GRINCOH Growth-Innovation-Competitiveness
Fostering Cohesion in Central and Eastern Europe

Synthesis Report: WP2. International Context of cohesion: the Role of Trade and FDI

WP coordinator: Károly Attila SOÓS (IE CERS HAS)
This Report has been prepared with the cooperation of János Gács, Gábor Hunya, Björn Jindra and Magdolna Sass.

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1. Executive summary

From the beginning of transition in 1989/90, the CEECs switched towards an 'open economy' model of economic development, and the evolving patterns of trade, industrial specialization and integration into cross-border production networks through foreign direct investment (FDI) have played a crucial role in structural changes and modernisation processes of CEECs' economies.

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However, the economic crisis and the rise of global competition from other, mainly Asian, emerging economies challenge the future sustainability of the development model adopted by CEECs. This triggers also questions about an appropriate policy mix to foster competitiveness via trade and FDI. Against this backdrop, research in this work package provides an update of the role and further potential of internationalization processes for the region's economic cohesion and growth.

First, the work package provided an assessment of changes in the CEECs position in international trade patterns at the detailed product level: this entailed an assessment of technological and product quality upgrading and the impact this has on firm- and industry-level productivity.

Task 1: Changing patterns of CEECs' trade as a facilitator of EU integration:

- The share of exports in the GDP of CEECs increased rapidly until the crisis (2008-2009), and after a temporary setback, started to recover in recent years. The inclusion of CEECs – particularly in the case of some Central European ones – in international (mostly European) production networks also implies extensive exports and imports of semi-fabricates. We find that selected CEECs are among the few most open, most export-based economies of the world. At the same time, their exports are also highly concentrated, mostly on engineering (including automotive) industries. This specialisation entails obvious advantages but it also implies risks, and may call for the diversification of industrial structures.

- The dominant export market of the CEECs is the EU. Taking into consideration that much of this intra-EU export consists of products and services to be built into goods and services produced in EU15 and subsequently exported into non-EU countries, we can understand that the dependence of these CEECs' exports on EU (final) demand is considerably smaller than at first glance. (e.g., only approximately half, rather than two thirds, of Hungarian exports, and about three fifths, rather than three quarters, of Slovak exports go to the EU as final destination).

- However, our research indicates that CEECs' respectable export performance is increasingly the result of market access factors (geographical distance, etc.), with the contribution of their supply capacity having been modest as compared to other country groups. More closely, price competitiveness is a serious issue: too fast price (unit value) increase entails a relative worsening of export performance. Furthermore, we have found that the competition among CEECs shows signs of being based on product quality, but competition with other countries is dominated by cost aspects.

Task 2: Impact of trade on CEECs' productivity, innovation and technology upgrading:

- Besides quantitative growth, qualitative upgrading – upward movement on the technology ladder and increasing unit values – can also be observed in CEECs' exports. A related question is whether the movement towards higher technology levels in exports also necessarily means upgrading of the work performed on export products in CEECs. Or alternatively, are these exports produced mostly by relatively simple, low-pay, e. g., assembly activities which fail to generate high levels of value added? Our research results confirm a trend observed also for other emerging market countries: wages in the production of exported goods tend to be higher than in the production of goods for the domestic market.

- Our research investigated whether trade in variety is an explanation for rising skill premiums in countries at a different level of development. For the EU-27 trade in export varieties has a

positive impact on both the cost shares of low and high educated workers whereas the one on the medium educated is negative. This is similar when considering import varieties. Whereas, trade volumes are significantly positive for both medium and high-skilled workers, the increase in the import and export varieties – which have been largest for the CEECs on average – impact significantly negatively on the medium and high-educated labour cost shares.

- Furthermore, we provide new evidence in explaining the innovation-exporting nexus. We find a positive correlation between innovation and exporting status for EU firms, with the quantitatively highest correlation found between exporting status and product innovation. While firms in the CEECs are in general more likely to innovate, the impact of exporting on innovation for firms in CEECs is significantly smaller than that of non-CEECs. Firm size also has a smaller effect on innovation in case of CEEC firms, whereas, foreign ownership has a significantly larger impact on innovation. This confirms that foreign affiliates are an important driver of innovations and exports in CEECs.

Task 3: Effects of FDI on CEECs' firms catching-up:

- To date, the substantial body of empirical literature on spillovers from inward FDI has produced mixed empirical results. We investigate different effects of inward FDI on domestic firms' performance in CEECs accounting for firm heterogeneity. We find that horizontal (or within industry) spillovers have become increasingly important over the last decade and might become even more important than vertical (inter industry) spillovers. Firms' heterogeneity in terms of absorptive capacity, size, productivity and technology level significantly affect productivity effects of inward FDI. Both direct effects from foreign ownership as well as the spillovers from foreign firms do substantially depend on the absorptive capacity and productivity level of individual firms.

- The impact of FDI in services in CEECs is an important issue since services dominate inward FDI in general and in the CEECs in particular. Services FDI could increase manufacturing sector productivity by lower prices of services, higher quality of services, greater variety of services, but also via increasing competition and horizontal knowledge spillovers to local service firms. We find positive and significant impact of service FDI on domestically owned firms' productivity in CEECs. Disaggregation by sector shows that foreign presence in the energy sector drives the positive effect of the aggregate service linkage.

- CEECs also increasingly engaged in outward FDI (OFDI) until the start of the economic crisis. EU accession prompted an increase of OFDI from CEECs and reorientation from CEECS to EU15 destination countries. Location choice analysis indicates that market seeking constitutes the dominant investment motive and efficiency seeking does not play a considerable role. OFDI from CEECs after EU accession can be only to a limited extent be associated with technology related location factors factors in host locations. This seems to apply especially in case of direct OFDI i.e. FDI undertake by fully domestic owned firms from CEECs. Thus the nexus between OFDI and technologocal catching-up is weak for CEECs, which is in contrast to previous findings for other, mainly Asian, emerging markets.

- Now a subsequent question was to what extent internationalization in terms of OFDI translates into productivity growth. In contrast to previous findings for a number of developed countries, we find no robust evidence of an effect of OFDI on productivity growh in case of CEECs firms. Although we observe that firms with foreign subsidiaries experience

significantly higher productivity growth than either firms with no subsidiaries or those with domestic subsidiaries, this effect seems to be only relevant in two countries (Czech Republic, Romania) and does not appear to be long lasting.

Task 4: The role of inward FDI in CEECs' production and innovation networks:

- Case study evidence from the automotive and electronics industry in Hungary, which is characterised by a high share of foreign R&D in total R&D, examined the dynamaics of R&D activities in foreign owned subsidiaries. Results indicate a prevalence of asset-augmenting or knowledge-seeking motives for R&D rather than local market adaptation. In addition, there seem to be cases in which local R&D does not only support local production, but also carries out tasks for the whole multinational company, bearing a global responsibility. Functional upgrading—within and across busines functions—was affected by subsidiaries' continuous capability accumulation as well as MNEs organisational consolidation in response to the economic crisis.

- Prior evidence showed that in CEECs technological activities of foreign subsidiaries are often implemented without considerable linkages to various actors in the domestic innovation system. Survey evidence reavealed that about 30% of foreign subsidiaries entertain R&D co-operation with domestic network partners with significant differences across host countries and sectors. Public research institutions are more frequently selected as partners for R&D cooperation than local suppliers or customers. An R&D mandate of the foreign subsidiary, its technological capability as well as technological embeddedness with the parent company are positively associated with the incidence of R&D cooperation. We found that the regional knowledge stock is positively associated with the probability of R&D co-operation.

- Third, the work package has addressed directly the role that FDI plays in the dynamics of cohesion. On the one hand, we have investigated the relationship between FDI, human capital and long-term income growth of regions across the EU and within CEECs; on the other hand, research addressed the link between FDI location, agglomeration economies in advanced regions and policy intervention.

Task 5: Role of FDI in terms of regional development and policy impact:

- Our findings suggest a weak process of overall GDP per capita income convergence in all EU regions between 2003 and 2010 as well as a "poverty trap" for poor regions within CEECs in lower income classes. Higher FDI stocks per se are only weakly positively associated with higher long-term GDP per capita growth rates in both the EU and the CEECs regions. In contrast, we find higher long-term GDP per capita growth rates in regions with above average human capital endowment. In addition we find support for a strong complementarity between FDI and human capital. Overall results indicate the existence of domestic as well as foreign-led regional growth patterns in CEECs.

- Regionally different state aid ceilings as well as the development of special/industrial zones/parks influenced the location choice of investors in selected CEECs. Some of the less developed regions received more aid and also more FDI projects than before the crisis, but regional disparities in development levels hardly changed. Policies applied to NUTS-2 regions usually benefited from existing agglomerations in the given region; a different approach may be necessary to treat backwardness in less urbanized and under-developed territories.

Task 6: Policies to foster sustainable competitiveness through trade and FDI:

The work package has reflected upon the existing policy approach to trade and FDI and discussed possible adjustments for a continued 'open economy' strategy of CEECs in a changing international context with an exploration of cohesion aspects in its various dimensions. Besides formulating the basic policy orientations and the policy conclusions and implications of all research papers in a separate chapter of this report, a policy paper on knowledge spillovers from FDI and the positioning of CEECs in a global shift in production and innovation has also been prepared.

- Our policy conclusions discuss the problem of competitiveness of CEECs, the relationship between companies'exporter status and innovation, CEECs' participation in cross-border value chains (production networks) and the issues of export concentration, the possibilities to influence the regional distribution of FDI, the regional efficiency of FDI and its relationship with the redional knowledge base, FDI's contribution to foreign technology linkages of domestically owned companies and the spillover effects of FDI in manufacturing and the service sector.

- Our policy paper states that general economic policies and regulatory frameworks are more important than specific, targeted instruments and measures directed at FDI, and only within a coordinated policy framework could specific FDI policies be successful. We argue for (non-coercive) policies of stimulating linkages of foreign affiliates with local firms; for building research capacities in the public sector (which strengthens R&D in the business sector); for supporting high-tech activities regardless of the industry, rather than high-tech industries; for applying incentives for employee training; and for the establishment and strengthening of industrial, technological and science parks. We have to keep in mind the increasing pressure under which CEECs come in particular Asian emerging economies in terms of location of production and innovation activities. More emphasis on technological aspects in the investment schemes would not only increase the potential for technological spillovers from MNEs but also improve the absorption capability of domestic firms.

2. Objectives and methodology

The overarching objective of this work package has been to analyse the role of the changing international context in terms of trade and Foreign Direct Investment (FDI) on the economic cohesion process of Central and East European Countries (CEECs) within the European Union (EU) and the wider global economy. Our purpose has been to advance the state of the art by addressing the following issues:

- To assess the relevance of changing patterns of CEECs' trade as a facilitator of EU integration. This has required the analysis of the impact of trade on CEECs' productivity, technology, and innovation upgrading.

- To scrutinise the productivity effects of inward/outward FDI on CEECs' firms in terms of catching up, to analyse the embeddedness of inward FDI in CEECs' production and innovation networks, and to investigate the location patterns of FDI at the regional level across CEECs.

- To derive policy conclusions on how trade and FDI can foster enhanced cohesion of CEECs, cutting across different policy areas such as investment incentives, innovation, and regional development.

Our work has not always been aimed at finding solutions to any problems, improving the functioning of CEECs' economies, formulating proposals for economic or other policies. In certain fields, it is simply important, indeed very important, to understand what tendencies, interactions among economic phenomena prevail, even though we do not see real possibilities to change them (e. g., the impact of cross-border production networks on relative wages in CEECs) and sometimes we even do not know what kind of policy (intervention in what direction) would we propose if we could propose measures of intervention (e. g., the impact of foreign trade on skill premiums).

Despite the occurrences of such non-policy-oriented analyses, most of our work has been aimed at producing such knowledge, from which policy conclusions do follow.

Of course, we could not treat the CEECs as a homogeneous bloc. Differences among them have been important for our research. The inherited level of economic development, the speed of transition to the market economy, the distance from large western European economic agglomerations and other factors differentiate CEECs; the differences have largely been taken into consideration in our research.

Our research methods have been the traditional ones; of course, following various traditions.

The general and obligatory element among them is literature review, in other words the clarification of the "state of the art", without which we could hardly formulate questions worth to (try to) answer or hypotheses worth to test. Also obligatory has been the use of the relevant data, meaning databases of the Eurostat, national statistical offices and other important databases like Amadeus, fdimarkets.com, wiod.org, etc. We also assisted in updating an important database: the IWH FDI Micro Database.

In searching answers and performing tests we largely apply econometric methods. Over the last few decades, these methods have become extremely various. A common requirement on them is the application of robustness test on estimation results; our papers comply with this rule.

A minority of papers apply no or little econometrics, but do use extensive analysis of statistical and other quantitative data.

One paper is based on interviews with economic decision-makers.

3. Evidence of analysis – synthesis

3.1. Task 1 Changing patterns of CEECs' trade as a facilitator of EU integration

3.1.1. Unit labour costs, unit values and export performance

Central and Eastern European countries arrived partly from Soviet or Yugoslav intra-federation trade, partly from the rather particular CMEA (Council for Mutual Economic Assistance) trade system – almost from other worlds – into „normal" international economic relations: into WTO- and later also EU-regulated cross-border trade of goods, services and capital (and, within the latter, FDI). Our investigation of export prices (unit values) and unit labour costs of (some) CEE countries, as well as our analysis of CEECs' general export performance have dealt with some important general features of the integration of the CEECs into this world of international trade.

Our research of export prices (unit values) and unit labour costs founds itself on the results of previous works but with the important innovation that our interest is not restricted on the changes of these indicators but also extends on their absolute levels. Once we have some knowledge on levels, we can also attribute more sense to changes – namely we can see whether changes represent divergence of convergence of the different national levels of the indicators. The levels in question have been subject to very few research; the article closest to our approach is Hallak-Schott 2011. The latter authors addresse the relation between unit values and qualities and give a detailed description of calculating unit value levels. Among CEECs, they consider Hungary, Poland and Romania, and rank the countries by unit value levels. By the complexity of the issues studied, we were also forced to restrict the research on the Czech Republic, Hungary, Poland and Slovakia to Germany, using Austria's export as a benchmark.

As concerns unit values, we have found that in 2005 (in line with Hallak-Schott 2011) Hungarian exports displayed rather high indicators, whereas Czech and Polish unit values were rather low. Further, our results indicate convergence: an initially 10% higher unit value corresponds to almost 1% (0.96) lower change in UV between 2005 and 2010. However, this relationship varies by country. In Poland and the Czech Republic, some convergence is present, but it is particularly strong in Slovakia. Besides convergence across countries, we also find such trend across products within a country, see Table 1.

Table 1. Estimated UV convergence values

	I. Simple OLS			II. Value weighted OLS		
	Est. Coeff.	s.e.	R^2	Est. Coeff.	s.e.	R^2
Full sample	-0.0961***	0.0110	0.0671	-0.0695***	0.0065	0.1143
Hungary	-0.0466**	0.0188	0.0304	-0.0764***	0.0162	0.1741
Czech Rep	-0.0729***	0.0169	0.0924	-0.0285**	0.0113	0.0570
Slovakia	-0.1613***	0.0301	0.0716	-0.1513***	0.0207	0.2498
Poland	-0.0850***	0.0177	0.0704	-0.0480***	0.0090	0.1254

We sought and found relationship between unit values and exported quantities. First we calculated this for all products, then – see the second bunch of columns in table 2 – for overlapping products. The relationship is negative in both cases, as expected.

Table 2. Unit value Regressions: levels negatively correlated with quantities

VARIABLES	I. Full sample			II. Restricted sample		
	Dependent variable: log unit value in 2005					
log quantity in 2005	-0.493***	-0.424***	-0.423***	-0.683***	-0.554***	-0.553***
	(0.0434)	(0.0395)	(0.0393)	(0.0777)	(0.0741)	(0.0736)
log value of total	0.442***	0.320***	0.320***	0.576***	0.454***	0.452***
imports of Germany	(0.0587)	(0.0482)	(0.0484)	(0.111)	(0.115)	(0.114)
market share out of	1.978***			3.416***		
CEE4 countries in 2005	(0.229)			(0.425)		
wage share		-0.357			-0.926***	
		(0.223)			(0.154)	
ULC1 level in 2005			-0.0411			-0.133
			(0.206)			(0.236)
CZ	-0.0288	0.341***	0.365***	0.135**	0.525***	0.599***
	(0.0393)	(0.0873)	(0.0923)	(0.0596)	(0.0973)	(0.0800)
SK	-0.210***	-0.362***	-0.284***	-0.148*	-0.379***	-0.153
	(0.0672)	(0.0778)	(0.0754)	(0.0781)	(0.0526)	(0.0958)
PL	-0.123***	0.108*	0.164***	0.00973	0.220**	0.385***
	(0.0384)	(0.0498)	(0.0474)	(0.0289)	(0.0849)	(0.113)
Constant	-1.158	1.435**	1.262**	-0.632	2.089	1.366
	(0.767)	(0.482)	(0.470)	(1.599)	(1.669)	(1.614)
Observations	14,978	14,978	14,978	1,808	1,808	1,808
R-squared	0.543	0.483	0.482	0.767	0.667	0.666

Notes: HS8 level. Restricted sample means sample of commonly exported (overlapping) goods. All regressions include industrial sector dummies (based on NACE classification). Standard errors, clustered at industry level, in parentheses. *** p < 0,01, ** p < 0,05, * p < 0,1

Similar negative correlation of UV levels with quantities is also supported by the data on the industry level, and changes in quantities also negatively correlate with changes in UVs. At the same time we have found that changes in market shares correlate positively with changes in UVs. However, „market share" here means share in the total exports of our four countries to Germany, rather than in total German imports. The plausible interpretation of these ostensibly contradictory results is that

on the German market our four countries compete with each other primarily with quality and goodwill, whereas against other exporters their weapons are the prices.

Further, we decomposed the change of the share of the four countries in total EU27 exports to Germany into three margins: the extensive margin (number of products), the unit value margin and the quantity margin, in order to see which country in which way increased its exports to Germany. We found that the Czech and Slovak exports increased significantly during the 2000s. This is decomposed to a strong growth in all margins: the number of Czech and – somewhat less – Slovak products exported, quantities exported and prices at both countries grew in parallel, with the latter suggesting strong quality upgrading. A similar pattern can be observed in the Polish case, with the difference that export unit values were still relatively low in 2010. The quality of Polish exports may have increased, but it still seems to be lower than that of the other countries under study. In contrast, the Hungarian share on the German market stagnated during the second half of the 2000s. The decomposition suggests relatively high and increasing Hungarian export unit values together with relative stagnation of quantities. (We have to add that this slow growth followed an outstandingly high growth period.)

