b, this is due to the fact that pro-growth effects of exports in higher-end technology industries are bigger than in industries with lower-end technology. This confirms that it matters a lot what countries export.

[Insert Table 6a]

[Insert Table 6b]

Tables 6a and 6b present results for growth effects of exports disaggregated to three BEC groups. Table 6a reveals that, in non-core CEE countries, the positive growth effect of exports on TFP growth in the low-tech industries is due to growth of exports of intermediates. In core CEECs, however, impact of exports on TFP growth seems to be confined to exports of high-tech capital goods and to exports of medium-tech intermediate and consumer goods. Results also show that pro-growth effects of exports of consumer goods are bigger than those of intermediate goods and capital goods. This suggests that margins in exporting final consumer goods might be bigger than in exporting intermediates or capital goods.

To sum up, the results show that export restructuring and economic specialization brought about by FDI during the last two decades in the CEE countries might matter for long run productivity growth. Countries attracting FDI to industries of higher-end technology intensity have boosted exports relatively more and consequently succeeded in higher productivity growth.

6. Conclusions

This paper studies the contribution of FDI to structural change in the Central and Eastern European Countries (CEECs) by veryfing the mechanism of the global supply chain (GSC) concept as developed by Baldwin (2011, 2012). Specifically, we account for the importance of industry and technology segment to which FDI has been attracted. We argue that the higher the technology intensity of the 'implanted' industries and products through FDI the higher will be benefits for the host country.

We tackle the complexity of the GSC concept by accounting for the technology intensity of industries and trade structure of imported and exported products. We employ industry-level data for 8 to 12 CEECs for the period 1995-2007. By accounting for technology intensity we show that FDI has significantly contributed to export restructuring in the CEECs, whereby the effects are shown to be heterogenous across countries. We find that more advanced core CEECs succeeded in increasing exports predominantly in higher-end technology industries, while non-core remain to specialize in exports of lower-end technology industries. This dichotomous export restructuring between both groups of CEE countries is shown to have played a crucial role in determining their potential for long-run productivity growth. Countries attracting FDI to industries of higher-end technology intensity have consequently succeeded in substantially higher productivity growth.

As noted by Baldwin (2012), these productivity improvements due to inflow of FDI may not necessarily predestine countries more lucky in attracting FDI to higher-end technology industries for long-run higher development levels. FDI may easily pull out of the countries leaving them without much homegrown economic foundations. Yet, so far FDI certainly helped the CEECs over the last decade and a half to grow faster in terms of TFP and to increase employment in higher-end technology industries. How sound and stable is this specialization in the long run, however, is another question.

Bibliography

Arnold, J., B.S. Javorcik and A. Mattoo. 2007. *Does Services Liberalization Benefit Manufacturing Firms? Evidence from the Czech Republic*. World Bank Policy Research Working Paper 4109. Washington, D.C.: World Bank.

Aturupane, Chonira, Simeon Djankov and Bernard Hoekman (1999) "Horizontal and Vertical Intra-Industry Trade between Eastern Europe and the European Union," *Weltwirtschaftliches Archiv*, Vol.135, No.1, pp. 62-81.

Baldwin, R. 2012. *Global Supply Chains: Why they emerged, why they matter, and where they are going*. CTEI Working Papers CTEI-2012-13. The Graduate Institute Geneva, Centre for Trade and Economic Integration.

Baldwin, R. 2011. *Trade and Industrialisation after Globalisation's 2nd Unbundling: How Building and Joining a Supply Chain are Different and Why It Matters*. NBER Working Paper 17716. National Bureau of Economic Research, Cambridge, MA.

Baldwin, R.E., Francois, J.F. and Portes, R. 1997. The Costs and Benefits of Eastern Enlargement: The Impact on the EU and Central Europe. *Economic Policy*, April, pp. 127-176.

Barba Navaretti, G. and A. Venables. 2004. *Multinational Firms in the World Economy*. Princeton, NJ: Princeton University Press, 2004.

Bellak, C. 2003. *FGM Survey*, Survey prepared for the Jubilaumsfondsprojekt 'Are the Geese Flying?' Vienna: The Vienna Institute for International Economic Studies (WIIW). Mimeo.

Borensztein, E., J. De Gregorio and J-W. Lee. 1998. How does foreign direct investment afect economic growth. Journal of International Economics, 45(1): 115-135.

Carkovic, M. and R. Levine. 2005. Does Foreign Direct Investment Accelerate Economic Growth?" in T.H. Moran, E.D. Graham, and M. Blomström (eds.), *Does Foreign Direct Investment Promote Development?* Washington, DC: Institute for International Economics, pp. 195-220.

Contessi, S. and A. Weinberger. 2009. Foreign Direct Investment, Productivity, and Country Growth: An Overview. *Federal Reserve Bank of St. Louis Review*, 91(2): 61-78.

Cutler, H., D.J. Berri and T. Ozawa. 2003. Market recycling in labour-intensive goods, flying-geese style: an empirical analysis of Easte Asian exports to the U.S. *Journal of Asian Economics*, 14: 35-50.

de Mello, L.R. 1997. Foreign Direct Investment in Developing Countries and Growth: A Selective Survey. *Journal of Development Studies*, 34(1): 1-34.

Damijan, J.P. and M. Rojec. 2007. Foreign Direct Investment and Catching up of New EU Member States: Is there a Flying Geese Pattern. *Applied Economics Quarterly*, 53(2): 91-117.