We have also examined connections between unit labour costs (ULCs) and volumes of value added in manufacturing and various industries within manufacturing. We did not find any clear connections between shares in value added and levels of ULCs. At the same time, we found negative relationship between changes in ULCs and changes in the volume of value added in all of the countries: a larger (smaller) increase in ULC involves a smaller (larger) increase in volume.

This strand of our research has shown that the four countries are integrated into the mechanisms of trade in the EU: they are participants of both price and quality competition. The inter- and intra-country convergence of unit values reflects the transformation of their output structure in line with the requirements of open economies. The observed „catching-up" phenomena (e. g., Czech and Slovak export unit values' getting closer between 2005 and 2010 to the previously increased Hungarian ones) reflect uneven but basically parallel development of international competitiveness in the different countries.
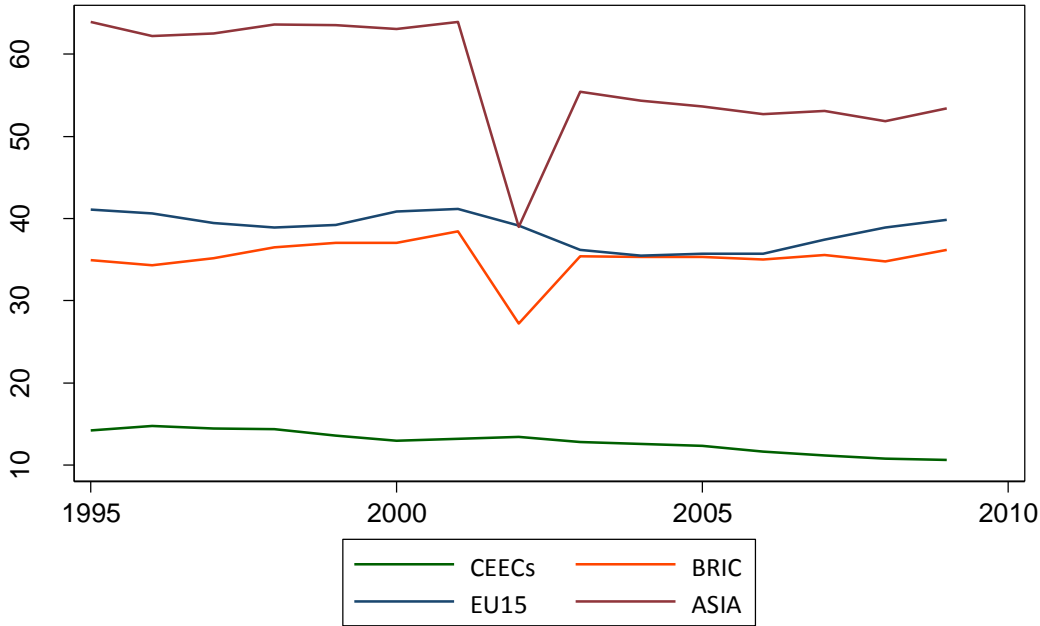
3.1.2.   Export performance – market access versus supply constraints

In another line of our research, we have analysed the determinants of the impressive growth of CEECs' export performance between 1995 and 2011 in a comparative perspective with other groups of countries. Based on the relevant theoretical concepts, we have followed the approaches of Redding and Venables (2004, 2004a), Fugazza (2004), and Damijan, Rojec and Ferjančič (2011), and have distinguished between foreign market access and the supply capacity determinants of export performance. We built an econometric model to assess the determinants of export performance in two steps: first, we assessed the contribution of foreign market access against that of supply capacity improvement, and second, we assessed the importance of individual factors determining the foreign market access and supply capacity. We also looked at the effect of EU accession and current financial and economic crisis on CEECs export performance growth.

The contribution of supply capacity to the CEECs' export performance has been decreasing steadily since the high of year 2000, and has become smaller than that of other country groups studied (see Figure 1). Supply capacity in 2011 contributed less than five percent to CEECs' export performance, the remaining being accounted by foreign market access. Interestingly, the financial and economic crisis of 2008-2009 didn't have a significant impact on this trend. It seems that along with the

ongoing EU accession, the contribution of the foreign market access component to CEECs' exports has been gaining in importance. Thus, export performance of CEECs' in the last decade or so has been predominantly due to their better position in the EU market, while the contribution of their own supply capacity has been decreasing. The situation in other groups of countries, which exhibited the highest export growth in the last 15 years (BRIC, Asia[1], EU-15) show much higher and stagnating contribution of supply capacity to their export performance.

Figure 1. Dynamics of the contribution of supply capacity
to export growth in percent

As concerns the various components of the supply capacity, productivity of the exporting country negatively impacts the supply capacity of CEECs. Given the fact that trends in real ULC of CEECs since their accession to the EU have not been at all favourable, i.e. they have not improved their wage competitiveness vis-a-vis the EU-15 countries; this is in line with expectations. Inward FDI penetration has a positive impact on CEECs' export performance, with the size of the impact depending to a major extent on the share of FDI into manufacturing sectors. Export unit values, denoting the structural changes of CEECs' exports, have a significant negative impact on CEECs' supply capacity.

The distinctive contributions of this strand of research have been: (i) the model has taken into account a broader set of explanatory variables of supply capacity than previous studies; (ii) CEECs' export performance has been put in comparative perspective with other transition countries and emerging economies; (iii) this has been the first examination of CEECs' export performance spanning beyond 2004, i.e. beyond the time of EU accession and, thus, enabling distinction between pre- and post-EU accession period, as well as between pre-crisis and crisis period.

In the light of this research, the future of CEECs' export growth seems to be at jeopardy because the benefits of EU accession seem to have been mostly exploited, and the internal supply capacity is less

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[1] Thailand, Hong Kong, Macao, Singapore, Malaysia, Indonesia, Philippines, Taiwan and South Korea.

and less important base of their export performance. A key determinant of the latter negative trend is deteriorating cost competitiveness.

3.1.3. Export concentration, vertical specialisation, intra-industry trade

Two strands of our research have analysed CEECs' trade from the point of view of integration of the CEECs into cross-border production networks or value chains. These networks can be examined in breakdown by countries or by industries. As concerns the latter, our analysis identifies several key conclusions:

- Vertical specialization intensified the most in manufacturing;
- High-tech sectors are major drivers of growing vertical specialization in manufacturing;
- There is non-negligible cross-industry heterogeneity in changes in vertical specialization with some industries also experiencing losses in vertical specialization over time;

Furthermore, within the manufacturing sector, vertical specialisation intensified the most in the high-tech sector: with almost 30 percentage points, vertical specialization increased the most in the Electrical and optical equipment industry (NACE 30t33) followed by the Transport equipment industry (NACE 34t35) with an almost 22 percentage points increase in vertical specialization. Similarly, impressive increases in the degree of vertical specialization of over 10 percentage points are observable in the Leather, leather and footwear industry (NACE 19), the Coke, refined petroleum and nuclear fuel industry (NACE 23), the Machinery industry (NACE 29), the Textiles and textile products industry (NACE17t18) and the Wood and products of wood and cork industry (NACE 20).
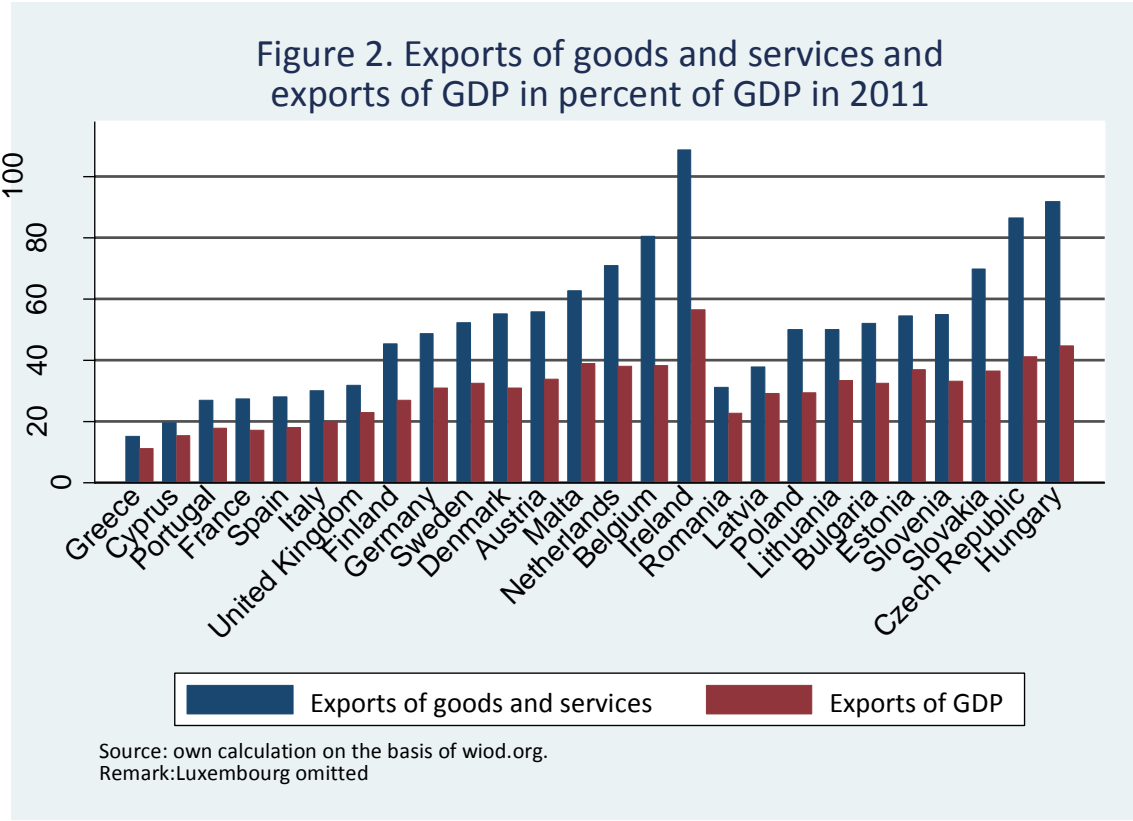
As concerns the other kind of breakdown, intensive participation of the countries in such networks – vertical specialisation – seriously distorts the statistical display of the foreign trade of countries. Exported goods and services contain imported inputs. The foreign value added content of individual countries' export may be quite high. Thus, exports are "blown up". Besides that, vertical specialisation may, and in the case of a few CEECs it does, significantly influence the territorial and sectorial distribution, concentration of exports (and imports). The true representation of export's distribution are the shares of national value added, consumed or invested in various foreign countries or groups of countries (territorial distribution) and the shares of national value added, consumed or invested anywhere abroad in the form of products (services) of different sectors (sectorial distribution).

The density of cross-border production networks is much higher in intra-EU than in extra-EU trade. An important consequence of this difference is a further ostensible blow up: that of the share of intra-EU trade within total trade. In this trade, the share of imported components of goods and services included in (i. e. used in the production of) exported goods and services is relatively high, higher than in the member countries' extra-EU trade. Consequently, the data showing the share of individual member countries' exports beyond the borders of the EU belittle the actual dependence of the member countries on extra-EU demand. For the latter purpose, we should know what share of the GDP produced in a country and exported from it is consumed and invested outside the EU.

Thanks to "world input-output tables" created by a group of economists (see http://www.wiod.org/new_site/database/wiots.htm), calculating the latter indicator is not impossible. On the basis of the tables (available for 1995-2011, 40 countries including the 27 pre-2013 member states of the EU plus the "rest of the world" and 35 NACE- and CPA-based sectors), input-output coefficients, Leontief inverses and exported value added (GDP) data can be calculated,

and can be compared to the (rough) data of exports of goods and services. Any country's exported GDP can also be determined in any combination of sectors and importing (final user) countries.

Taking the rough statistical data and based on such calculations, respectively, we display in Figure 2 the shares of the exports of goods and services and the shares of GDP exports in the GDP for 27 EU member countries.

Figure 2. Exports of goods and services and exports of GDP in percent of GDP in 2011

Source: own calculation on the basis of wiod.org.
Remark: Luxembourg omitted

The exports of goods and services are, of course, larger in all countries than GDP exports – the difference between the two is vertical specialisation –, but the difference varies across countries, taking higher values not as much for small countries, as for those more deeply involved in cross-border production networks: Denmark, Austria, Malta, the Netherlands, Belgium and Ireland among old EU members, Slovenia, Slovakia, the Czech Republic and Hungary among CEECs. But we are also interested in the difference of the intra-EU versus extra-EU breakdown of the two kinds of measurement of exports. In Figure 3, we display the share of extra-EU exports in the exports of

goods   and   services   and   in   GDP   exports.

Figure 3
Extra-EU exports of goods and services in percent of the total
and extra-EU exports of GDP in percent of the total in 2011
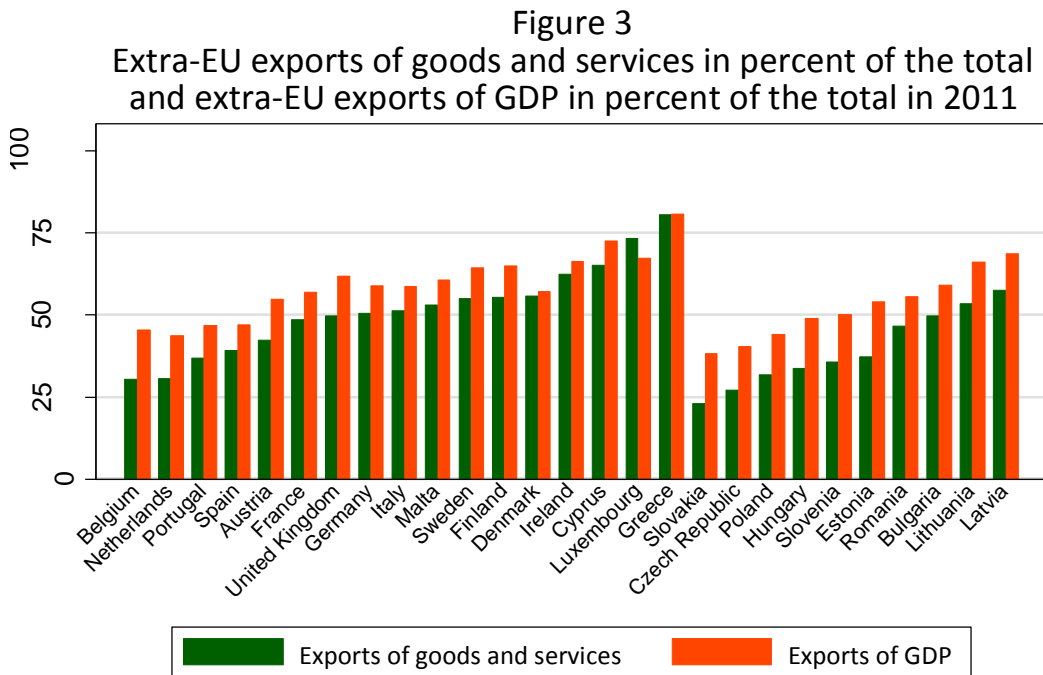
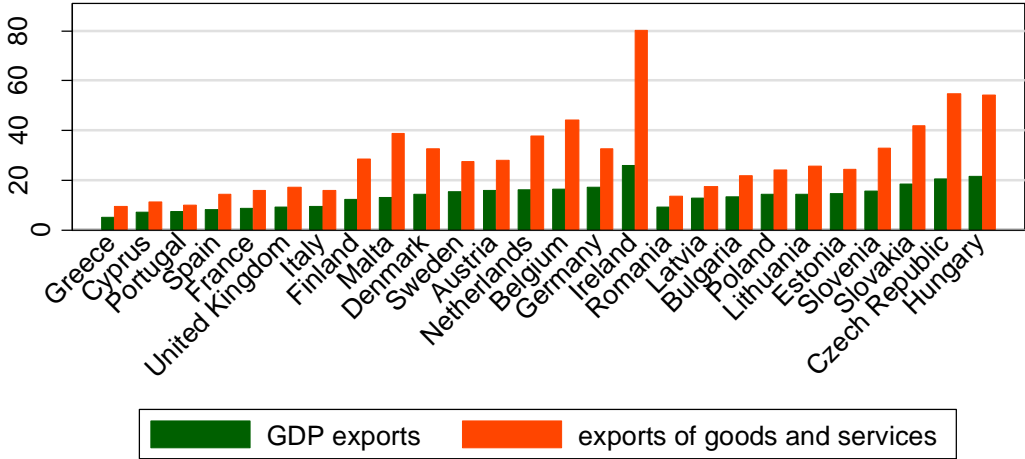Source: Own calculations on the basis of wiod.org.

In all countries, except for the heavily service-exporting Greece and Luxembourg, the extra-EU share of GDP exports is lower than that of the exports of goods and services. But we can also observe that the difference between the two shares does not have everywhere the same size. The biggest difference between the extra-EU share of GDP exports and exports of goods and services can be observed in Belgium, the Netherlands, Slovakia, the Czech Republic, Hungary, Slovenia and Estonia. In the case of these countries, the explanation of the difference in question is not restricted to the higher density of cross-border production networks within the EU. A further obvious reason why these countries' extra-EU GDP exports are high relative to their exports of goods and services is their important role of producers of component parts and subassemblies for extensive extra-EU exporters. (E. g., German cars exported to many countries in the world often have significant import content originating from the enumerated countries.)

Besides territorial concentration, we have also analysed the sectorial concentration of exports. We do not deal with this issue at the product level, for two reasons. First, we have found that neither high concentration in individual countries nor important cross-country differences can be observed at that level in the EU. Second, data for such analysis in terms of value added exports is not available.[2] We analyse sectorial concentration at the level of 35 sectors, following the world input-output tables.

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[2] Besides these two reasons for not analysing sectorial concentration on the product level, a third one might be that such concentration seems to be less dangerous than concentration at higher sectoral levels – e. g., on the level of the 35 sectors of the world input-output tables. Let us mention the example of the Hungarian steel and motor industries. The latter industry until 1991 had been restricted for all practical purposes to the production of buses for Soviet exports and a limited amount of trucks. Those exports disappeared together with the Soviet Union and then, within some years, the motor industry began to produce almost only passenger cars (and component parts, subassemblies for such cars). Győr and Szentgotthárd, cities previously not at all related to

One usual measure of concentration is the share of the five largest sectorial exports in total exports. These shares are displayed for EU member countries, for both GDP exports and exports of goods and services, in Figure 4. The high concentration of the exports of goods and services is extreme in the cases of the Czech Republic, Slovakia and Hungary, and their GDP exports' concentration is also outstandingly high; Estonia and Slovenia's indicators are also rather high.

Figure 4
The share of the five largest sectorial exports in percent of
total exports of goods and services and the share of the
five largest sectorial GDP exports in total GDP exports in 2011
(Data in percent)

Source: own calculations based in wiod.org.
Remark: Luxembourg is omitted.

And let us also mention that our indicator reflects only the level of dependence of exports (exports of GDP or of goods and services) on the demand for the products and services of the largest export sectors of the CEE countries, whereas the really interesting issue is the level of dependence of total GDP. The latter dependence is the function of export concentration and of the exported share of the GDP. The latter is displayed in Figure 2, showing that the five countries' exported GDP share is also outstandingly high, which increases their exposure to foreign demand, enhancing the potential danger of the strong sectorial concentration of their exports.

The largest export sectors of these countries are different fields of engineering, primarily automotive industry, and construction. The establishment of clusters of these industries in these (and even though to a lesser extent in other) CEECs entails obvious synergies, advantages in technological development and other fields. However, the strong dependence on the motor industry – one of

passenger car production, fast became important sites of the European passenger car industry. The transition to new subsectors within the motor industry was not painless, but it was rapid and smooth. It was not cheap in terms of investments but foreign car producers were ready to meet those costs. As compared to this, the crisis of iron metallurgy – i. e., a whole sector – has transformed some previously flourishing North Eastern Hungarian cities into sites of studies of pauperisation.

those industries having the largest idle production capacities in the world – also entails dangers which were already felt by Slovakia in 2009[3].

The means of analysing intra-industry trade (IIT) were originally not developed for the analysis of trade based on cross-border production networks (vertical specialisation); nevertheless, these means can be used fruitfully in the largely and increasingly vertical specialisation-based intra-EU trade of CEECs.

The classical literature of IIT underlined the fundamental role played by the level of manufacturing and general economic development in the advancement of a country's IIT with others (Balassa – Bauwens 1987). Thus, IIT first appeared more or less as a privilege of advanced countries. However later, with the emergence of the distinction between horizontal and vertical IIT, the theoretical framework for a subordinated, low-tech role of "developing" countries in IIT was also created (e. g. Greenaway – Hine 1991).Then, lots of studies described the trade of emerging market countries (e. g. Clark – Stanley 1999) with developed ones on this basis, and some authors found that this framework holds for CEECs, too. (e. g. Aturupane et al. 1999). Others, rather than finding such actual development, forecast it as the likely future of the manufacturing sector of the CEECs, (Gabrisch – Werner 1998). However, their pessimism was not corroborated by actual developments; the more optimistic forecasts of Winters, – Wang (1994, p. 133) and Halpern (1995, p.83) proved right.

We measure IIT at the 8-digit level of the combined nomenclature, using the "classical" Grubel–Lloyd IIT index (Grubel – Looyd 1975). For the sake of comparison, we also present a similar figure for 10 of EU-15 countries: Austria, Finland, Germany, Greece, Ireland, Italy, the Netherlands, Portugal, Spain and Sweden. CEECs' IIT share has been rapidly increasing between 1995-2011, but cross-country differences within the group have remained important, see Figure 8. Highest IIT levels can be observed at the "Visegrad" group (the Czech Republic, Hungary, Poland, Slovakia) and Slovenia. Obviously, Romania's, Bulgaria's and the Baltic countries' relatively large geographical distance from such industrial "superpowers" like Germany and northern Italy certainly reduces their IIT levels. Previous multiple regression analysis also supports the importance of this impact (Fertő – Soós 2008). But even so, Baltic and Balkan countries have rapidly increasing IIT levels.

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[3] As the European Automobile Manufacturers' Association's Slovakia Country Profile (at http://www.acea.be) stated, this country was then the largest per capita car producer in the world. The Slovak economy is strongly exposed to the car idustry's international fluctuations. The automotive industry accounted for 17% of this country's total GDP in 2010, the vast majority of which was destined for export, cf. Automotive (2012). In Slovakia the decline of manufacturing production in 2009 was „led unsurprisingly by the car industry, which had previously been the growth motor.", cf. Hugh (2009).

Figure 5. The share of IIT in the countries' total trade

Source: own calculations based on Eurostat Comext
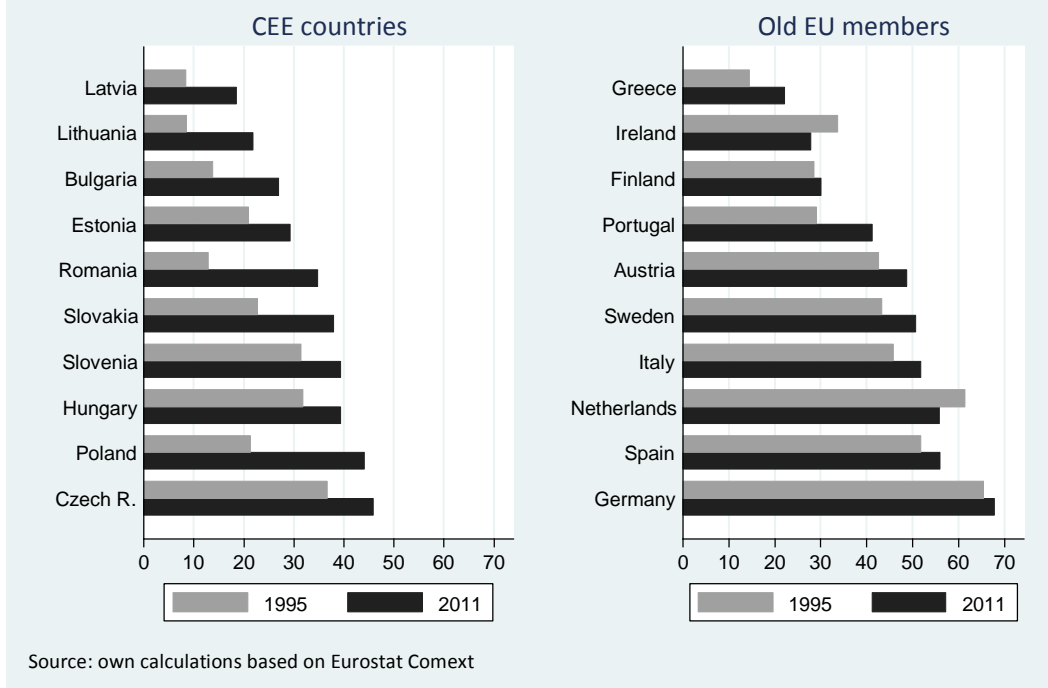
For the purposes of presenting the quality level of CEECs' participation in IIT, we have calculated the shares of their (and the 10 "control group" countries') horizontal, low-quality vertical and high-quality vertical IIT with EU-15. IIT is horizontal if the difference between export's and import's unit values is smaller than 15 percent. If export's unit value is below import's unit value by more than 15 percent then we face low-quality vertical IIT. In case of similar difference in the opposite direction, IIT is high-quality vertical. We display the development of the share of the three kinds of IIT in total manufacturing trade with EU-15 between 1995 and 2011 in Figures 6 to 8.

Figure 6. The development of low-quality vertical IIT's share in total trade

CEE countries

Old EU countries
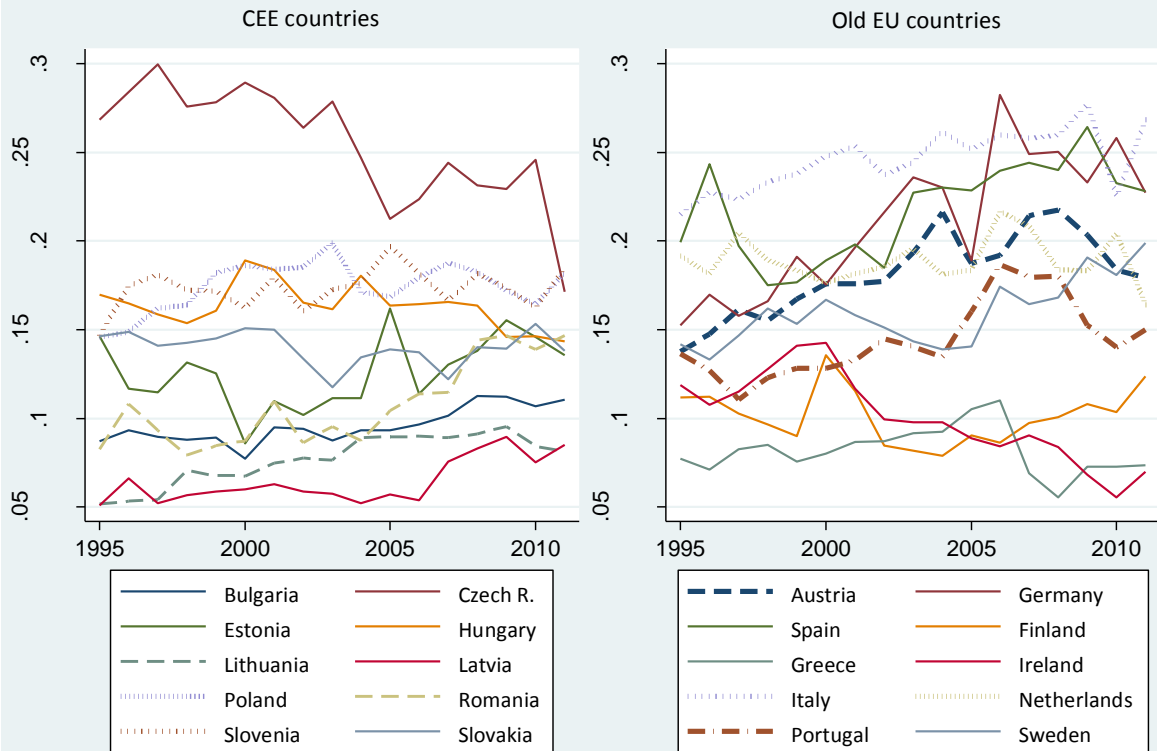
Source: own calculations on the basis of Eurostat Comext.

Figure 7. The development of horizontal IIT's share in total trade

CEE countries

Old EU countries
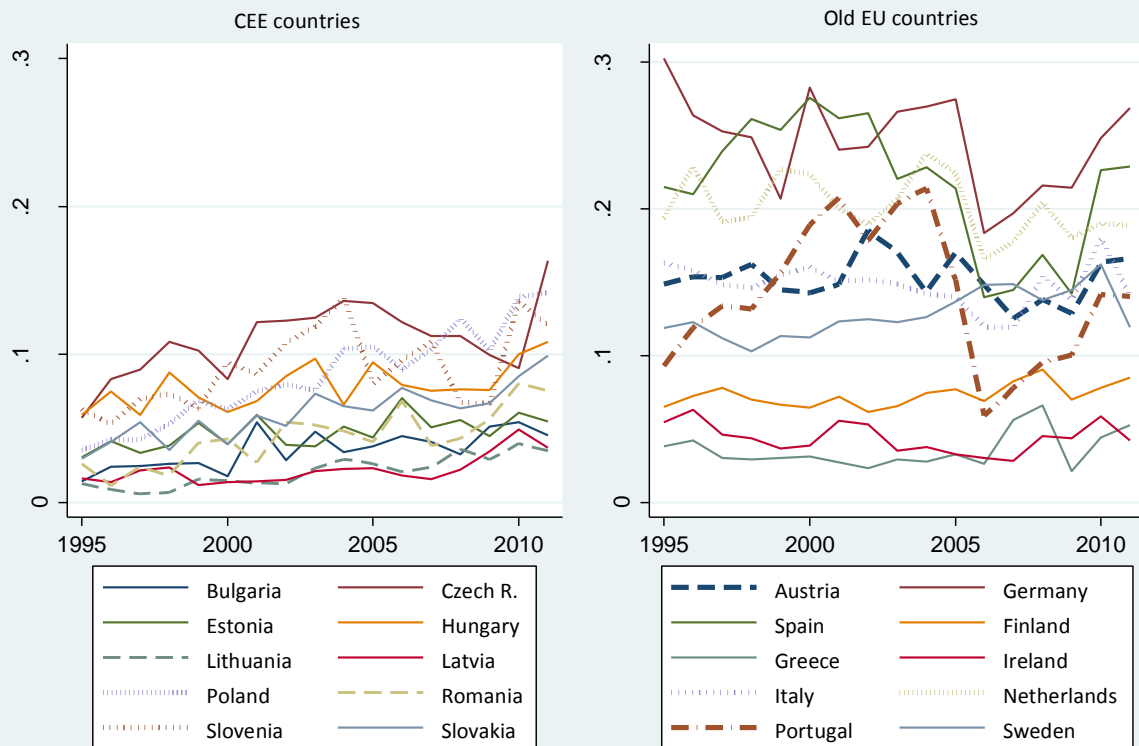
Source: own calculations on the basis of Eurostat comext.

Figure 8. The development of high-quality IIT's share in total trade

Source: own calculations on the basis of Eurostat Comext

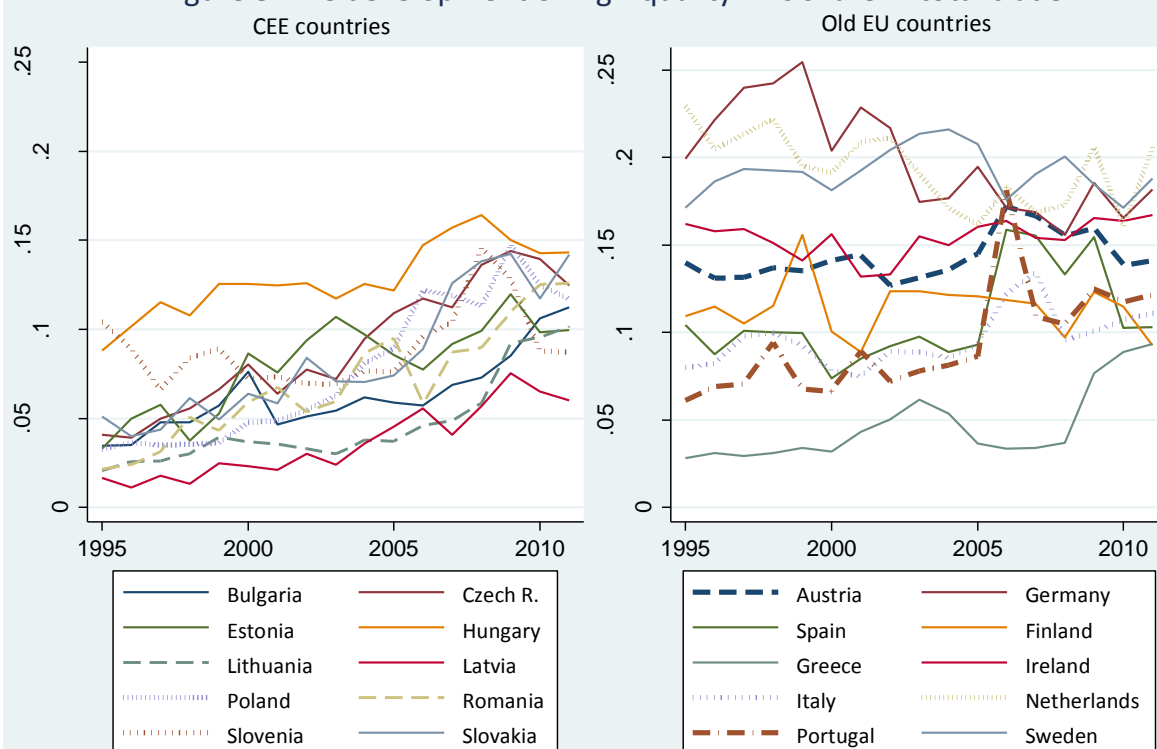The Figures reflect strong trends of quality upgrading in all CEE countries. Albeit low-quality IIT's share has been increasing in Balkan and Baltic countries, the other two kinds' increase can be observed in all CEECs. No country seems to be locked in specialisation on low-quality, and Hungary's, the Czech Republic's and Slovakia's IIT quality structure has got close to that of the technologically most advanced old EU member countries.

We have also dealt with the question: what is the impact of export growth and increasing vertical specialisation on main indicators of economic development. Theoretically, there are two arguments in favour of a positive effect of increased openness on growth: firstly, following the Ricardian tradition, the exploitation of comparative advantages through specialization fosters growth. Secondly, as advocated by the endogenous growth tradition, the exploitation of economies of scale or knowledge and technology spillovers results in higher growth. Empirically, evidence seems to point at a positive relationship between trade and income. For instance, Frankel – Romer 1999 demonstrate that trade has a non-negligible and significant effect on income. Specifically, they calculate that an increase in the ratio of trade to GDP by one percentage point increases income per capita by between 0.5 and 2%. And despite the heavy criticism this analysis received for its proxy of trade, empirical analyses that corrected for its methodological shortcomings reach similar conclusions. For example, Noguer – Sicart 2005 use data from World Trade Database and find that trade has a large and significant effect on income. Similarly, a positive relationship is also found between trade and labour productivity, with causation running from trade to labour productivity. For example, for different proxies of trade exposure and openness, Ades – Glaeser (1999), Frankel – Romer 1999 and others find a positive and significant causal effect of trade on labour productivity. Additionally, empirical evidence also points at a positive trade-employment nexus. For instance,

Sousa et al. 2012 shed light on the relationship between trade and employment and quantify the number of jobs in the EU that are supported by sales of goods and services to the rest of the world.

As against the impact of the growth of exports, empirical evidence on the performance effects of vertical specialization is still pretty scarce, and – albeit it points at a positive effect of increased vertical specialization on growth, employment and productivity – it is loosely formulated, and not econometrically tested. For instance, OECD – WTO – UNCTAD 2013 analyse the group of G20 economies to shed light on some of the implications of the proliferation of cross-border value chains. They highlight that, since the income derived from trade flows within global value chains has increased greatly between 1995 and 2009, all G20 economies have benefitted from the emergence of global value chains. I. e., they treat cross-border value chains as an (at least) dominant reason for the spectacular growth of international trade. Likewise, similar conclusions are derived by the analysis of IMF 2013, which uses the WIOD database and highlights that between 1995 and 2009, value added exports (i.e. income generated by exporting) have increased from initially 15% of world GDP to 22% (before slightly contracting again in 2009, as a result of the global financial crisis). Moreover, their analysis demonstrates that stronger vertical integration (as proxied by higher levels of value added exports relative to GDP) is associated with swifter growth.