Damijan, J.P., M. Knell, B. Majcen and M. Rojec. 2003a. Technology Transfer through FDI in Top-10 Transition Countries: How Important are Direct Effects, Horizontal and Vertical Spillovers. *William Davidson Working Paper No. 549 (February)*. Ann Arbor: The University of Michigan Business School.

Damijan, J.P., M. Knell, B. Majcen and M. Rojec. 2003b. The role of FDI, R&D accumulation and trade in transferring technology to transition countries: evidence from firm panel data for eight transition countries. *Economic systems*, 27(2): 189-204.

Damijan, J.P., M. Rojec, B. Majcen and M. Knell. 2013. Impact of Firm Heterogeneity on Direct and Spillover Effects of FDI: Micro Evidence from Ten Transition Countries. *Journal of Comparative Economics.*

Damijan, J.P., J. Konings, S. Polanec. 2013. Pass-on Trade: Why do Firms Simultaneously engage in Two-Way Trade in the Same Varieties? *Review of World Economics,* 149 (1): 85–111.

Djankov, S. and B. Hoekman B. 2000. Foreign Investment and Productivity Growth in Czech Enterprises. *World Bank Economic Review*, 14: 49-64.

Dowling, M.T. and C.T. Cheang. 2000. Shifting Comparative Advantage in Asia: New Tests of the 'Flying Geese' Model. *Journal of Asian Economics,* 11: 443-463.

Dunning, J.H. 1993. *Multinational Enterprises and the Global Economy*. Wokingham: Addison Wesley.

Dunning, J.H. and S.M. Lundan. 2008. *Multinational Enterprises and the Global Economy, Second Edition*. Cheltenham: Edward Elgar.

Findlay, R., 1978. Relative backwardness, direct foreign investment, and the transfer of technology: a simple dynamic model. *Quarterly Journal of Economics*, 92: 1–16.

Fontagné, Lionel, Michael Freudenberg, and Nicholas Péridy (1997) "Trade Patterns Inside the Single Market," CEPII Working Paper No. 1997-07, April, Centre D'Etudes Prospectives et D'Informations Internationales.

Gonzalez, J.L. 2012. Vertical Specialisation and New Regionalism. PhD Thesis. University of Sussex.

Gorodnichenko, Y., J. Svejnar and K. Terrell. 2006. Vertical and Horizontal FDI spillovers in Transition Economies: Do Institutions Matter? Mimeo.

Greenaway, D., R.Hine, and C.Milner (1995) "Vertical and Horizontal Intra-Industry Trade: A Cross Industry Analysis for the United Kingdom," *Economic Journal*, Vol.105, November, pp.1505-1518.

Halpern, L. and B. Murakozy. 2006. Does Distance Matter in Spillover? Hungarian Academy of Sciences, Institute of Economics, CEU Department of Economics, Budapest. Mimeo.

Hausmann, R., J. Hwang and D. Rodrik. 2007. What you export matters. *Journal of Economic Growth*, 12(1): 1-25.

Hunya, G. (ed.). 2000a. *Integration through Foreign Direct Investment*. Cheltenham: Edward Elgar.

Hunya, G. 2000b. International Competitiveness Impacts of FDI in CEECs. *WIIW Research Reports no. 268*. The Vienna Institute for International Economic Studies, Vienna.

Kalotay, K. 2010. Patterns of inward FDI in economies in transition. Eastern Journal of European Studies, 1(2): 55-76.

Kinoshita, Y. 2000. R&D and Technology Spillovers via FDI: Innovation and Absorptive Capacity. CERGE-EI, Prague. Mimeo.

Kojima, K. 2000. The 'Flying Geese' Model of Asian Economic Development: Origin, Theoretical Extensions, and Regional Policy Implications. *Journal of Asian Economics,* 11:375-401.

Kojima, K. and T.Ozawa. 1985. Toward a Theory of Industrial Restructuring and Dynamic Comparative Advantage. *Hitotsubashi Journal of Economics,* 25(1):1-20.

Konings, J. 2001. The Effects of Foreign Direct Investment on Domestic Firms: Evidence from Firm Level Panel Data in Emerging Economies. *CEPR Discussion Paper No. 2586*.

Landesmann, M. 2003. Structural features of economic integration in an Enlarged Europe: patterns of catching-up and industrial specialisation. *European Economy No 181*. European Commission, Brussels.

Nicolini, M. and L. Resmini. 2010. Which Firms Create Them and Which Firms Really Benefit? FDI Spillovers in New EU member States. *Economics of Transition*, 18 (3): 487-511.

Nicolini, M. and L. Resmini. 2006. The Impact of MNEs on Domestic Firms in CEECs: A Micro-Econometric Approach. ISLA, Bocconi University, Milan. Mimeo.

OECD. 2002. Foreign Direct Investment for Development: Maximising Benefits, Minimasing Costs. Paris: OECD.

Ozawa, T. 1992. Foreign Direct Investment and Economic Development. *Transnational Corporations*, 1(1): 27-54.

Ozawa, T. 2000. The 'Flying-Geese' Paradigm: Toward a Co-evolutionary Theory of MNC-Assisted Growth, in: K. Fatemi (ed.), *The New World Order: Internationalism, Regionalism and the Multinational Corporations*. Amsterdam & New York: Pergamon: 209-223.

Ozawa, T. 2003. Pax Americana-led Macro-clustering and Flying-geese Style Catch-up in East Asia: Mechanisms of Regionalized Endogenous Growth. *Journal of Asian Economics,* 13(1):699-713.

Ozawa, T. 2012. FDI, catch-up growth stages and stage-focused strategies. *Columbia FDI Perspectives*, No. 70, May 28. Vale Columbia Center, New York.