Our econometric analysis of the impact of the export growth rate and vertical specialization is different from the one applied by OECD – WTO – UNCTAD 2013 because we treat vertical specialisation as a separate independent variable, rather than an implicit factor of export growth. Our approach is also different from that of IMF 2013 since we measure the progress of vertical specialisation with the share of foreign GDP in exports, rather than with the share of exported (of course, own) GDP to total GDP. Using these two independent variables, we estimate their combined impact, on three levels: the level of the whole economy, the manufacturing sector and within the latter the high-tech sector, to four crucial performance indicators: gross output, value added, employment and labour productivity. According to the results of the estimation, the impact of both independent variables is mostly positive and significant on all the four macroeconomic variables. The comparison between the results received for old member states and CEECs reveals two ostensibly important differences. On the one hand, export growth and vertical specialisation seem to have bigger effect with higher significance on gross output, and export growth also has bigger effect on value added in CEECs than in old member states. On the other hand, however, vertical specialisation's impact on value added, which is positive and statistically significant in the old member states, is positive in the CEECs but not significant at any one of the three levels.

Let us underline that the latter result does not mean at all that those workers participating in CEECs in cross-border production networks perform low-value-added activities (which is one of the favourite "theories" of strengthening anti-gobalisation political trends in CEECs). In Hungary, the only country where we have the relevant data, the opposite of that is true. In this country (see Figure 9), only in low-quality (in the Figure LQ) vertical IIT – whose share in total exports is shrinking – are wages significantly and durably lower than in non-IIT manufacturing exports but even there they are higher than in the average of manufacturing industry. This is in line with the seemingly paramount rule[4], according to which in emerging market countries export sectors, including foreign subsidiaries, pay higher wages than others.

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[4] A sieries of meta-analyses supporting this is quoted by Brown et al. 2003.

Figure 9. Earning levels related to non-IIT exports and to various kinds of IIT as compared to average earnings in manufacturing

(Hungary, calculated on the basis of the earnings statistics-balance sheet database)
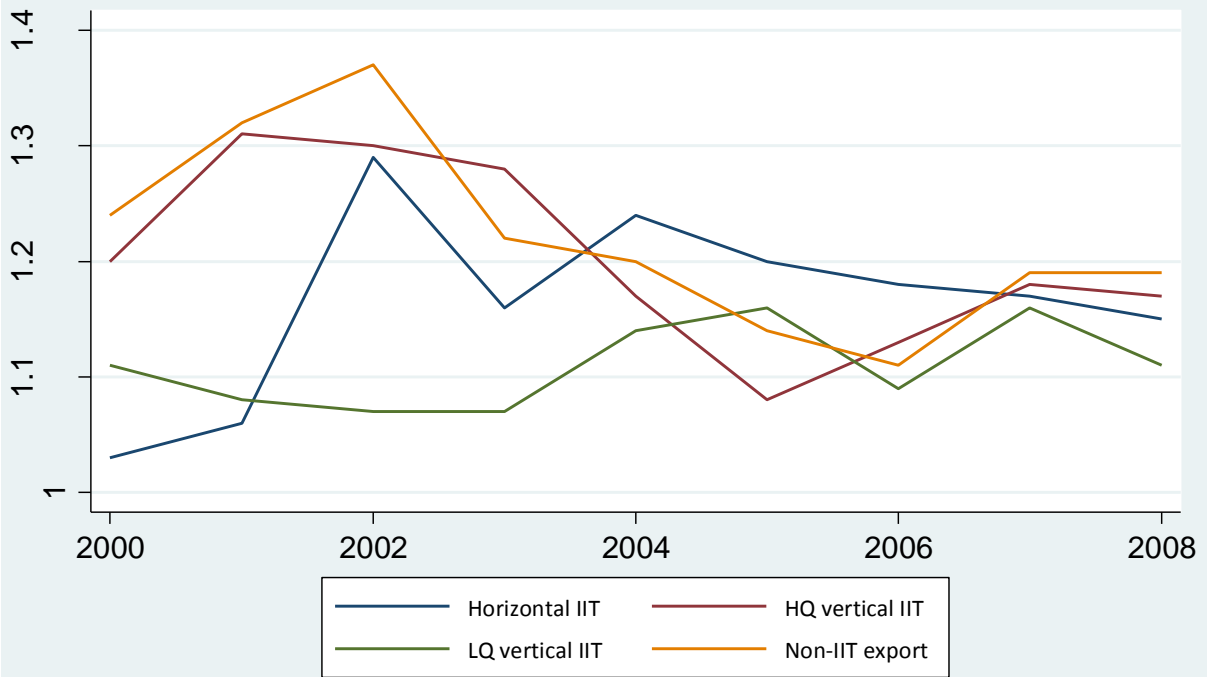
Source: own calculations based on KSH and NAV data.

3.2. Task 2: Impact of trade on productivity, innovation and technology upgrading

3.2.1. Exporter status and innovation

We provide new evidence in explaining the innovation-exporting nexus. This nexus had been searched previously both with positive and negative results but – with one Slovenian exception – not for any CEE country. Our research has been based on data of four waves of the Community Innovation Survey (CIS III to CIS 2008) for between 14 and 16 countries . Some previous works on this issue have tried, with more or less success, to determine the direction of causation: whether exportation causes innovation, or the other way around. We have followed another tradition, examining only the fact of correlation. The Innovation Surveys extended to 14-16 countries, only partly CEECs, thus we also had a control group of old EU member countries. Our analysis has included both product, process, organisational and marketing innovations.

Treating innovation as dependent and exports (exporter status) as independent variable, we have controlled for firm size since larger firms have several factors of advantage in innovation. Other control variables have been market power (market concentration), R&D expenditure and its in-house share, and foreign ownership.

Since it is likely that innovative success and presence in the export market are codetermined, with causality working in both directions, we have also repeated our estimation with IV probit regression. For the whole sample of firms we have found that all four types of innovation display a positive correlation with exporting status, with the quantitatively highest correlation found between exporting status and product innovation. Results confirm that larger firms are more likely to innovate, with the effect predictably most pronounced in case of organizational innovations and smallest in case of marketing innovation. Market concentration does not have a statistically significant effect on innovation, while the effect of foreign ownership (being part of a MNE network) depends on the type of innovation. Only process and marketing innovation are affected by foreign ownership, with process innovation being negatively affected and marketing innovation being positively correlated with foreign investment. This may be a reflection of the fact that most innovation in MNEs is carried out by the headquarters. Results of separate estimations for new-to-market and new-to-firm innovations are also interesting. Foreign ownership has a negative effect on the innovative performance of small firms but it has a generally positive effect for medium and large firms. In all estimations we have found that exporter status most strongly is correlated with product innovation and least strongly with organisational innovation.

The most important part of our work is the one in which we seek potential differences in the impact of innovation determinants between Central and Eastern European Economies and old EU members. We have found that while firms in the CEEC sample are in general more likely to innovate (with the exception of new-to-market process innovations), the impact of exporting on innovation for firms in CEEC countries is significantly smaller than that of non-CEEC countries (except concerning product innovations). Size also has a smaller effect on innovation in case of CEEC firms, but the effect is only significant for new-to-market innovations. On the other side, foreign ownership has a significantly larger impact on innovation (apart from product innovation) in firms in the CEEC subsample. This confirms that foreign affiliates are an important driver of innovations in the CEEC countries.

We have also repeated our estimation with a two-stage instrumental variable probit regression (2SLS IV probit) model, as a robustness check, with result basically similar to those described above.

3.2.2.   Effects of trade variety on the skill premiums in CEECs

The essential thought behind supposed relationship between trade (export and import) variety and skill premium is that there is substitution effects between different types of labour and imported materials. Falk – Koebel 2002 found little support for this hypothesis. They concluded that the increase in imported materials was driven by higher output growth rather than input substitution whicfh would have changed relative wages of workers of various skill levels. Contrary to these authors, Michaels et al. 2014, in a research extending to 11 countries have found – weak – correlation between trade openness and skill premiums.

In our research, we follow the work of Kurokawa (2011) and Atolia and Kurokawa (2013) by considering whether trade in variety is an explanation for rising skill premia in countries at a different level of development.

Trade between two countries increases the number of available varieties in each country, which lowers the price of intermediates. The lower price of intermediates has the effect of increasing output of the final good, which with fixed supply of high skilled labour will increase the real wage of high-skilled labour. If intermediates and high-skilled labour are complements it can also be shown that the skill premia will also rise following trade, a result that applies equally well to both countries.

The basic data source for our analysis is the recently compiled World-Input-Output-Database (WIOD). Additional data allow for the splitting up of value added into capital and labour income and the latter into low, medium and high skilled workers. These data are available both in factor income and physical input terms.

Regressing wage cost shares on export and (separately) import growth and export and import product variety, we observe at the subsample of developed countries that the level of exports impacts positively upon the low-skill cost share and negatively upon the cost shares of medium- and high-skilled labour. Coefficients on the export variety variable indicate positive and significant effects for the low- and high-skilled shares and negative effects for the medium-skilled share. Results when considering imports are largely similar, with the level of imports reducing the medium- and high-skilled cost shares. Results on the import variety measure are also consistent with those for export variety, with positive coefficients on the variety measure found for both the low- and highskilled cost share, and negative effects found for the medium-skilled cost share. In the case of developed countries therefore, we find evidence to suggest that increased import variety increases the cost shares of high-skilled labour, though this is at the expense of medium-skilled labour rather than low-skilled.

In the case of developing countries we observe that the level of exports has a significant effect on both the low- and high-skilled cost shares, with the coefficients both being positive. The export variety variable has a significant effect in the case of high-skilled labour only, with the coefficient being negative. In the case of import variety we find a positive and significant coefficient on the level of imports for the low-skilled cost share only. Consistent with the results for the full sample, we find in the case of the import variety variable a positive and significant effect on low-skilled cost shares, and negative and significant effects on the medium and high-skilled cost shares.

Restricting the analysis to the EU, generally we meet similar patterns to those observed for the other samples. For the EU-27 trade in export varieties has a positive impact on both the cost shares of low and high educated workers whereas the one on the medium educated is negative. This is similar when considering import varieties in which case however the coefficient on the high educated labour

share becomes insignificant. This is similar for the sample of EU-15 country only in which case however import varieties positively impact upon the share of high-educated workers.

The increase in the import and export varieties – which have been largest for the CEECs on average – impact significantly negatively on the medium and high-educated labour cost shares with insignificant effects found for the shares of low educated shares. Here it is however further interesting to note that the coefficients concerning trade volumes are significantly positive for both medium and high-skilled workers.

3.3. Task 3: Effects of FDI on CEECs' firms catching-up

3.3.1. Firm heterogeneity and FDI productivity spillovers

Foreign investors can transfer technology in two ways: directly to the affiliates under their ownership and control, and indirectly to other firms in the host economy through spillovers. There is ample empirical evidence of positive direct technology transfers from a multinational company (MNE) to its foreign affiliates in terms of higher productivity levels and growth (see, for instance, Haddad – Harrison 1993 and Girma – Görg 2006). On the other hand, despite the theoretical justification of potential spillovers, the evidence of technology spillovers from a foreign affiliate to its host country horizontal competitors and/or vertically linked suppliers and customers is weak or even negative.

The other kind of technology transfer through FDI is spillovers from foreign affiliates to domestically owned firms. These transfers take place when the entry or presence of foreign affiliates, which typically have better technologies and organizational skills than domestically owned firms, increases the knowledge of domestically owned firms and foreign investors do not fully internalize the value of these benefits (Griliches 1979, 1992). FDI spillovers can occur between firms that are vertically integrated with the MNE (vertical, inter-industry spillovers) or in direct competition with it (horizontal, intra-industry spillovers). The substantial body of empirical literature on FDI spillovers, which has developed over the last 30 years, has produced mixed empirical results. The econometric analyses have found positive, neutral, and negative spillovers from foreign subsidiaries to domestically owned firms. The overall impression of the lack of evidence on FDI spillovers is predominantly due to the results of the firm-level panel data analysis. This is important because this is the most appropriate way to account for FDI spillovers.

By applying the firm-level panel data analysis, our research has specifically tackled some of the problems of accounting for FDI spillover as outlined by Gőrg and Greenaway (2001, 2004). We distinguish between vertical and horizontal spillovers and introduce the heterogeneity of domestically owned firms with respect to technological capacities, productivity, human capital and size. These factors determine domestically owned firms' absorption capacity for spillovers. Absorption capacity for knowledge spillovers is measured in the literature in various, even contradictory ways. E. g., according to Halpern – Muraközy 2007, knowledge spillovers occur more frequently if the technology gap between domestically owned and foreign firms is not too large. Quite the opposite, Haskel et al 2007 estimate that on average, less productive (and smaller) plants receive stronger FDI spillovers than more productive (and larger) ones.

In our research, we measure the impact of external technology spillovers by including the technology variables directly in the production function, a method similar to the endogenous growth models. The basic idea of our approach is that an individual firm can boost its technology level either internally through an appropriate ownership structure and its own investments into human capital,

and/or by relying on external sources of knowledge spillovers, such as home market spillovers and horizontal and vertical spillovers from MNE affiliates.

Regarding the impact of FDI, MNEs can transfer newer technology and organizational skills both directly to the affiliate and indirectly to other firms in the host economy. On the one hand, direct effects generally appear to affiliates as changes in productivity and as potential better utilization of existing inputs. The presence of an affiliate, on the other hand, can also indirectly increase the rate of technical change and technological learning in the economy through knowledge spillovers to local firms. The innovation system and social capabilities of the host economy, together with the absorptive capacity of other firms in the host economy measured by their own investments into human capital, will then determine the pace of technological progress in the economy as a whole.

Knowledge spillovers can occur either between firms in the industry (external spillovers) or between foreign owned and domestically owned firms. Knowledge spillovers stemming from foreign owned firms arise between firms that are vertically integrated with the foreign affiliate (inter-industry spillovers) or in direct competition with it (intra-industry spillovers). We define the scope for intra-industry spillovers, or horizontal spillovers, as the share of an industry's output produced by the foreign affiliates. These spillovers mainly reflect the competitive pressures that encourage local firms to introduce new products to defend their market share and adopt new management methods to increase productivity. We also account for potential vertical spillovers of foreign affiliates, i.e., for the impact of foreign affiliates on their upstream suppliers. Foreign affiliates often provide resources to improve the technological capabilities and quality standards of their upstream suppliers. We account for these backward linkages as the sum of the output of industries r purchased by firms in industry k.

It is important to note that not all spillovers are positive. The parent firm can also have a negative impact on the direct transfer of technology to its affiliate and reduce knowledge spillovers to the local economy. For example, MNEs can provide their affiliates with too few, or the wrong kind, of technological capabilities.

Finally, it is important to consider the external knowledge spillovers that are generated at the industry level, which can benefit all the firms in the industry. Ethier 1979 and others emphasize the importance of external spillovers among differentiated firms in an industry. The larger the industry, the larger the scope either for inter-firm exchange of components or for competition among differentiated firms. We capture these spillovers by the size of the industry, measured with the aggregate value added.

For the estimation, we used panel data for 10 transition economies: Bulgaria, the Czech Republic, Croatia, Estonia, Latvia, Lithuania, Poland, Romania, Slovenia and Ukraine. Balance sheet and financial statement data were collected for 1995-2005 for most of the countries; for somewhat shorter periods for four of them. In the estimation, we have had to make correction for the selection bias (namely, for the non-random selection of companies bought by foreign owners).

The essential of our econometric approach is that to analyse the impact of different channels of technology transfer on a firm's total factor productivity, we estimate a growth model (of the TFP) augmented by a firm's technology structure. In the model we include a human capital variable and also interaction terms of the spillover variables with the human capital variable in order to control for the impact of firm absorption capacity on firm ability to reap the benefits of spillover effects from both the foreign and domestically owned firms in the sector. The model is estimated with OLS. We perform the estimatons separately for each country, and perform several robustness checks.

Among the results we first describe direct effects of FDI as the impact of foreign ownership on foreign affiliate TFP growth, as foreign ownership is believed to enhance firm performance through direct technology transfers. For three countries (the Czech Republic, Latvia and Slovenia), the growth rate of affiliates was significantly higher than that of domestically owned ones .For the other countries, the otherwise similar results were not significant. Further, we find that in the individual countries firms of different kind had advantages from being in foreign ownership. We can see that the productivity growth differential of foreign affiliates relative to domestically owned firms is driven by small foreign affiliates in the Czech Republic, by micro and large affiliates in Latvia and by medium sized foreign affiliates in Slovenia, as well as by affiliates of medium (Q3 quintile in the Czech Republic) or high productivity (Q4 quintile in Latvia and Q4 and Q5 quintiles in Slovenia). Robustness checks confirm that direct productivity improvements from foreign ownership are far from being general, but are subject to foreign affiliate heterogeneity. The productivity gains widely differ, not only across size and productivity classes, but also with regard to the time period after the ownership change. In Ukraine's rather particular case, a switch to foreign ownership seems to have a negative impact on firm cumulative TFP performance. These effects, however, are quite divergent over the period, indicating the possibility of significant turbulence in the economic environment in this country. All these results confirm that direct productivity improvements from foreign ownership are far from being general, but are subject to foreign affiliate heterogeneity.

As concerns domestically owned firms, we find that without control for firm heterogeneity none of the ten countries under examination show positive and significant horizontal spillovers from foreign affiliates. Moreover, in four out of ten countries (Estonia, Romania, Slovenia and Ukraine), significant negative horizontal spillovers are found. These results, however, are reverted when controlling for the absorptive capacity of firms. We find positive horizontal spillovers in six out of ten countries (Czech Republic, Croatia, Estonia, Romania, Slovenia and Ukraine) once we control for individual firms' wage levels as proxies for the levels of human capital. Negative horizontal spillovers are found in one country (Bulgaria) only. On the other hand, after controlling for absorptive capacity, negative horizontal spillovers are not found in any of the countries. There are only three countries (Croatia, Romania and Slovenia) where horizontal spillovers seem to accrue in a non-discriminatory way regardless of firm size. In all three countries, positive horizontal spillover effects tend to increase with firm size. The results in other countries vary considerably. A similar pattern appears for output and technology gap heterogeneity, too.

In the case of vertical spillovers of foreign affiliates on domestically owned firms, we focus on backward linkages only, as our preliminary results and other empirical studies (Smarzynska-Javorcik 2004; Halpern and Murakozy 2007) demonstrate that forward linkages are rather low or insignificant in transition countries. Unlike the horizontal spillovers, vertical spillovers seem to have more heterogeneous effects. Abstracting from the absorption capacity and heterogeneity of firms, there are only two countries (Slovenia and Ukraine) that show positive vertical spillovers from FDI at the NACE 2-digit sector level, while there are four countries (Bulgaria, the Czech Republic, Poland and Romania) that demonstrate significant negative vertical spillover effects. These results change slightly when allowing for the absorptive capacity of firms. In Bulgaria, the Czech Republic and Poland, firms with higher absorption capacity (human capital) are shown to be able to reap positive spillovers from their upstream linkages with foreign firms.

The main novelty of this strand of our research is the explicit control for firm heterogeneity when accounting for different effects of FDI on firm performance. This results in some contrasting results to the previous empirical work in the field. We find that horizontal spillovers have become

increasingly important over the last decade and might become even more important than vertical spillovers. Furthermore, these results show that the heterogeneity of firms, in terms of absorptive capacity, size, productivity and technology level, significantly affects the results. These findings suggest that both direct effects from foreign ownership as well as the spillovers from foreign firms do substantially depend on the absorptive capacity and productivity level of individual firms.

3.3.2. Spillovers from service FDI to manufacturing

The impact of FDI in services in CEECs is an important issue since services dominate inward FDI in general and in the new EU member states (NMS) in particular. At end 2009, services accounted for 67.5% of total inward FDI stock in the 10 CEECs, business activities having the highest 19.4% share, followed by finance with 18.8%, trade 13.1%, transport, storate and communications 6.8%, electricity, gas and water 5.8%, construction 2.5%, and all other services with 1.1% share. Various kinds of spillovers from foreign-owned firms to domestically owned ones have been subject to research, however, empirical studies on the impact of vertical spillovers from services FDI to manufacturing are sparse.

There are two basic reasons for hypothesizing positive spillovers from services FDI to manufacturing. Firstly, there is theoretical proposition that benefits of foreign affiliates' superior technologies and organizational skills may spill over to domestic firms, as foreign investors could not fully internalize the value of these benefits (Griliches, 1979, 1992). Secondly, service inputs play a distinctive role in the production of goods and other services. It is generally recognized (e. g. Francois 1990) and empirically evidenced (e. g. Inklaar et al. 2007) that the impact of services on growth and productivity of other sectors, most notably of the manufacturing sector, is important. For CEECs the underdeveloped services sectors were an onerous socialist legacy. The transition process has brought distinctive liberalisation and development of services in these countries.

The literature on services' sector liberalization mainly deals with its impact on other sectors, most notably manufacturing. Liberalization of services involves entrance of new domestic and foreign providers which leads to lower prices, higher quality and greater variety of services (Arnold et al. 2011). The empirical evidence of positive impact of services liberalization on manufacturing does not leave any doubt. It reports on the positive impact on manufacturing exports (e. g. Francois – Woerz 2008), and productivity (e. g. Fernald 1999).

To date, the substantial body of empirical literature on FDI spillovers has produced mixed empirical results. Most firm level studies cast doubt on the existence of FDI spillovers in developing countries (see e.g. Harrison 1996). If positive spillovers have nevertheless been found, they have been limited to certain (types of) industries. The evidence from firm-level panel data analysis of FDI spillovers in transition countries also suggests only few intra-industry spillovers from FDI (see e. g. Kinoshita 2000).

For transition countries, recent research has found some evidence of (backward) vertical spillovers from FDI. As summarized, e. g., by Havranek – Irsova 2011, it seems that horizontal intra-industry spillovers and vertical forward spillovers are less likely to take place than vertical backward spillovers. It also became obvious that including local firms' heterogeneity in the model is crucial as not all of them are capable of absorbing spillovers from foreign affiliates. Without certain level of absorption capacity domestic firms may not be capable of profiting from foreign affiliates presence ; i.e. the heterogeneity of domestic firms with repect to productivity, technological capacity and human capital, co-determines their ability to absorb knowledge spillovers from FDI.

Specific research of spillovers from services FDI is relatively new. Services FDI could increase manufacturing sector productivity by lower prices of services, higher quality of services, greater variety of services, but also via increasing competition and knowledge (horizontal) spillovers to local service firms (Arnold – Javorcik – Mattoo 2011).

In our econometric estimation we have worked with the data of Bulgaria, the Czech Republic, Estonia, Romania, Slovakia and Slovenia. In order to analyze the impact of FDI in the service sector on the productivity of manufacturing firms, we include two types of explanatory variables, sector-specific and firm-specific regressors. Our key variables of interest belongs to the former and are determined by the share of service inputs over all domestic inputs in the given manufacturing sector, as well as by the share of service inputs provided by foreign owned firms over all domestic inputs in the referring manufacturing sector. The inclusion of both variables allows us to distinguish between the influence of general service intensity in sector m and the impact of services provided by foreign controlled firms. In the calculation of both linkage measures we refer to national input-output tables provided by the World Input-Output Database (wiod). In the various estimations we everywhere find positive and significant impact of service FDI on domestically owned firms' productivity. We also calculate the foreign service linkage measure for five service sectors separately: energy supply, wholesale and retail trade, transportation and telecommunication, financial services and businees services. The results show that for the whole sample the foreign presence in the energy sector drives the positive effect of the aggregate service linkage.

3.3.3. Outward FDI, location choice and catching-up

In another research strand, we have examined the determinants of outward FDI from CEECs within the EU. Looking at host countries' characteristics, we have empirically analysed the determinants of location choice for OFDI over a longer period (1996 to 2010). Thereby, we have been particularly interested in the question whether knowledge seeking – a potential contribution to technological upgrading – is a driving force of OFDI from CEECs. Further, we have investigated whether EU accession has had an impact on the relative importance of key OFDI determinants.

The existing literature agrees that market seeking constitutes the dominant investment motive of OFDI from CEECs (e.g. Svetličič and Jaklič 2003, Svetličič and Jaklič 2006, Sass and Kalotay 2010). During the 1990s, OFDI aimed primarily at markets of other CEECs and neighbouring countries at similar levels of development (Antalóczy 2001, Radlo 2012). This applies to OFDI among Baltic countries (Varblane et al. 2001), the group of central European countries (Antalóczy and Éltetö 2002) as well as to the former Yugoslavia. This process of regional integration through OFDI was supported by relatively low transportation costs and free trade agreements among CEECs existing prior to EU accession (Varblane et al. 2001). At this stage, efficiency seeking did not play a considerable role for OFDI from CEECs (Varblane et al. 2001, Andreff 2003, Sass and Kalotay 2010) due to the lack of significant differences in labour costs (Varblane et al. 2001), except for Slovenia.

We contribute to this literature by focusing on changes to the relative importance of pull factors for OFDI from CEECs before and after EU accession. Thereby, we focus upon knowledge related host country determinants such as access to human resources or R&D capabilities as pull factors for OFDI from CEECs. This is in line with technological accumulation towards the internationalization process of firms (Cantwell, 1989; 1995) and reflects recent evidence on the importance of knowledge seeking in internationalization process of firms originating from other emerging markets mainly in Asia (Mathews 2006, Rugman 2009, Li 2010).

We use a knowledge-augmented gravity model to analyse the influence of host-country specific endowment factors for the location choice for foreign subsidiaries. Thereby, we control for standard location factors such as market growth and size, wages, prior bi-lateral FDI flows, transportation infrastructure, and distance between home and host market (see Blonigen 2005 for an overview).

Using the Amadeus database, we have identified a total of 2,518 foreign affiliates in the year 2012 that were established by any CEECs' parent firm worldwide. By far the majority, i.e. about 76 % (1,906) of them were located within the EU27. 65 % of the parent firms were fully domestically owned companies. The other 35 % of parent firms have one or more foreign shareholder, which mainly originate in EU15 countzries. Therefore, the latter group of firms located in CEECs and owned by a foreign company undertakes so called "indirect OFDI". For the observation period 1996 to 2010, we could identify a final sample of 990 foreign affiliates in the EU27. About 58 % of foreign affiliates were located in the EU10.

Table 3: Annual entries of in the EU27 by CEE firms (number of foreign affiliates and %) 1996-2010

Year of Entry*	EU27		EU15**		EU10***	
	Freq.	%	Freq.	%	Freq.	%
1996	57	5,76	9	2,14	48	8,42
1997	60	6,06	15	3,57	45	7,89
1998	66	6,67	31	7,38	35	6,14
1999	64	6,46	19	4,52	45	7,89
2000	85	8,59	25	5,95	60	10,53
2001	64	6,46	20	4,76	44	7,72
2002	72	7,27	35	8,33	37	6,49
2003	70	7,07	18	4,29	52	9,12
2004	81	8,18	45	10,71	36	6,32
2005	88	8,89	33	7,86	55	9,65
2006	95	9,60	52	12,38	43	7,54
2007	108	10,91	66	15,71	42	7,37
2008	42	4,24	25	5,95	17	2,98
2009	25	2,53	15	3,57	10	1,75
2010	13	1,31	12	2,86	1	0,18
Total	990	100	420	100	570	100

*Note: *Year of entry is based on the year of incorporation of the foreign affiliate. **EU15 are the 15 EU member countries before Eastern enlargement (Belgium, Denmark, Germany, Finland, France, Greece, GB, Italy, Ireland, Luxemburg, Netherlands, Austria, Portugal, Sweden and Spain). ***EU10 are the ten CEECs (see footnote 2)*

Source: AMADEUS Database 2012. Own calculations.

This concentration is related to overall relative higher entry rates of firms into other EU10 countries in the period before EU accession (see Table 3 above) as well as mutual investment between countries that belonged to one federation before transition (Czech and Slovak Republic; Baltic States). With the first wave of EU accession in 2oo4, the entry rates into EU15 countries started to exceed entry rates into EU10. In this sample the Czech Republic (33 %) and Poland (30 %) account by far for the highest shares of foreign affiliates. All other CEECs account for less than 10 % of foreign affiliates (Bulgaria 1,4 %; Estonia 7,8 %; Hungary 5,1 %, Lithuania 7,4 %, Latvia 4,9 %, Romania 1,5 %; Slovenia 3,1 %; Slovakia 6,1 %). Furthermore, about 73 % of all foreign affiliates of the sample can be classified as direct OFDI.

In our analysis, country level location choice is a discrete choice problem where profit maximizing firms choose locations from a distinct set of countries. Given that our analysis is based on choices amongst a comparatively small set of alternatives (EU27) an appropriate econometric approach is the Conditional-Logit model (McFadden 1984). It relies on the assumption that each location decision is a discrete choice made among different alternatives. Coefficients in Conditional-Logit model are estimated by maximum likelihood procedures.

Table 4. Results for interaction model – EU15 vs. EU10 and Pre vs. Post EU accession

	(1) EU15 vs. EU10 *full sample*	(2) EU15 vs. EU10 *excl. LU, NL, UK*	(3) Pre vs. Post Acc. *full sample*	(4) Pre vs. Post Acc. *excl. LU, NL, UK*
GDP	-0.0204	0.00274	0.419***	0.162**
	(0.0575)	(0.0575)	(0.0533)	(0.0626)
GDP growth	0.0563**	0.0583**	0.0805***	0.0273
	(0.0225)	(0.0226)	(0.0217)	(0.0231)
Knowledge (index)	-12.49***	-11.53***	-4.810***	-0.186
	(1.500)	(1.483)	(0.820)	(0.907)
Wages	-0.697***	-0.755***	-1.328***	-1.563***
	(0.146)	(0.148)	(0.104)	(0.121)
Bi-lateral FDI	0.470***	0.501***	0.608***	0.558***
	(0.0384)	(0.0394)	(0.0354)	(0.0398)
Infrastructure	0.705***	0.750***	0.395***	0.498***
	(0.111)	(0.110)	(0.0892)	(0.104)
Distance	-1.254***	-1.124***	-0.856***	-0.905***
	(0.105)	(0.109)	(0.0859)	(0.103)
*Interaction*GDP	1.674***	0.827***	0.351***	0.0680
	(0.105)	(0.137)	(0.0819)	(0.101)
*Interaction *GDP growth	0.166**	-0.0523	0.170***	0.193***
	(0.0514)	(0.0765)	(0.0415)	(0.0455)
*Interaction *Knowledge	12.42***	14.78***	2.302**	4.100***
	(1.741)	(1.834)	(1.103)	(1.214)
*Interaction *Wages	0.0113	0.0464**	0.00948	-0.00301
	(0.0145)	(0.0210)	(0.0114)	(0.0140)
*Interaction *Bi-lateral FDI	-0.465***	-0.406***	-0.0109	0.0234
	(0.0808)	(0.102)	(0.0577)	(0.0664)
Interaction	0.142	-0.624**	0.208*	0.202
	(0.164)	(0.199)	(0.122)	(0.142)
*Interaction *Distance	0.750***	0.165	0.293**	0.445**
	(0.186)	(0.216)	(0.137)	(0.163)
Observations	23,760	16,086	23,760	16,086
Number of affiliates	990	766	990	766
Loglikelihood	-1,614	-1,123	-2,182	-1,468
Chi-square	1,371	1,205	1,157	1,024
P-value Chi	0.0000	0.0000	0.0000	0.0000

***Note: ****In the EU 15 vs. EU10 estimations in interaction term the dummy equals 1, if the foreign affiliate is located in EU15 countries and 0 otherwise. In the Post vs. Pre EU accession estimations in the interaction terms the dummy equals 1, if the foreign affiliate was created after EU accession of the home country and 0 otherwise. S*tandard errors in parentheses, *** p<0.001, ** p<0.05, * p<0.1*

Our results seem to support the assumption by Kalotay (2004) that EU accession would prompt an increase of OFDI from CEECs, since firms would attempt to strengthen their competitive position with local presence around the single economic area. Market seeking (measured in terms of GDP and GDP growth) still constitutes the dominant investment motive for OFDI from CEECs (see Table 4 above). However, with EU accession the geographic focus changed from other - often neighbouring - CEECs countries (Svetličič and Jaklič 2003, Svetličič and Jaklič 2006, Sass and Kalotay 2010) to EU15 markets that are considerably larger in size. Our results also confirm that efficiency seeking does not play a considerable role for OFDI from CEECs within the EU27 (Varblane et al. 2001, Andreff 2003, Sass and Kalotay 2010), investors from CEECs and in particular direct investors react negatively to high wage levels in host countries.

The results of this research add to the existing body of knowledge by showing that EU integration did not only facilitate market integration but also offers opportrnity for technology seeking OFDI from CEECs. We find a positive effect of technology related location determinants for foreign subsidiaries locationg in EU15 as well as location choice taking place EU accession. However, this applies only if we control for tax optimisation strategies by excluding foreign subsidiaries in three host countries frequently associated with tax havens. In the full sample we obtain a large and negative effect of host country technological capability for fully domestic investors (direct OFDI) from CEECs, however, this does not hold when we exclude locations associated with tax optimisation. Technological capability is a positive location factor for large foreign affiliates in contrast to small operations. This applies to the full sample but again is not robust to the exclusion of host countries frequently associated with tax optimisation strategies.

Therefore OFDI from CEECs after EU accession can only to a limited extent be associated with technology related location factors in host countries, which could be linked to technological catching-up. This conclusion confirms earlier research showing that OFDI from CEECs is not primarily related to technological capabilities or innovation within the home countries (Andreff 2002, Antalóczy and Sass 2008). Thus the nexus between OFDI, knowledge-seeking behaviour and technologocal catching-up is still weak. This is in stark contrast with findings in other emerging markets, mainly in East Asia (Mathews 2006, Rugman 2009, Li 2010). This could potentially be explained by different home country specific institutions as well as by different modalities of participations in global production and innovation networks.

3.3.4. Outward FDI and firm performance

In the context of new EU member states from Central and Eastern Europe (CEECs-11, i. e., the eight that join the EU in 2004, the two of 2007 and one of 2013), the issue of foreign direct investment (FDI) has traditionally been looked at from the inward FDI perspective. In the last decade, however, outward FDI from CEECs has become an increasingly important phenomenon deserving proper analytical attention. In 2005-2013, outward FDI stock of CEECs-11 increased from EUR 21.2 billion to as much as EUR 104.5 billion, in terms of share in GDP from 2.5% to 8.3%. In 2005, the ratio between outward and inward FDI stock of CEECs-11 was 7.8%, by 2013 it increased to 18.1%. The main outward investing countries among CEECs-11 are Poland with EUR 37.3 billion outward FDI stock in 2013, followed by Hungary with EUR 28.8 billion, the Czech Republic with 15.5 billion and Slovenia with EUR 5.6 billion (Hunya 2014).

Why do firms invest abroad? Investing abroad will eventually have a positive impact on the performance of investing firms. Following Dunning's OLI (Ownership-Location-Internalisation advantages) paradigm (Dunning, 1981), exploiting economies of scale, especially as far as ownership

specific advantages is concerned, specialisation and concentration on core competences with cost-efficiency based offshoring (creation of global supply chains), advantages of multinationality of operations, combining of ownership specific advantages with the best possible location advantages and spillovers from host countries' firms are expected to bring benefits to investing firms in terms of productivity and extent of operations. Investing abroad means entering new markets, strengthening of own advantages, access to new technologies and knowledge, which will result in expanding and efficient restructuring of parent firm activities (Lall 1996, p. 13).

The issue of self-selection of firms in outward FDI and of learning/upgrading by investing abroad has been empirically widely documented for firms from traditional investing countries, but not so for firms from CEECs-11. With only very few exceptions (Damijan et al., 2007), proper econometric assessment of these issues in the case of CEECs-11 is almost non-existent and limited to individual countries. Besides self-selection, the main related issues analysed in the literature are learningand upgrading by outward FDI, in other words, research tends to find positive impact on firms investing abroad. Fears that foreign production of MNEs in a number of developed economies would cause home country exports and employment to fall have not been confirmed. Blomstrom – Kokko 1994 shows that the net effect of Swedish outward FDI on home country's investment, exports and employment is one of complementarity, rather than substitution. Alejandro et al. 2011 find positive effect of US services outward FDI on parent companies' employment, and we could continue the examples. Outward FDI seems to have a different impact on different segments of investing firm/home country labour force. In this regard, the most important effect is reduction of labour intensity in parent firms and decreasing demand for low skilled labour at home. Fors – Kokko (2001) find that Swedish MNEs gradually decrease their labour intensity. Increasing productivity of investing firms stem partly from economies of scale, but is also importantly due to specialisation and restructuring following investing abroad.