Puga, D. and A.J. Venbales. 1996. The Spread of Industry: Spatial Agglomeration and Economic Development. *Journal of the Japanese and International Economies*, 10(4): 440-464.

Rosati, D.K. 1998. *The Impact of EU Enlargement on Economic Disparities in Central and Eastern Europe*. Shaping the New Europe: Challenges of EU Eastern Enlargement – East and West European Perspectives. WIIW 25 Years Anniversary Conference, November, 11-13. Vienna Institute for International Economic Studies, Vienna.

RWI. 2001. The Impact of Trade and FDI on Cohesion (Preparation of the "Second Cohesion Report"). Final report to the European Commission DG Regional Policy. Rheinisch-Westfälisches Institut für Wirtschaftsforschung e.V., Essen.

Schoors, K. and B. van der Tol. 2001. The Productivity Effect of Foreign Ownership on Domestic Firms in Hungary. University of Gent, Gent. Mimeo.

Sgard, J. 2001. Direct Foreign Investments and Productivity Growth in Hungarian Firms, 1992-1999. *Document de travail No. 01.19*. Paris: CEPII - Centre d'edutes prospectives et d'informations internationales.

Smarzynska, B. and M. Spatareanu. 2002. FDI Spillovers through Backward Linkages in Romania: Some Determinants. World Bank, Washington, D.C. Mimeo.

Smarzynska Javorcik, B. and M. Spatareanu. 2009. Tough Love: Do Czech Suppliers Learn from Their Relationships with Multinationals. *Scandinavian Journal of Economics*, 111 (4): 811-833.

Torlak, E. 2004. Foreign Direct Investment, Technology Transfer, and Productivity Growth in Transition Countries – Empirical Evidence from Panel Data. Cege Discussion Paper 26, Georg-August-Universität Göttingen, Göttingen.

Toth, I. and A. Semjen. 1999. Market Links and Growth Capacity of Enterprises in a Transforming Economy: The Case of Hungary. In I.J. Toth and A. Semjen eds., *Market Links, Tax Environment and Financial Discipline of Hungarian Enterprises*. Budapest: Institute of Economics, Hungarian Academy of Sciences.

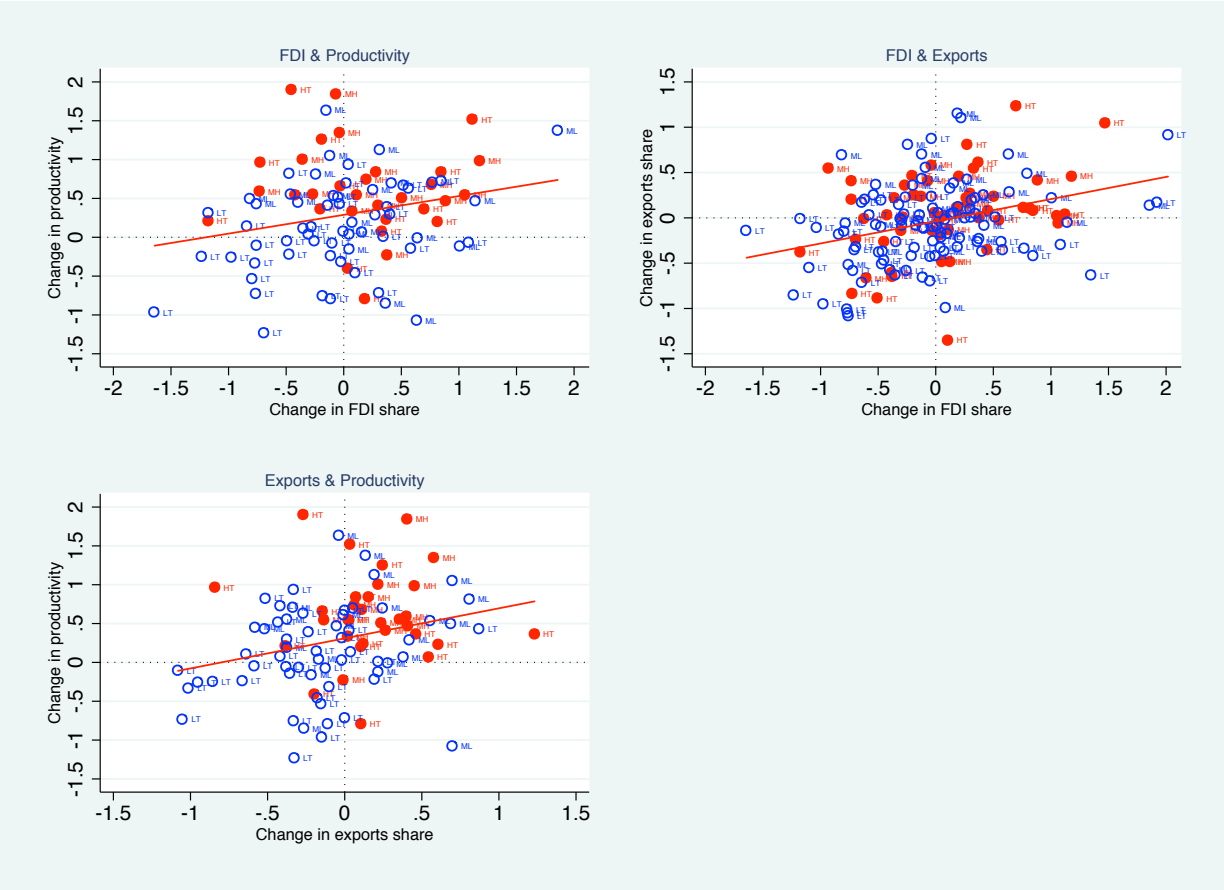
Tytell, I. and K. Yudaeva. 2005. The Role of FDI in Eastern Europe and New Independent States: New Channels for the Spillover Effect. *Working Paper No. 60*. Center for Economic and Financial research (CEFIR), Moscow.