Based on the above told, on mainstream international business and new trade theories explaining outward FDI on a firm level and within the limitations of the available data, we have hypothesized,

- first, that only the best firms or firms with sufficient ownership specific advantages will engage in outward FDI, and
- second that due to economies of scale, multinationality of their operations and the combination of ownership specific advantages with the best possible location advantages investing firms do benefit by investing abroad. This should be reflected in the growth of their productivity.

In our (firm-level) econometric estimation we have used the data of nine CEECs: Bulgaria, Estonia, the Czech Republic, Hungary, Latvia, Poland, Romania, Slovenia, and Slovakia. Our dependent variable is the growth of value added per employee. Besides the main independent variable signalling whether the company has a foreign subsidiary, we use several control variables – the level of employment, an indicator variable signalling the presence of a foreign owner and others. Because of problems of measurement of several independent variables, the estimation's error term may be correlated with them, which threatens biased coefficients at the OLS estimation. We treat this endogeneity problem using various methods. Another econometric problem is that with OLS regression we cannot be sure about the direction of causality. We have treated this with the introduction of lags of the independent variables.

As for estimation results, the control variables' coefficients mostly have the expected sign and significance, e. g., foreign ownership increases productivity. . The two indicators of particular interest, those for the ownership of foreign and domestic subsidiaries show mixed results. While OLS estimates indicate that firms with foreign and domestic subsidiaries are more productive than firms without subsidiaries, there appears to be no effect on productivity growth. If anything the effect of subsidiaries on productivity levels appears bigger for domestic than for foreign subsidiaries. In a further step, where fixed effects are controlled for, we observe that firms with foreign subsidiaries experience significantly higher productivity growth than either firms with no subsidiaries or those with domestic subsidiaries. This effect is driven exclusively by the subsamples of Czech and Romanian firms, while the impact in other countries is substantially less pronounced. In addition, the positive effect does not appear to be long lasting as it is only statistically significant a year after the investment was made, while employing longer lags yielded positive but insignificant correlations.

3.4. Task 4: The role of inward FDI in CEECs' production and innovation networks

3.4.1. New survey data on foreign subsidiaries' production and innovation networks

Traditionally research on FDI location by MNEs uses bi-lateral country level aggregate data on FDI flows. Empirical studies on FDI spillover effects based on a production function approach by and large use aggregate industry-level data on FDI stocks in combination with inter-sectoral linkage coefficients derived from national-level input-output tables. However, recent theoretical advances require micro data sets at the enterprise level in order to take account of firm heterogeneity.

Against this background the project participant IWH created the IWH FDI Micro database[5] as a bi-annual survey in selected transition economies of Central and Eastern Europe as well as East Germany. After a pilot survey in 2002, the project was fully launched in 2007 as part of a Strategic Targeted Research Project ("*Understanding the relationship between knowledge and competitiveness within the enlarging EU*") supported by the 6th EU Framework Programme. The cross-country survey collected continuously data for annual representative samples of foreign subsidiaries. The survey focused on indicators not available in official statistics such as information on investment motives, business functions as well as internal and external networks for R&D and innovation.

The 2013 survey of the IWH FDI Micro Database was co-founded by our GRINCOH project. Within the project the survey was intended to shed light upon production and innovation linkages of foreign firms within selected transition economies of Central and Eastern Europe. Thereby, we intended to apply aspects of a global value chain perspective.

In cooperation with the partners IEHAS, IER and UCL and intensive exchange with other international network partners including UNCTAD, the Industrial Performance Centre at MIT as well as the University of Groningen the conceptional basis for the development of survey based indicators was intensively discussed. Existing research based on extensive case studies showed evidence of up-grading processes in foreign subsidiaries in the Central and Eastern European automotive and electronics sectors (Pavlinek and Zenka 2010, Szalavetz 2011, Sass and Szalavetz 2013). Already prior surveys of the IWH FDI Micro Database included various indicators of R&D, product innovation and process innovation, which can be used to measure the technological dimension of firms' upgrading. However, firms may also undergo functional upgrading i.e. extending the portfolio or nature of

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[5] Please see for more information: http://www.iwh-halle.de/projects/2010/fdi/e/Forschungsfragen.asp

performed business functions such as R&D, design, development, production, distribution and marketing. In turn value creation and value capture within global value chains is linked to functional composition and upgrading of firms' activities as well as reigning governance structures of the chain (Kaplinsky and Morris 2001, Gerreffi et al. 2005). By definition foreign affiliates operate in vertically integrated chains, since they are owned by foreign often large multinational firms and therefore from part of a hierarchy. However, depending upon product architecture and industry specific characteristics we find different patterns of governance and power asymmetries of buyer-supplier relationships also within large multinational firms, which should be taken into consideration when examining upgrading processes of foreign owned firms.

In order to link to this type of global value chain analysis, it was decided to include a number of new measures into the questionnaire that capture a) foreign subsidiaries employment across business functions, b) human capital across business function, c) changes to the distribution of employment across business functions since entry of the foreign/multinational shareholder, d) information of business functions executed by own affiliates, e) the nature of relationship to the foreign/multinational shareholder before entry, and f) the complexity of inputs sourced by the foreign subsidiary. The classification of business functions was based on a standard adopted in a set of surveys on international sourcing and organisation of business functions implemented by a network of European Statistical agencies (Sturgoen et al. 2012).

In addition, we decided to include into the existing questionnaire a number of novel measures that focus on investment and finance of foreign subsidiaries. These aspects are often neglected in international business research (Bowe et al 2010). After external consultation the IWH team designed questions on a) investment by foreign subsidiaries, b) sources of finance for investment, c) financial constraints, d) sources of finance for R&D and innovation, e) information on export performance (destinations, new/termination of export relationship) and f) external shocks as perceived by the foreign subsidiary.

The resulting final questionnaire[6] of the 2013 survey includes 52 questions and is divided into nine sections. The first section mainly covers questions concerning the foreign owned enterprise's financial sources and restrictions for investment and the distribution and educational background of its employees. The second part covers standard questions about the shareholder structure of enterprises. This includes questions on date of entry, mode of entry, as well as the autonomy over particular business functions. Part three is directed to foreign enterprises with outward FDI and contains similar questions as the second section. The fourth part of the questionnaire deals with questions about domestic investment and part five deals with research and development (R&D) including R&D employment and R&D expenditure. All R&D indicators are in line with the international standards as codified in the Frascati Manual (OECD 2002). Part six of the questionnaire deals with product and process innovations including their intensity and sources of financing R&D/innovation. All innovation-related indicators are in line with the international standards as codified in the Oslo Manual (OECD 2005). The seventh part of the questionnaire includes questions on the diffusion of R&D and innovation. Taking the foreign owned enterprise's position in the global value chain into consideration, the eighth part covers questions about the relationship with suppliers while part nine deal with the relationship with customers and external shocks

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[6] See here: http://www.iwh-halle.de/projects/2010/fdi/pdf/Questionnaire_2013_NBL_ENG.pdf

The population of foreign affiliates was generated from the AMADEUS database for East Germany, Poland, Czech Republic, Slovak Republic, Hungary and Romania. The population was stratified by ownership (FDI inward, FDI outward), sector (producing industries NACE REV.2: 05 to 39 and the selected services NACE Rev.2: 46, 49-53, 58-64, 66, 68-74, 78 and 82) as well as firms size in terms of number of employees (up to 9, 10-49, 50-249, more than 250). The survey was implemented by means of computer assisted telephone interviews (CATI), which were conducted by the Institute for Applied Social Sciences (INFAS). CATI was chosen as the appropriate method because the survey relies upon a special design for highly standardised surveys, involving complex target groups, and has substantial filtering in the questionnaire. The questionnaire was first programmed and internally tested for coherency before being submitted to at least four pre-tests per country between in October 2013. The pre-test necessitated minor changes. The final questionnaire required on average a 30 minute interview. The interviews were conducted by native speakers for each country. The implementation of the survey was completed between 6 November 2013 and 17 March 2014 by the survey provider.

In 2013, the total population (inward and outward FDI) of the IWH FDI Micro Database for East Germany and the CEE countries included 3,862 and 12,065 enterprises respectively. Altogether 2,338 East German and 5,008 CEE companies could be contacted during the survey. Around 18.5% of East German enterprises and 43.7% of CEE enterprises could not be contacted due to reasons such as wrong contact numbers, insolvency or incorrect information. For East Germany, a total sample of 366 interviews could be conducted, which corresponds to a response rate of 15.7%. In the case of CEE countries, 836 interviews could be realised, which corresponds to a response rate of 18.7% (Poland: 16.5%, Czech Republic: 13.4%, Slovak Republic: 18.6%, Hungary: 26.3%, Romania: 18.5%). Thus, a total of 1,202 enterprises participated in the 2013 survey for the IWH FDI Micro Database. This generates an overall response rate of 16.4%. The full information about the survey representativeness per country and for different sub-samples has been documented in a comprehensive methodological note[7] (IWH 2013).

The survey data is available to external researchers[8] of public research institutes and universities through an on-site access in a safe-room-environment at the IWH. In addition, a scientific use file (SUF) is available via the data archive at the Leibniz Institute for Social Sciences (GESIS).

3.4.2. Relationship between functional upgrading and productivity growth of multinational subsidiaries

The activities of a foreign subsidiary (meaning here a subsidiary not restrained to a sales outlet) of a multinational company more often than not are restricted to one or two functions, primarily to production of good and services. Yet the offshoring of business function associated with the support of production and increasingly advanced tasks from developed economies create upgrading opportunities for firms located in emerging and transition economies. The literature on multinationals and global value chains (GVCs) suggests that firms' performance in terms of value creation and capture crucially depends upon their ability to 'upgrade'. Apart from product and process upgrading this refers to 'functional upgrading' i.e. the changing portfolio and nature of business functions executed by firms within the GVC.

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[7] See also here: http://www.iwh-halle.de/projects/2010/fdi/pdf/Methodological_note2013.pdf

[8] For more on external data access: http://www.iwh-halle.de/projects/2010/fdi/e/Datenzugang.asp

The emerging literature on business function offshoring distinguishes (Eurostat, 2013) six (groups of) business functions. Besides (1) the production of goods or services as the core or primary business function, these are – as support or ancillary business functions – (2) distribution and logistics: transportation, warehousing, etc.; (3) marketing, sales services and after sales services: market research, advertising, etc.; (4) ICT services: hardware and software consultancy, software data processing and database services, etc.; (5) administrative and management functions: procurement, legal services, accounting, book-keeping and auditing, business management and consultancy, etc.; and (6) R&D, engineering and related technical services: research, experimental/applied development, etc.

Our paper advances the existing research on functional upgrading (in particular Majcen et al., 2009; Sass and Szalavetz, 2013) by testing the relationship between functional upgrading of foreign subsidiaries over time and the effect on productivity growth. Thereby, we assume that a functional diversification into support or ancillary support business functions increases the knowledge content of local activities and thereby local value added of foreign subsidiaries. Thus, other things equal we hypothesise that functional upgrading has a positive effect on the productivity growth of foreign subsidiaries.

As concerns the source of data, IWH-FDI-Micro database 2013 survey adopted existing classification of business functions and offers the unique possibility to assess functional upgrading in terms of breadth and depth in sample of multinational affiliates based in catching-up economies within the European Union (see Chapter 3.4.1).. The participating firms reported the share of employees working in each one of the six defined business functions. This information yields information on the change of the employment structure with respect to the framework of business function between the entry of the foreign investor and the reporting year 2013. In order to assess objective data on firms' performance the survey data has been matched by the survey provider to accounting data from the AMADEUS Database. This included data drawn from the online version of the AMADEUS Database as well as corresponding historical records. Unfortunately, it was not possible to track how the employment structure has developed in the period between the reporting year and the point of investment. Thus, we decided not to apply a panel estimation in this analysis. Instead, we estimated the impact of functional upgrading on the performance of foreign subsidiaries in a cross-sectional estimation.

In the estimations, we used three independent variables: the share of other than production personnel, the number of other than production functions and the evenness of the distribution of personnel among other than production functions (measured with the inverse of the Herfindahl index). We also used some control variables; the dependent variable was the growth rate of labour productivity (growth rate of value added per employee). Our findings suggest that functional upgrading has a positive impact on foreign subsidiaries performance measured in average labour productivity.

First of all our findings would support the key conceptual proposition that functional upgrading of peripheral actors in global value chains is one potential pathway to increasing local value added. This process seems to be explained by a shift of employment in firms from core production-oriented activities to higher value adding support or ancillary activities in the post and pre-fabrication stages of the value chain.

Second our findings shed light on the relationship between of functional upgrading and performance of subsidiaries in MNE networks. Our findings seem to indicate that foreign subsidiaries are able to

appropriate part of the efficiency gains obtained through the process of functional upgrading. This is in contrast to prior case study evidence that highlighted limited effects of functional upgrading on foreign subsidiaries' performance in terms of value added (Sass and Szalavetz, 2013). However, the case studies also indicated that upgrading that resulted in the increase of specific functions related employment had a direct and immediate impact on subsidiaries' value added (ibid). Our study suggests that this relationship holds in a large sample of foreign subsidiaries from different CEECs. Yet, our findings signal this process mainly is relevant for the productivity growth of foreign subsidiaries in manufacturing rather than service. This might also be explained by an unsuficient granularity in the easurment of business functions in services.

The existing case study evidence helps also to contextualize our finding that the effect of functional upgrading is stronger in the earlier phases after entry of the foreign investor. This could be explained the observation that functional upgrading in breadth is more or less automatic, being function of the run-up of production (Sass and Szalavetz, 2013). Over time, but also quite rapidly following the initial investments, activities pertaining to higher order support functions are assigned to the subsidiary: controlling, IT, operations management, logistics, procurement, etc. Against this background, it could be explained that the effect of functional upgrading on productivity growth is strongest in the initial phase following the investment.

Subject to the inherent limitations in the measurement of business functions as well as subsidiary performance using financial data, our findings suggest on a more general level that a certain share of multinational subsidiaries located in CEECs managed successfully not only to functional upgrade but also benefited from higher productivity growth as a result of this. This process is highly relevant in face of the challenges of Central and East European catching-up economies to maintaining their economic dynamism and avoiding a looming middle-income trap. The latter requires changing the drivers of growth to manage the transition from middle- to a high-income status.

3.4.3. Survey evidence on foreign subsidiaries' R&D co-operation

The technology accumulation approach towards firms' internationalization suggests that foreign subsidiaries have an important role in the generation and diffusion of new technologies in the multinational enterprise (Cantwell 1989, 1995). From an empirical perspective, we know that the majority of MNEs' technological activities are concentrated in their home countries. There is evidence, however, that various strategic activities such as R&D are increasingly organised in geographically dispersed centres and open networks in domestic or foreign locations (Narula – Guimón 2010; Patel – Vega 1999; Le Bas – Sierra 2002; Narula – Zanfei 2005). This allows MNEs to tap into location-specific advantages and enhance the enterprises' competitiveness (Dunning 1977, D'Agostino – Santangelo 2012). Due to this development foreign knowledge bases become more and more important to MNEs as sources of knowledge and technology (Meyer et al. 2011).

At the same time, this trend potentially increases productivity and industrial upgrading in the location region, where foreign subsidiaries can function as agents of technological and economic development (Günther – Gebhardt 2005). The evolutionary perspective on technology development (Kim – Nelson 2000) suggests that technology transfer from developed to developing economies is based on technological linkages between the foreign subsidiary and the regional environment (Gentile-Lüdecke – Giroud 2012). Recent research shows that MNEs' investment into East European transition economies is dominated by market- and efficiency seeking motives; the search for knowledge and technology is of secondary importance, but has essentially gained importance over time (Gauselmann et al. 2011). Günther et al. (2008) focus on foreign subsidiaries' technology and

knowledge sourcing in East Germany. They find that a competence-augmenting strategy increases the likelihood for technological linkages as well as region specific endowment factors.

We have contributed to this literature by investigating the determinants of R&D cooperation between MNEs' foreign subsidiaries and domestic enterprises in sub-national locations within CEECs. The research exploits the IWH FDI Micro database 2009 survey of 1,245 foreign subsidiaries based in Poland, Hungary, the Czech Republic, Slovakia, Romania and East Germany. The survey allows us to distinguish R&D c-operation by different domestic network partners (suppliers, customers and research institutions), thereby leading to a better understanding which firm- and region-specific factors influence R&D co-operation of foreign subsidiaries in CEECs.

Table 5. Frequency of foreign subsidiaries' R&D co-operation by host country and partner

	No. of subsidiaries	in %
Total R&D co-operation	369	29,6
in East Germany	239	38,0
in the CEE countries	130	21,1
of which is R&D co-operation with regional…		
suppliers	144	39,0
customers	119	32,2
reserach institutions	268	72,6
R&D co-ooperation in East Germany with regional…		
suppliers	90	37,6
customers	83	34,7
reserach institutions	183	76,6
R&D co-operation in the CEE countries with regional		
suppliers	54	41,5
customers	36	27,7
reserach institutions	85	65,4

Source: IWH FDI Micro database 2009

The descriptive analysis reveals that the generation of new technology does play a role for MNEs in CEECs. Within the sample, about 30% of foreign subsidiaries entertain R&D co-operation with domestic network partners in CEECs. The frequency is significantly higher in East Germany compared to the other transition economies in the sample (see Table 5 above). Furthermore, we find that R&D co-operation between foreign subsidiaries and domestic partners in the region is significantly more frequent between foreign subsidiaries and regional research institution than with other regional partners (suppliers or customers). It is also significantly more frequent in the manufacturing branch than in selected services. In the manufacturing sector most R&D co-operations take place in foreign subsidiaries belonging to NACE 24 (manufacture of chemicals & chemical products), 25 manufacture of rubber & plastic products), 28 (manufacture of rubber & plastic products), and 29 manufacture of machinery & equipment). In the service sector R&D co-operations are most often conducted by foreign subsidiaries belonging to NACE 51 (wholesale trade & commission trade exc. motor vehicles), 72 (computer & related activities), and 74 (other business activities).