Wang, J-Y., 1990. Growth, technology transfer, and the long-run theory of international capital movements. *Journal of International Economics*, 29: 255–271.

WIIW. 2000. Structural Developments in Central and Eastern Europe. WIIW Structural Report. The Vienna Institute for International Economic Studies, Vienna.

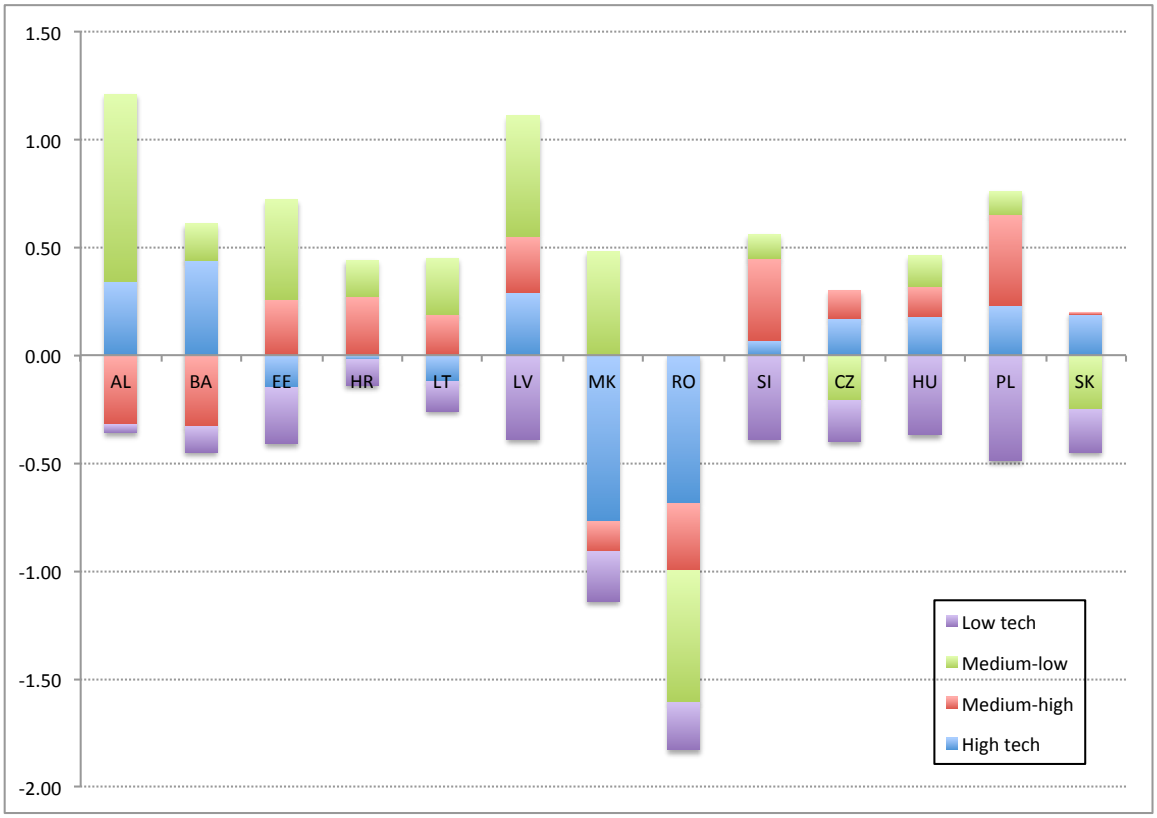
Tables and figures to be included into text

Figure 1: Correlation between FDI, exports and productivity in 14 CEE countries, total change between 1995 and 2007



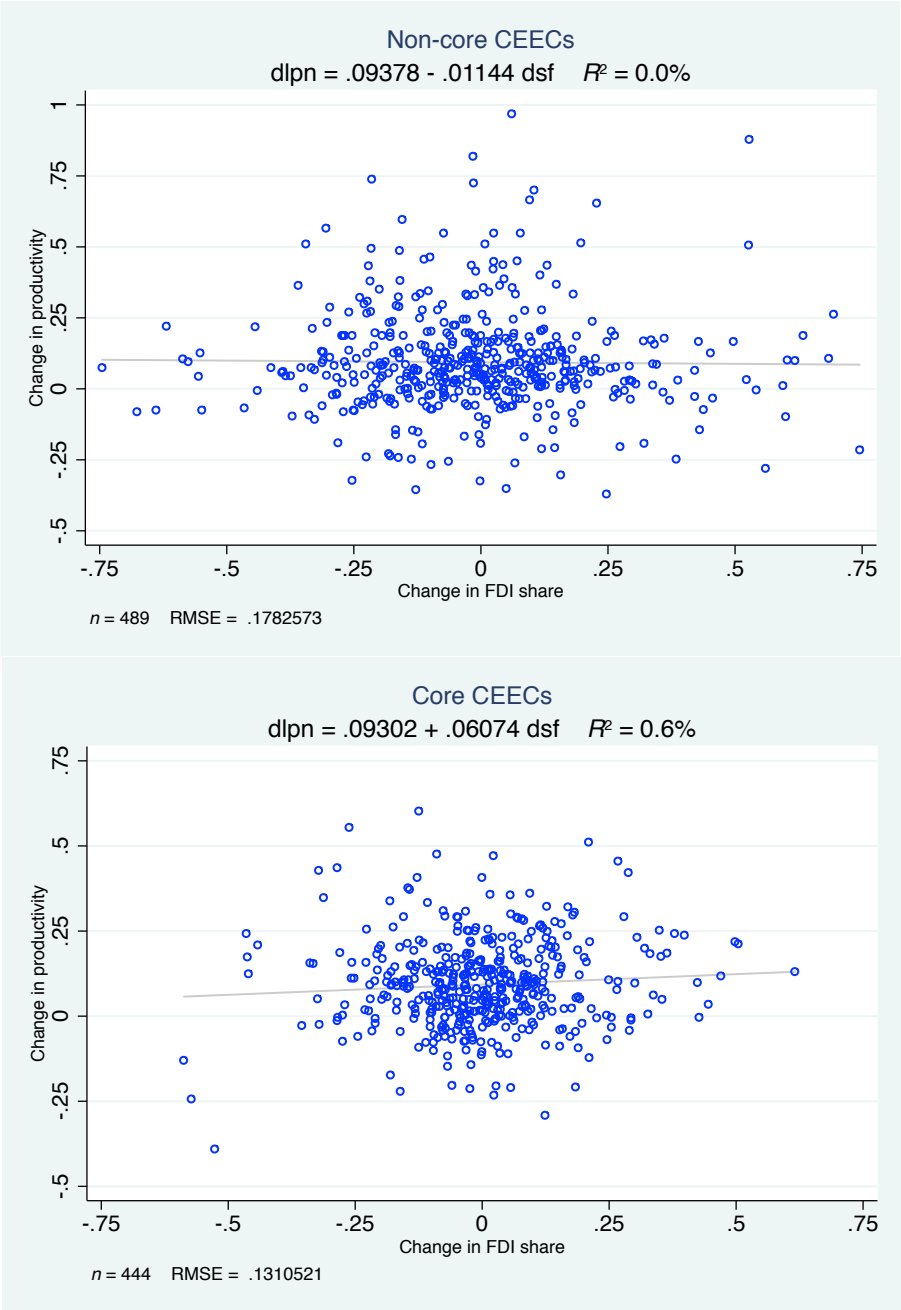
Notes: Data for 14 CEECs for Nace Rev. 1 2-digit industries. Upper figures depict relationship between total change in share of FDI of industry *j* in total manufacturing over 1995-2007 on total change in labor productivity (measured with value added per employee) in industry *j* and total change in share of exports of industry *j* in total manufacturing over the same period, respectively. Lower figure shows relationship between total change in share of exports of industry *j* in total manufacturing and total change in labor productivity in the same industry over 1995-2007. Change from 0 to 1 indicates a 100% change of particular variable relative to the initial value in 1995. Industries are assigned labels according to their technology intensity, where LT, ML, MH and HT refer to low-tech, medium-low tech, medium-high tech and high-tech based on OECD classification).

Figure 2: Changes in export shares by technology groups between 1995 and 2009



Notes: Average over industries of total changes of export shares in total manufacturing exports between 1995 and 2007.

Figure 3: Correlation between FDI and labor productivity in 10 CEE countries in the period 1995-2007, annual growth rates



Notes: Data for 10 CEECs for Nace Rev. 1 2-digit industries. Figures depict relationship between annual growth of share of FDI of industry *j* in total manufacturing and annual growth of labor productivity in industry *j* (measured with value added per employee). Core CEE countries: CZ, HU, SK, PL; non-core CEE countries: BG, EE, LT, LV, SI, RO.

Table 1: FDI inflows in CEECs and SEE-6 as percentage of total FDI inflows in EU-27 in 1998-2010; sub-period averages (in %)

	1998-2000	2001-2003	2004	2005-2007	2008-2010
Bulgaria	0.16	0.40	1.53	1.25	1.35
Czech Republic	1.01	1.69	2.23	1.43	1.42
Estonia	0.09	0.18	0.43	0.38	0.45
Hungary	0.63	0.94	1.92	0.96	1.04
Latvia	0.08	0.07	0.29	0.24	0.15
Lithuania	0.12	0.14	0.35	0.25	0.25
Poland	1.55	1.50	5.78	2.77	3.35
Romania	0.28	0.47	2.89	1.44	1.96
Slovakia	0.21	0.82	1.36	0.55	0.45
Slovenia	0.03	0.24	0.37	0.14	0.19
CEECs	**4.15**	**6.46**	**17.15**	**9.43**	**10.61**
Albania	0.02	0.05	0.16	0.06	0.27
Bosnia and Herzegovina	0.03	0.08	0.32	0.18	0.11
Croatia	0.23	0.46	0.53	0.54	0.85
Macedonia	0.03	0.07	0.15	0.06	0.09
Montenegro	0.00	0.01	0.03	0.11	0.29
Serbia	0.02	0.22	0.43	0.48	0.55
SEE-6	**0.32**	**0.89**	**1.61**	**1.43**	**2.16**

Source: Calculated from UNCTAD, World Investment Report 2011, Annex Table 1: FDI inflows by region and economy, 1990-2010; http://archive.unctad.org/Templates/Page.asp?intItemID=5823&lang=1.