In our econometric analysis, we have worked partly with the whole sample of companies and partly with an East German and a CEE sub-sample, in order to control for regional and developmental differences. In another breakdown, we have used three subsamples for MNE subsidiaries' R&D

cooperation with suppliers, customers and research institutions, respectively. The results show that foreign subsidiaries R&D co-operation is region- as well as firm-specific.

According to our estimation results, in the whole sample as well as in subsamples the R&D mandate of the foreign subsidiary is significantly positively associated with the probability of regional R&D co-operation and so is the foreign subsidiary's internal technological embeddedness with the parent company. The importance of the MNE's strategic market entry motive 'access to location-bound knowledge and technology' is not significantly associated with regional R&D co-operation in the whole sample and all sub-samples. This might be explained by a change in the foreign subsidiary's orientation over the time of its existence. Furthermore, the foreign subsidiary can follow more than one investment strategy at the same time depending on the technological field of investment. In addition, the results show that foreign subsidiary's technological capability is positively and significantly associated with R&D co-operation. In terms of region specific effects, we find that the regional knowledge stock is positively and significantly associated with the probability of regional R&D co-operation. This seems to be especially the case for the CEE sub-sample and for R&D co-operation with customers and research institutions. In contrast to our assumption, we do not find a positive interaction between foreign subsidiaries' technological capability and the regional knowledge stock.

In sum, the results suggest that both the technological competences of the foreign subsidiary and the regional knowledge base are important for the development of technological linkages within regions of CEECs. Thus, governments ought to concentrate on policy tools that attract and reward technological active foreign enterprises and support technological linkages with domestic firms.

3.4.4. Case study evidence on foreign subsidiaries' R&D and innovation capability

We have also examined relationshpis between FDI and R&D on the basis of company case studies prepared in the automotive and electronics sectors in Hungary, a country in which the larger part of private R&D expenditure is being spent by foreign-owned companies in these sectors. Interviews were conducted with leading managers at 20 companies. We paid attention to interview some of the largest R&D spenders and to have a differentiated sample in terms of geographical and value chain position as well as of the size group (small, medium, large) of the companies. Additional information was also collected from the balance sheets of the companies and through indirect channels such as specialised newspapers. Our questions have been the following. First, what types of R&D activities are located into Hungary by multinational companies, and how do these location decisions relate to the strategy and motivations of a multinational firm? Second, what are the main location advantages, on the basis of which Hungary is selected for such activities by multinational companies. Third, how do these activities impact upon the local economy, what are the main channels through which this impact is realised? We investigated the automotive and electronics sectors, in which there are important foreign R&D capacities operating in Hungary.

Our starting point has been that MNEs' main assets, including their R&D capacities are usually concentrated in their home country, because of various factors, including its embeddedness into the local innovation system. Thus this "home-country-bias" in R&D should be compared to those advantages, which result from transferring R&D activities abroad. What can be the motives of companies to internationalise R&D activities?

The internationalisation of production is still the most important factor for the internationalisation of R&D, but the significance of getting access to foreign knowledge is on the increase. (See for example

le Bas – Sierra 2002, Sachwald 2008.) It is important to note that the different motivations at the company level are connected to differing requirements concerning the host country and location, affect different R&D activities and result in differing types of foreign sourcing of R&D with different impact on the host countries. For example, Serapio – Dalton (1999) demonstrate that besides demand considerations, supply factors are also important in locating R&D in the US by foreign companies. Pearce (1999) also shows that product development increased at the expense of adaptation. On the other hand, Patel and Vega (1999) revealed that companies locate those technologies abroad, in which they are strong in their home countries.

Traditionally mentioned purposes of the internationalisation by MNEs of their R&D activities are market and knowledge seeking. The former means adapting the MNE's to local market, legal, etc. requirements, whereas the latter means acquiring local knowledge for the MNE. A third motivation is efficiency seeking, see e. g. Sachwald 2008. The latter usually appears in a „global development centre" of the MNE responsible for those tasks and projects, which can be separated, fragmented from the overall innovation process of the multinational firm, and the solutions found by the GDCs can be „fed back" into these processes. In that sense, this is a type of vertical, or vertically integrated foreign direct investment (Caves 2007) through which these R&D centres in the host economies are established. In this case the dominance of the efficiency-seeking motivation is clear-cut.

Locational advantages are manifold; their respective importance depends on the motivations and drivers, on whose basis multinational companies decide for the internationalisation of their R&D activities. According to empirical evidence, the level of development of the host country positively affects FDI in R&D, as it takes place predominantly between highly developed countries. (Manning et al., 2008 and EC, 2010) Moreover, larger countries usually attract more R&D. As another locational factor, the stock of relevantly skilled labour and in connection with that, the structure (absolute number of relevantly skilled graduates) and efficiency of the local education system also influence the location choice of firms (see e.g. Thursby and Thursby 2006); however, labour costs both in absolute and relative terms (the home and host country compared) play a minor role (See e.g. Lerni 2010, who shows that labour costs are important for the internationalisation of US R&D only in the case of developed host countries and Belderbos et al. 2009). In a wider sense, the technology capacities, expertise and competencies of the host country are also important.

Our sample of 20 companies has included eight stand-alone R&D units and 12 production-related R&D units; the latter partly carry out R&D tasks for the whole multinational company, bearing a global responsibility. One production-related R&D unit became quasi stand-alone because its production units were partly relocated to cheaper countries. As far as their entry mode is concerned, half of the companies in the sample was realised through a greenfield project, and there are four privatisation-related acquisitions and six non-privatisation-related acquisitions. In terms of the number of employees, at the level of the "whole" affiliate there are mainly large-sized companies (13) in the sample, six are medium-sized and only one is small. As concerns the size of the R&D units, there are only four large ones, all of them stand-alones, and seven fall in the medium-sized category. The companies are highly export-oriented, typically selling in Hungary less than 10 percent of their production.

As concerns location in our particular region, Kokko – Kravtsova (2008) examine four former transition economies (Estonia, Hungary, Poland and Slovenia), and they found that the following characteristics matter the most for the innovativeness of foreign-owned firms. The relative development at the sector level is important, they note that if there is a substantial gap between

foreign-owned affiliates and local companies, it negatively affects the innovative capabilities of foreign-owned companies. At the same time, education expenditure has a significant positive impact on it. In terms of entry mode, greenfield projects and in terms of the level of intra-firm exports, highly integrated affiliates are less likely to have their own innovative capability in product and process technology. Schmiele (2009) analyses among others the location choice of German companies concerning their R&D activities. For the Eastern European region, only the export experience of the German company is a significant factor. However, there are certain push factors in the home country (though not significant), which influence the choice of that region: for example lack of qualified labour and high innovation costs.

Impacts on the host economy (spillovers) may take two distinct forms: those of technological and pecuniary externalities, because FDI goes together with costs and benefits which are not directly transmitted through the market. Direct technology transfer may be important in the case of R&D, as the companies use the highest level technologies, and they also use high quality management and production organisation. Other types of effects, for example acquisition of labour skills concerning technology, managerial skills, know-how, knowledge about the markets, etc. Pecuniary externalities may occur through the use of local suppliers, including local services providers and through selling products to local companies (backward and forward linkages), and also in the payment of taxes.

Studying the dynamics of development of the companies, we have found that production-related R&D units usually start out with a narrow mandate, concentrating on sustaining, redesigning, improving existing products and processes. In many cases, as the parent company's trust grows gradually together with the successful accomplishment of these simpler tasks, later more and more complex tasks are allocated to the affiliate, which may result in attaining even global responsibilities in certain development areas. (Trust is also reflected by the fact that the share of foreign employees permanently staying in Hungary is usually very low.) It is important to note that relocation of R&D units can be very rare, we could find only traces in our sample. The establishment of the R&D unit in Hungary usually represented an expansion of R&D activities.

As concerns relations with other companies (in Hungary or elsewhere), in the overwhelming majority of cases, the R&D output serves the local production in the affiliate, the parent company or other affiliates of the multinational company (17 cases), thus it is not sold to "independent" buyers. None of the companies acquired R&D results in the form of patents or know-how from other companies. Outsourcing of R&D-related activities is slightly more frequent (14 cases), but none of the companies deem it significant, except for the two minority foreign-owned ones. Outsourcing is more occasional in the sample than continuous. 12 companies cooperate with universities, mainly with the purpose of securing the "supply" of appropriately trained specialists for themselves. Trainings for the R&D personnel (and for other workers) are continuous, partly using trainings offered by local SMEs or universities.

In the interviews the answers to the – importantly: open – question on locational advantages were relatively unanimous. There were eight factors, mentioned at least by two managers. These are the following: previous production (10), knowledge base (9) and costs, especially those of skilled labour (9), the level of education (8), previous personal contacts (3) and availability of skilled engineers (3), previous experience (2) and buyers' requirements (2). In our sample, contrary to the findings of the literature, cost considerations are as frequently mentioned as the knowledge factor. The importance of the level of local education however, further strengthens the importance of the local knowledge base. The set of factors differs for the production-related and stand-alone R&D units.

Understandably, for all production-related units, the presence of relevant production is the most important locational factor. For stand-alone units the most important locational factor is usually the knowledge base, except for three cases, where there was previous production and originally the R&D unit was either planned or actually established to support local production, but later either production was relocated or there was a considerable change in the original plans. While costs were mentioned by half of the respondents (the two minority foreign-owned companies are not analysed here), it must be noted that in none of the cases was that mentioned on the first place.

The interviewed managers were also asked about the problems and barriers to the further attraction of FDI in R&D and for their operations in Hungary. The overall opinion was that the business environment, especially the taxes (profit and personal income) are favourable for an export-oriented company. Criticism was formed mainly on the instability of the regulatory system, the sudden, unexpected changes in regulations, taxes etc. even during the tax year. As for the further attraction of FDI in R&D activities, according to one manager, a certain "saturation-level" was already reached (company no. 4), especially due to the bottleneck caused by the quality and quantity of fresh graduate engineers. However, others were more of the opinion that there is still room for other R&D investments. On the other hand, many company managers complained about the declining level of education in engineering and the lack of language knowledge. As concerns impacts on the local economy, backward of forward linkages of R&D activities themselves are either non-existent or very limited in the majority of cases. However, there are production backward linkages at the production-related units. Besides that, there is cooperation with universities, in some cases even including outsorcing. A further way of impact is through the "movement" of trained R&D workers; however, employees very rarely went to work in domestically owned companies.

3.5. Task 5: Role of FDI in terms of regional development and policy impact

3.5.1.   The role of FDI and human capital in regional growth patterns

A growing body of literature focuses on the EU's per capita income distribution at the sub-national level, regional convergence and the process of "catching-up" by less advanced regions. Some empirical studies suggest the existence of convergence in all European regions (Fingleton, 1997, 1999; Lopez-Bazo et al., 1999), while others show evidence of regional GDP disparities and the formation of convergence clubs or multiple equilibriums within the income distribution (Lopez-Bazo et al., 1999; Ertur and Le Gallo, 2003; Canova, 2004; Le Gallo, 2004).

Given the existence of marked income disparities across European regions, governments, those of CEECs in particular, have designed policies that use various incentives to attract foreign direct investment (FDI) to promote the catching-up. Motivated by an endogenous growth framework (Romer, 1986; Lucas, 1988), the accumulation of FDI is regarded as an important growth driver that triggers technological processes, resulting in productivity spillovers. The positive impact of FDI on economic growth seems almost to have acquired the status of a stylized fact (Campos and Kinoshita, 2002), although the empirical evidence is ambiguous (Alfaro and Rodriguez-Clare, 2004; Görg and Strobl, 2001; Glass et al., 2001; Lipsey and Sjöholm, 2005). There are concerns that positive knowledge spillover, predicted by an endogenous growth framework, does not occur in developing or transition countries. This could be linked to negative effects of FDI, for example, through a "crowding out" of domestic investment. The impact of FDI seems to depend on a variety of economic and political conditions in the host country, such as the level of per capita income, the degree of openness in the economy and the human capital in science and technology (Herzer et al., 2006).

With regard to the latter, already Griliches (1969) emphasized the complementarity between human capital and private physical capital that affects productivity growth and economic performance. Arguably, human capital endowment favours the development and absorption of technology. It accelerates the rate of technological change through investments in education, workforce skills, scientific knowledge and social institutions (see Acemoglu, 1998, 2003; Benhabib and Spiegel, 1994, 2005; De la Fuente and Da Rocha, 1996; Nelson and Phelps, 1966). According to Klenow and Rodriguez-Clare (2005) and Mamuneas et al. (2006), the regional growth differentials are determined less by the pure endowment of human and physical capital as growth factors than by the relation between these productive factors and their externalities.

When the positive impact of the FDI-growth relationship is considered at a sub-national level, empirical evidence is ambiguous. While Mullen and Williams (2005) and Mayer-Foulkes and Nunnekamp (2009) argue that the effects of FDI on growth through productivity and knowledge spillovers are not affected by the geographical dimension of the economic unit being considered, Girma and Wakelin (2001) claim that FDI-related spillovers are assumed to be localized and benefit primarily those regions that are able to absorb the knowledge spillover. If the host region does not possess the capacity to absorb the knowledge and the incorporated technology, FDI carries the risk of crowding out domestic investments and of harming regional economic performance.

Against this backdrop, our paper contributes to the discussion on whether long-term per capita income growth paths at the sub-national are affected by the accumulation of FDI and human capital. In particular, the research assesses the complementarity of FDI and human capital as determinants of income convergence dynamics. We investigate the association of both factors with regional per capita growth paths for 269 European regions (NUTS2) during 2003 and 2010. We also analyse a sub-sample of 56 CEEC regions separately for two reasons: Firstly, in order to investigate the catching-up process by CEEC regions compared to the whole EU sample over the period, and secondly, to gain additional insights into the extent of endogenous growth in newly integrated transition countries over time.

Research on regional convergence emphasizes the importance of capturing intra-distribution dynamics, since the relative position of regions can change over time. According to Quah (1997), more important than changes in the external shape are the movements within this particular distribution that explain intra-distributional dynamics and a catching-up process. Therefore, we apply a Markov-chain approach to examine income distribution dynamics. It relies upon the concept of computing transition matrices, which provide information about the stationary probabilities of transition from one income state to another.

Distributing the 269 NUTS-2 EU regions across five income classes, our estimation indicates a rather weak tendency of income convergence across the whole sample of EU regions between 2003 and 2010, suggesting that the income distribution across all EU regions is already close to its steady state. However, the estimated transition matrix offers several detailed insights into the dynamics of this convergence process. Below-average income classes face only small, but upward moving transition probabilities of about 5 to 10 percent. In contrast the highest income classes show a lower degree of stationary probabilities and thus face higher transition probabilities of moving down than moving up in the income distribution. The regions of income level 4 face a probability of 37,5 percent to relegate and a quite low stationary probability to remain (55,36 percent) in the level.

As concerns the analysis of growth dynamics in the sub-sample of EU regions in the 10 CEECs, the initial distribution is - as in case of the whole EU sample - a fairly even one across the five income

classes (see Table 6 below). However, the limiting distribution differs significantly from the initial distribution, especially for the income classes 1 to 3. While the limiting distribution of the income classes 2 and 4 increase around the middle income class 3, the lowest income class 1 and the middle income class 3 decrease strongly. This implies a concentration of CEECs regions at both extreme ends of the limiting income distribution and a decreasing middle income class. Even though the results are suggesting that CEEC regions commonly enjoys higher GDP per capita growth rates than the EU-15 regions, the results on the evolution of the per capita income distribution do not offer much evidence for the existence of a "convergence club" in CEECs as a whole.

Table 6: Evolution of income distribution across CEEC regions, 2003–2010

PCPI class	initial distribution		final distribution				
	N	%	1	2	3	4	5
1	11	19,30	63,64	36,36	0,00	0,00	0,00
2	9	17,55	0,00	77,78	22,22	0,00	0,00
3	12	21,05	0,00	16,67	50,00	25,00	8,33
4	12	21,05	0,00	15,38	7,69	69,23	7,69
5	12	21.05	0,00	0,00	0,00	16,67	83,33
limiting	56	100	12,28	26,32	15,79	24,56	21,05

Source: Own estimations from the sample data

Further, as concerns the impact of FDI density on income growth, the initial distribution indicates that regions with an above average FDI density were already richer from the start. The probability of starting from one of the two highest PCPI classes is about 44 percent for regions with a high density of foreign turnover and 38 percent for EU regions with a lower density. The limiting distribution indicates that EU regions with an above density of FDI stocks will, on average, tend to be richer in the long run than regions with a below density of FDI stocks. The probability of ending up in one of the two highest income classes is about 40 percent for regions with a high density of FDI stocks, but only 33 for regions with a below density of FDI stocks. However, the estimated transition probabilities of the limiting distribution reveal no evidence for a significant positive association of FDI stocks and long-run growth. While the sample of regions with a high density of FDI stocks face a higher probability of ending up in the two highest PCPI classes, they also face a similar probability of 40 percent to end up in the lowest PCPI classes of the subsample with high FDI stocks. In contrast, the probability for regions of the below FDI density sample to end up in PCPI classes 1 and 2 is higher (48 percent) than for the classes 4 and 5 (33 percent).

For the subsample of regions in CEECs, we find similar results. The initial and the limiting distributions show as well that regions with above FDI stocks are richer from the beginning of the observation period, and also tend to be richer in the long-run than regions with below average FDI stocks in the subsample. In contrast to the above findings for the whole EU sample, CEEC regions with a higher FDI stocks face a higher probability of moving upwards into income classes 4 and 5 (46 percent) than moving downwards into lower income classes 1 and 2 (38 percent). CEEC regions with a below median FDI density face an even probability of moving upwards or downwards and face also higher stationary probabilities to remain in their income class. Thus, the estimation results indicate a weak positive association between FDI density and growth rates for regions within CEECs.

In analysing the regional income impact of human capital endowment, we use for the measurement of the latter the human resources in science and technology occupations (HRSTO) index. Estimation results indicate that the increases of long-term growth rates in European regions are conditional upon a high accumulation of HRSTO. EU regions with a high share of HRSTO face higher probabilities of being in one of the two above-median income classes than EU regions with a low density of HRSTO.