Table 2a: Average total increase in FDI share and export share in total manufacturing by technology groups, 1995-2007

	All CEE countries (13)		Non-core CEE countries (9)		Core CEE countries (4)	
	FDI	Exports	FDI	Exports	FDI	Exports
	(1)	(2)	(3)	(4)	(5)	(6)
High-tech	0.112	0.235**	0.044	0.125	0.300	0.483**
	[0.80]	[2.46]	[0.26]	[1.10]	[1.45]	[2.67]
Medium-high	0.243*	0.317***	0.146	0.249**	0.505**	0.462**
	[1.74]	[3.32]	[0.85]	[2.18]	[2.45]	[2.56]
Medium-low	0.318**	0.348***	0.288*	0.410***	0.402**	0.190
	[2.60]	[4.10]	[1.92]	[4.05]	[2.17]	[1.17]
Constant	-0.043	-0.253*	-0.121	-0.188***	-0.133	-0.279*
	[-0.23]	[-1.97]	[-1.39]	[-3.04]	[-0.81]	[-1.94]
Observations	182	162	134	117	45	45
R-squared	0.075	0.211	0.029	0.134	0.196	0.225

Notes: Dep. variable: change in share of exports and FDI, respectively, of particular industry *j* in total manufacturing between 1995 and 2007. Explanatory variables: dummy variables for technology groups. Control group is low-tech industries. Regressions include country fixed effects. Core CEE countries: CZ, HU, SK, PL; non-core CEE countries: AL, BG, EE, HR, LT, LV, MK, SI, RO. Robust t-statistics in brackets; *** p<0.01, ** p<0.05, * p<0.1

Table 2b: Average total increase in export shares by BEC product groups and technology groups, 1995-2007

	Non-core CEE countries (9)			Core CEE countries (4)		
	Capital	Intermed.	Consumer	Capital	Intermed.	Consumer
	(1)	(2)	(3)	(4)	(5)	(6)
High-tech	0.049	0.080	0.140	0.181**	0.140	1.021***
	[0.83]	[0.67]	[1.49]	[2.47]	[0.91]	[4.77]
Medium-high	-0.021	0.211*	0.267***	-0.098	0.482***	0.332
	[-0.35]	[1.76]	[2.86]	[-1.34]	[3.12]	[1.55]
Medium-low	0.000	0.409***	0.153*	-0.020	0.108	0.229
	[0.00]	[3.86]	[1.85]	[-0.31]	[0.78]	[1.19]
Constant	-0.179**	-0.640***	-0.127	0.001	-0.214*	-0.234
	[-2.40]	[-4.24]	[-1.07]	[0.02]	[-1.74]	[-1.38]
Observations	117	117	117	45	45	45
R-squared	0.165	0.264	0.114	0.238	0.230	0.392

Notes: Dep. variable: change in share of exports of particular industry *j* in total manufacturing exports between 1995 and 2007. Explanatory variables: dummy variables for technology groups. Control group is low-tech industries. Regressions include country fixed effects. Core CEE countries: CZ, HU, SK, PL; non-core CEE countries: AL, BG, EE, HR, LT, LV, MK, SI, RO. Robust t-statistics in brackets; *** p<0.01, ** p<0.05, * p<0.1

Table 2c: Average total increase in import shares by BEC product groups and technology groups, 1995-2007

	Non-core CEE countries (9)			Core CEE countries (4)		
	Capital	Intermed.	Consumer	Capital	Intermed.	Consumer
	(1)	(2)	(3)	(4)	(5)	(6)
High-tech	-0.164**	-0.100	0.088	0.028	0.393***	0.088
	[-2.26]	[-1.02]	[1.45]	[0.35]	[2.91]	[0.90]
Medium-high	-0.203***	0.080	0.003	-0.371***	0.311**	-0.139
	[-2.80]	[0.81]	[0.05]	[-4.64]	[2.30]	[-1.43]
Medium-low	0.012	0.082	0.015	-0.071	0.270**	-0.042
	[0.18]	[0.95]	[0.28]	[-1.00]	[2.23]	[-0.48]
Constant	0.238**	-0.189	-0.044	-0.027	-0.237**	0.078
	[2.59]	[-1.53]	[-0.57]	[-0.42]	[-2.21]	[1.01]
Observations	117	117	117	45	45	45
R-squared	0.176	0.068	0.062	0.424	0.245	0.115

Notes: Dep. variable: change in share of imports of particular industry *j* in total manufacturing imports between 1995 and 2007. Explanatory variables: dummy variables for technology groups. Control group is low-tech industries. Regressions include country fixed effects. Core CEE countries: CZ, HU, SK, PL; non-core CEE countries: AL, BG, EE, HR, LT, LV, MK, SI, RO. Robust t-statistics in brackets; *** p<0.01, ** p<0.05, * p<0.1

Table 2d: Average total increase in labor productivity and employment by technology groups, 1995-2007

	Non-core CEE countries (6)		Core CEE countries (4)	
	VA/Emp	Empl.	VA/Emp	Empl.
	(3)	(4)	(5)	(6)
High-tech	0.637***	-0.066	0.684*	0.173
	[2.84]	[-0.37]	[1.89]	[0.91]
Medium-high	0.642***	-0.245	1.054***	0.319*
	[2.86]	[-1.37]	[2.91]	[1.67]
Medium-low	0.405**	0.501***	0.639*	0.328*
	[2.07]	[3.20]	[1.96]	[1.92]
Constant	-0.312*	-1.236***	0.838***	-0.143
	[-1.74]	[-8.58]	[2.90]	[-0.94]
Observations	48	48	45	45
R-squared	0.372	0.310	0.219	0.170

Notes: Dep. variable: long difference in log value added per employee and log employment, respectively, of particular industry *j* between 1995 and 2007. Explanatory variables: dummy variables for technology groups. Control group is low-tech industries. Regressions include country fixed effects. Core CEE countries: CZ, HU, SK, PL; non-core CEE countries: BG, EE, LT, LV, SI, RO. Robust t-statistics in brackets; *** p<0.01, ** p<0.05, * p<0.1

Table 3: Impact of FDI on export restructuring by type of products, first differences

	Non-core CEE countries (6)			Core CEE-4 countries		
	Capital	Intermed.	Consumer	Capital	Intermed.	Consumer
	(1)	(2)	(3)	(4)	(5)	(6)
Δ FDI_j	-0.007	-0.012	0.031	-0.000	0.037*	0.037**
	[-0.50]	[-0.69]	[1.65]	[-0.00]	[1.80]	[2.09]
Share Im_Cap_j	0.018*	0.006	-0.012	0.010**	0.011*	0.030***
	[1.90]	[0.51]	[-1.18]	[2.00]	[1.87]	[3.60]
Share Im_Inter_j	0.006	0.024	-0.013	0.005	-0.008	0.016*
	[0.77]	[1.61]	[-1.13]	[1.31]	[-0.90]	[1.70]
Share IIT_{jk}	0.002	-0.016	-0.009	-0.012	0.022	-0.000
	[0.33]	[-1.28]	[-0.87]	[-0.92]	[1.33]	[-0.02]
Δ $Output_j$	0.004	-0.012	-0.002	-0.002	-0.002	0.001
	[0.84]	[-1.31]	[-0.19]	[-0.65]	[-0.25]	[0.19]
Δ $EU\text{-}imports_j$	-0.011*	-0.010	0.015	-0.006	0.011	-0.006
	[-1.91]	[-0.78]	[1.48]	[-1.34]	[1.61]	[-0.71]
EU accession	-0.015	-0.027	0.042	-0.017	-0.044*	0.013
	[-0.45]	[-0.36]	[0.63]	[-0.62]	[-1.81]	[0.61]
Constant	0.063	0.104	-0.214	0.151*	-0.195*	0.013
	[0.90]	[0.62]	[-1.41]	[1.78]	[-1.83]	[0.11]
Observations	718	718	718	547	547	547
R-squared	0.046	0.047	0.065	0.053	0.087	0.161

Notes: Dep. variable: annual growth of share exports of type *k* of products of particular industry *j* in total manufacturing exports. Regressions control for country, industry and time fixed effects. Core CEE countries: CZ, HU, SK, PL; non-core CEE countries: BG, EE, LT, LV, SI, RO. Robust t-statistics in brackets; *** p<0.01, ** p<0.05, * p<0.1

Table 4a: Impact of FDI on export restructuring by technology groups, first differences

	Non-core CEE countries (6)				
	All	High-tech	Med-high	Med-low	Low-tech
	(1)	(2)	(3)	(4)	(5)
Δ FDI_j	-0.005	-0.026	0.046	-0.082**	0.007
	[-0.25]	[-0.60]	[0.87]	[-2.28]	[0.24]
Share Im_Cap_j	-0.002	-0.043	0.022	-0.117**	-0.173***
	[-0.21]	[-1.13]	[0.40]	[-2.31]	[-3.50]
Share Im_Inter_j	0.010	0.166***	-0.080	0.044	-0.080***
	[1.03]	[3.27]	[-1.14]	[1.28]	[-4.79]
Share IIT_{jk}	-0.014	-0.033	0.024	-0.007	-0.024
	[-1.55]	[-1.13]	[0.38]	[-0.21]	[-1.61]
Δ $Output_j$	-0.009	-0.014	0.007	0.005	-0.027*
	[-1.09]	[-0.25]	[0.07]	[0.17]	[-1.96]
Δ $EU\text{-}imports_j$	0.003	0.377*	-0.031	0.028	0.025*
	[0.31]	[1.93]	[-0.15]	[1.12]	[1.76]
EU accession	-0.003	0.081	-0.002	-0.040	0.019
	[-0.10]	[0.93]	[-0.01]	[-0.62]	[0.45]
Constant	-0.064	-5.125**	0.221	-0.291	-0.060
	[-0.52]	[-2.01]	[0.08]	[-1.06]	[-0.39]
Observations	718	123	118	176	301
R-squared	0.052	0.332	0.208	0.299	0.238

Notes: Dep. variable: annual growth of share of exports of particular industry *j* in total manufacturing exports. Regressions control for country, industry and time fixed effects. Non-core CEE countries: BG, EE, LT, LV, SI, RO. Robust t-statistics in brackets; *** p<0.01, ** p<0.05, * p<0.1

Table 4b: Impact of FDI on export restructuring by technology groups, first differences

	Core CEE countries (4)				
	All	High-tech	Med-high	Med-low	Low-tech
Δ FDI_i	0.051***	0.078*	0.102	0.050**	0.010
	[2.95]	[1.68]	[1.29]	[2.04]	[0.44]
Share Im_Cap_j	0.019***	0.052	0.017	-0.250***	0.157*
	[2.63]	[1.44]	[0.26]	[-3.19]	[1.66]
Share Im_Inter_i	-0.004	-0.014	0.049	0.112**	-0.009
	[-0.51]	[-0.22]	[0.47]	[2.01]	[-0.46]
Share IIT_{jk}	0.021	-0.020	-0.036	-0.051	0.019
	[1.16]	[-0.24]	[-0.42]	[-1.03]	[0.72]
Δ $Output_i$	0.003	-0.019	-0.007	0.000	0.023**
	[0.51]	[-0.34]	[-0.08]	[0.01]	[2.30]
Δ $EU\text{-}imports_i$	0.005	0.042	-0.135	-0.021	-0.016
	[0.70]	[0.37]	[-0.25]	[-0.75]	[-1.19]
EU accession	-0.031	-0.061	0.315	-0.052	-0.121*
	[-1.53]	[-0.46]	[0.96]	[-0.99]	[-1.93]
Constant	-0.172	-0.228	1.499	0.336	-0.014
	[-1.43]	[-0.16]	[0.22]	[0.73]	[-0.09]
Observations	547	98	98	134	217
R-squared	0.093	0.394	0.304	0.374	0.259

Notes: Dep. variable: annual growth of share of exports of particular industry *j* in total manufacturing exports. Regressions control for country, industry and time fixed effects. Core CEE countries: CZ, HU, SK, PL. Robust t-statistics in brackets; *** p<0.01, ** p<0.05, * p<0.1

Table 5a: Impact of export restructuring on industry productivity growth by technology groups, non-core CEE countries (4)

	All	High-tech	Med-high	Med-low	Low-tech
	(1)	(2)	(3)	(4)	(5)
Δ Exports$_j$	0.158***	0.171	-0.100	0.201	0.156***
	[3.76]	[1.28]	[-1.30]	[1.56]	[3.09]
EU accession	-0.050**	0.029	0.047**	-0.003	-0.011
	[-2.05]	[1.09]	[2.05]	[-0.10]	[-0.88]
Constant	0.065***	0.059**	0.050**	0.117***	0.066***
	[3.52]	[2.29]	[2.41]	[4.52]	[5.38]
Observations	540	90	84	138	228
R-squared	0.657	0.659	0.766	0.606	0.642

Notes: Dep. variable: annual growth of total factor productivity in particular industry *j*. Regressions control for country, industry and time fixed effects. Non-core CEE countries: EE, LT, LV, SI. Robust t-statistics in brackets; *** p<0.01, ** p<0.05, * p<0.1

Table 5b: Impact of export restructuring on industry productivity growth by technology groups, core CEE countries (4)

	All	High-tech	Med-high	Med-low	Low-tech
Δ Exports$_j$	0.231***	0.176*	0.297***	0.175	0.052
	[5.61]	[1.74]	[3.52]	[1.47]	[0.68]
EU accession	-0.024	0.024	0.022	0.006	0.011
	[-1.05]	[1.16]	[0.85]	[0.41]	[0.78]
Constant	0.089***	0.050**	0.079***	0.069***	0.038***
	[5.42]	[2.30]	[2.94]	[4.51]	[2.62]
Observations	538	90	90	133	225
R-squared	0.316	0.333	0.353	0.345	0.238

Notes: Dep. variable: annual growth of total factor productivity in particular industry *j*. Regressions control for country, industry and time fixed effects. Core CEE countries: CZ, HU, PL, SK. Robust t-statistics in brackets; *** p<0.01, ** p<0.05, * p<0.1

Table 6a: Impact of export restructuring on industry productivity growth by type of products and technology groups, non-core CEE countries (4)

	All	High-tech	Med-high	Med-low	Low-tech
	(1)	(2)	(3)	(4)	(5)
Δ Exp_Capital$_j$	0.016	0.109	-0.050	-0.204	0.093
	[0.31]	[0.79]	[-0.89]	[-0.57]	[0.66]
Δ Exp_Interm.$_j$	0.175***	0.163	-0.141	0.183	0.094*
	[4.04]	[1.41]	[-1.02]	[1.48]	[1.84]
Δ Exp_Cons.$_j$	0.043	-0.052	0.192	0.142	0.073
	[0.92]	[-0.57]	[1.33]	[0.52]	[1.33]
EU accession	-0.052**	0.032	0.062**	-0.002	-0.013
	[-2.09]	[1.17]	[2.54]	[-0.08]	[-1.05]
Constant	0.065***	0.058**	0.048**	0.120***	0.067***
	[3.51]	[2.22]	[2.28]	[4.53]	[5.36]
Observations	540	90	84	138	228
R-squared	0.659	0.665	0.773	0.606	0.637

Notes: Dep. variable: annual growth of total factor productivity in particular industry *j*. Regressions control for country, industry and time fixed effects. Non-core CEE countries: EE, LT, LV, SI. Robust t-statistics in brackets; *** p<0.01, ** p<0.05, * p<0.1

Table 6b: Impact of export restructuring on industry productivity growth by type of products and technology groups, core CEE countries (4)

	All	High-tech	Med-high	Med-low	Low-tech
Δ Exp_Capital$_j$	0.084	0.273**	0.024	0.079	0.285
	[1.61]	[2.08]	[0.33]	[0.22]	[0.76]
Δ Exp_Interm.$_j$	0.173***	0.083	0.349***	0.152	-0.037
	[4.26]	[0.75]	[4.15]	[1.22]	[-0.52]
Δ Exp_Cons.$_j$	0.069	-0.079	0.401*	0.153	0.104
	[1.61]	[-1.10]	[1.96]	[0.85]	[1.50]
EU accession	-0.022	0.034	0.038	0.008	0.009
	[-0.94]	[1.61]	[1.46]	[0.52]	[0.63]
Constant	0.085***	0.044**	0.067**	0.070***	0.037**
	[5.18]	[1.99]	[2.51]	[4.53]	[2.58]
Observations	538	90	90	133	225
R-squared	0.312	0.357	0.398	0.348	0.245

Notes: Dep. variable: annual growth of total factor productivity in particular industry *j*. Regressions control for country, industry and time fixed effects. Core CEE countries: CZ, HU, PL, SK. Robust t-statistics in brackets; *** p<0.01, ** p<0.05, * p<0.1