To identify the combined impact of FDI and human capital endowment on income growth, we distribute the 269 NUTS-2 regions of the EU into four groups: (1) those with high density of FDI and low density of HRSTO, (2) those with high density of FDI and high density of HRSTO, (3) those with low density of FDI and high density of HRSTO and (4) those with low density of FDI and low density of HRSTO. The limiting distributions for these four subsamples indicate that the FDI-led increases of long-term growth rates in European regions are conditional upon a high accumulation of HRSTO: group (2) has the best results. Also, group 3 has better results than group 1, meaning that human capital has larger impact than FDI. Similarly to the results for all European regions, we find that regions in CEEC characterized by high FDI stocks as well as high HRSTO endowment are more likely experience catch-up growth. The group of regions where a high share of HRSTO is complemented by high initial FDI stocks shows considerably higher probabilities of remaining in the high income classes.

In sum, we find a weak process of overall GDP per capita income convergence in all EU regions during the observation period. The findings for CEEC regions suggest a "poverty trap" for poor regions in lower income classes. Furthermore, our results indicate that higher FDI stocks as such are only weakly positively associated with higher long-term GDP per capita growth rates in both the EU and the CEECs regions. In contrast, we find higher long-term GDP per capita growth rates in regions with above average human capital endowment independent of their FDI stocks. Furthermore, we find support for strong complementarity between FDI and human capital. This indicates the existence of domestic as well as foreign-led regional growth patterns in the EU.

3.5.2. Regional policy and FDI location

We have analysed the impact of regional policies on FDI location in Hungary, Poland and Romania.

FDI inflow into those CEECs consisting of more than one NUTS2 region – Bulgaria, the Czech Republic, Hungary, Poland and Romania - increased in 2005-2006, stayed close to that level in the following two years, and then declined. There was some recovery in 2010 and a deep fall in 2012. Some countries behaved differently, thus the 2006 peak was most pronounced in Bulgaria while the setback in 2011-2012 was most severe also in this country plus in the Czech Republic and Hungary. Poland showed much more balanced picture.

As concerns the regional distribution of FDI, in Hungary the central region (Central Hungary) dominates, and West Transdanubia has a relatively high share. Between 2000 and 2011, Central Hungary's share, despite some decline, remained dominant, and West Transdanubia's increased. Thus, FDI reinforced and did not mitigate regional disparities in Hungary. But FDI stock data may be too strongly influenced by investment decisions in the past and biased by financial flows and asset valuation while regional FDI flow data are not available. On the other hand, we can better follow the location of new greenfield projects, which was less concentrated than that of FDI capital. The share of Central Hungary was 46% considering the number of announced greenfield projects, 41% in terms of the pledged new jobs and 37% in the announced investment capital. Central Transdanubia is

second by a small margin ahead of West Transdanubia in terms of the number of new projects and with a wider margin in terms of jobs and capital. There is little difference between the remaining four regions; each of them received 6-7% of the projects in 2005-2012, meaning twice as much or even more than their share in the stock in 2000. (Albeit the total number of new greenfield investment projects – excluding projects not allocated to regions – was only two thirds in 2009-2012 of the number in the pre-crisis years of 2005-2008.) However, if we compare the regions' shares in the number of projects to their share in GDP, we find that the latter only exceeds the former in West and Central Transdanubia; in other regions the opposite holds (except for Central Hungary, where the two shares are equal), meaning that even after the changes, FDI continues to enhance regional inequalities.

As concerns regional policy tools, EU projects are the largest resources supporting regional development. They come from two main funds, the Economic Development Operational Programme (with the aim of fostering economic growth in Hungary, through strengthening competitiveness) and the Regional Operational Programmes for each of the NUTS-2 regions. In the 2007-2013 period the two gave the highest per capita support to Northern Hungary followed by south Hungarian Plains and Central Transdanubia, meaning that, in line with eligibility rules, regional support flowed to the less developed regions. There is no direct link between FDI and these operational programmes, but among the companies benefiting from economic development funds there were majority foreign owned firms.

After EU accession, government aid to big investors has become the central government policy tool to attract FDI (Hungarian Investment and Trade Agency, www.hita.hu). Non-refundable direct cash subsidy based on an individual government decision can be given for selected investment projects. The value of the project must be least EUR 10 million. The minimal number of new workplaces and the subsidy rate is also determined; conditions in all these respects are looser for regions other than Central Hungary and West Transdanubia. Of the 80 project subsidised according to these rules, one third went to Central Hungary, i. e., much less than this region's share in the GDP or in all greenfield investments. West and Central Transdanubia – with mid-level loose subsidy conditions – received average amounts of big FDI investments: they had no advantage or disadvantage. The two regions most favoured by large foreign investors were Northern Hungary and Northern Great Hungarian Plains, while most disadvantaged were Southern Transdanubia and, even more, Southern Great Hungarian Plains. The data also suggest that in more prosperous times the chances for regional equalization were better than in the crisis period. In 2007 and 2008, when the total number was highest, the share of Central Hungary was lower than in most other years, and Northern Hungary became a favoured destination. After 2009, Central Hungary regained its prominence among the number of subsidized (i. e. large) projects.

Beyond the aid to large investment projects there are some minor and more dispersed policy schemes to attract investors specifically to the less developed regions. The "Investor-friendly settlements programme", introduced in 2009, tried to respond to the problem, that most of the projects have been located in larger towns even if they went to less developed regions. The results of this programme are not yet known. Another policy tool aiming at the development of underdeveloped microregions, called "free entrepreneurial zones", is practically not used by foreign investors.

Concerning Hungary, we have arrived to the following conclusion. The location of foreign investment projects to less developed regions was a crucial component of FDI policy. The discussion of the

relevant data revealed that it did have some success at least in Northern Hungary and in the Northern Great Hungarian plains. Although, on this basis, new FDI projects and the location of large investment projects have become more decentralized over the years, this could not change the discrepancies in per capital GDP.

Poland, the largest country among the CEECs, has received less FDI per capita than Hungary and even less than Romania. It has policies and means for influencing the location of FDI in its less developed regions; the size of regional disparities is similar to what can be observed in Hungary.

The concentration of greenfield FDI projects is less marked in Poland than in Hungary or Romania and it diminished after 2008.

In the post-crisis years the number of projects was 17% lower and the number of jobs was 66% lower than is the pre-crisis period. The crisis related setback in the number of projects was the highest in four of the more developed regions (Figure 9). At the same time, there was a significant increase in many of the less developed regions, first of all in Swietokrzyskie but also in Lubelskie and Podkarpatskie. Swietokrzyskie had the lowest number, only seven projects in the pre-crisis period, but 24 more recently when it took the 10th position out of 16 regions. (It must be noted, however, that in 2012 five out of eight projects were textile outlets in a new shopping centre.) Some mid-range regions, like Lodzkie, maintained their shares by the number of new projects. The most serious setbacks took place in two of the less developed regions namely Lubuskie and Warminsko-Mazurskie. As to the decline in the number of new workplaces, it was most serious in the four most developed regions as well as in three other regions where also the number of projects declined. Still there were three regions where the number of announced new jobs increased compared with the pre-crisis years albeit from a very low level (see Figure 10, in which regions are aligned in diminishing order of per capita GDP).

Figure 10. Change in the number of projects and jobs between 2005-2008 and 2009-2013 by regions in Poland
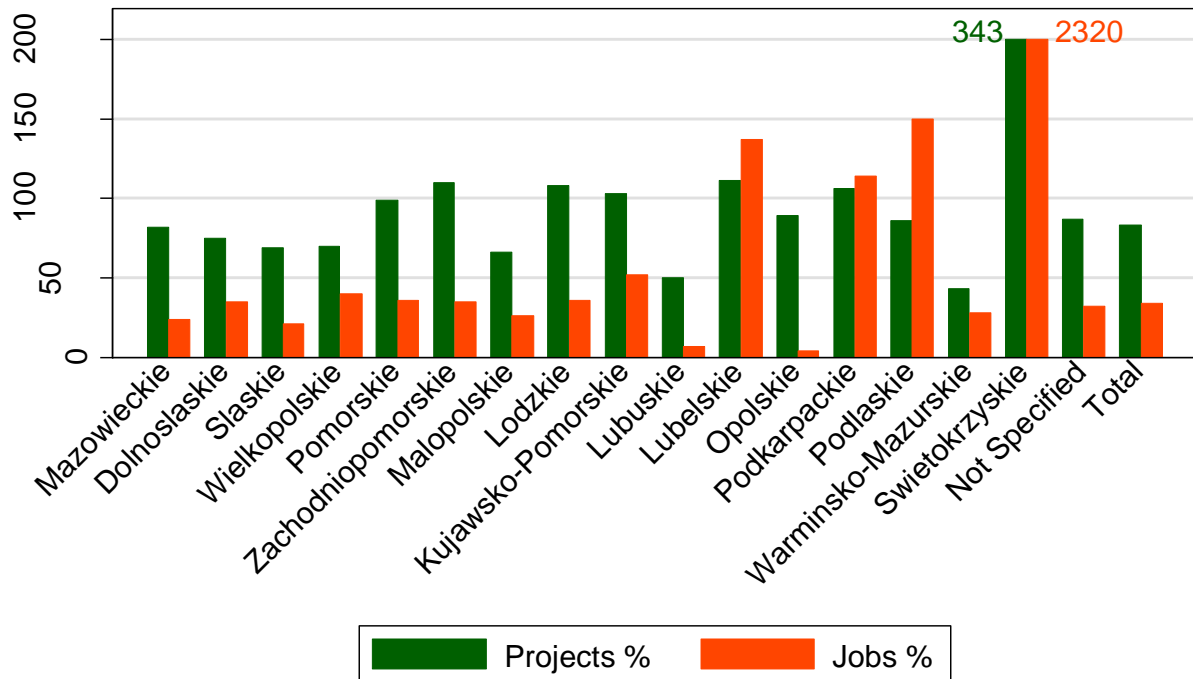
Source: own calculations based on Eurostat and fdimarkets.com

However, even after these changes, most less developed regions had few projects compared to their share in the country's GDP, and the mosrt developed regions still remained in good positions, see Figure 11.

Figure 11. Share in FDI projects per share in GDP by region and year in Poland in 2005-2011
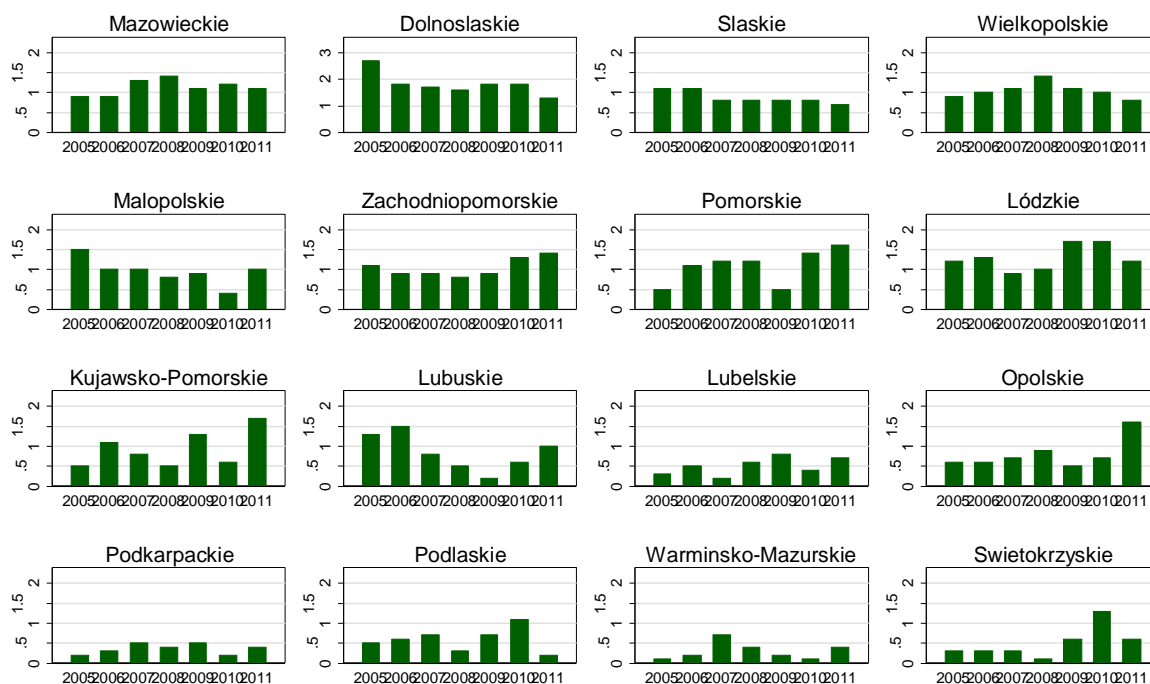
Source: own calculations on the basis of EUROSTAT and fdimarkets.com

As concerns the means used in investment policies, in Poland they are not different for foreign and domestic investors. In 2004-2006, ceilings for investment subsidies were differenctiated on NUTS-3 level. In 2007, this shifted to NUTS-2 level. In this period, six out of 16 Polish regions (voivodships) were allowed only low aid ceilings, 30% of the eligible investment costs in Mazowieckie, 40% in five other regions, while the rest of the country enjoyed 50%. Assuming that in the first couple of years of the 2007-2013 financing period investments projects were based on decision taken before 2007 the pre- and post-crisis years more or less correspond to the two regional aid periods.

The overall setback in the crisis years was more severe in the low-aid regions than in the high-aid regions, especially in terms of the number of projects (see Table 7). Differentiated aid intensities can thus be related to the regional distribution of investments and new jobs. The share of regions with high aid intensity increased in the total number of projects and jobs created but still they accounted only for a bit more than one quarter of the new projects in the 2009-2012 period.

Table 7. Distribution of FDI projects by regions and aid ceiling for large investments in per cent
Low: 30% and 40 of the eligible cost; High: 50% of the eligible cost

Number of projects	2005-2008	2009-1012	Change in number, %
Total number of projects			
Low aid regions	72.2	69.4	-21
High aid regions	27.8	30.6	-9
Total job creation			
Low aid regions	62.2	57.5	-68
High aid regions	37.8	42.5	-62
Number of manufacturing projects			

Low aid regions	64.6	56.3	-55
High aid regions	35.4	43.7	-34
Number of advanced services projects			
Low aid regions	83.6	79.6	6
High aid regions	16.4	20.4	38

Source: own calculations based on www.fdimarkets.com

Less developed, high aid regions with lower number of projects had higher share of manufacturing than the advanced low-aid regions. The number of projects declined less in low-aid regions (by 9%) than in the high-aid regions and even increased in some of them. Thus the share of low-aid regions in the manufacturing projects increased. A similar process took place in terms of job-creation.

Besides public aid ceilings, Polish investment policies also influenced the regional distribution of FDI with special economic zones meaning the application of some fiscal incentives. Special economic zones may have contributed to the shift of investment to the North and the South-East of Poland.

In sum, similarly to the Hungarian case, we can conclude that recent shifts in the location of FDI projects in Poland show a slow movement away from the more developed voivodships to the less developed regions where higher public aid ceilings are applied.

In Romania, the NUTS-2 region Bucuresti – Ilfov) including the capital includes little else than the capital, entailing rather high GDP level (220– 40 percent of the national average); other regions' corresponding value is between 62 and 114%. 2005-2010) the two most developed regions. Between 2005 and 2010, Bucuresti – Ilfov and Vest, the other most developed region increased their advance against the other regions which have all lost relative positions.

In 2006-2008 FDI boomed in Romania, partly because of important privatisations.Its drop thereafter was the consequence not only of the crisis but also of the end of the large privatisation drive.

Figure 12. The number of greenfield FDI projects and jobs created by them in 2009-2012 in Romania
(In percent of the corresponding values in 2005-2008)
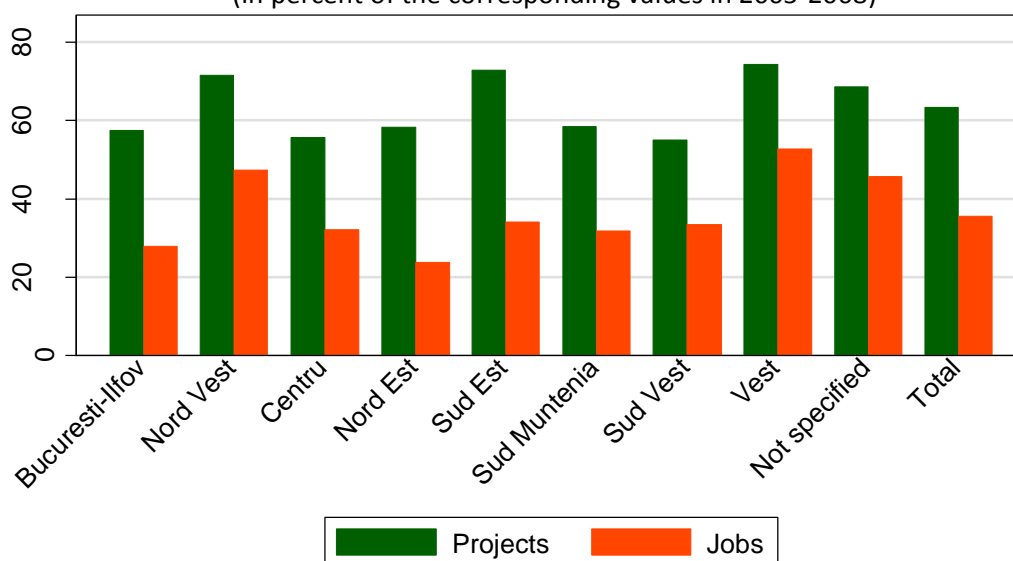
Source: own calculations on the basis of fdimarkets.com

The most severe setback in terms of project number was registered in Sud-Vest, Centru, Bucuresti-Ilfov, Nord-Est and Sud - Muntenia – declining to less than 60%. In terms of job creation Nord-Est was hardest hit followed by Bucuresti-Ilfov, both registering falling numbers to less than 30% of the pre-crisis years. Thus the capital region was among the losers by both indicators – a result similar to what was shown by FDI stock data but deviating from the GDP trend.

The two regions along the Western border of country, Vest and Nord Vest, managed through the crisis with much less loss than the other regions. Their shares in the country increased in terms of new foreign investment projects which were in line with their growing shares in FDI stock and GDP. Geographic proximity to the main markets coincided here with more advanced industrial tradition and better infrastructure while wages were not significantly higher than in the rest of the country. Thus all the most important location factors supported the shift of projects to the capital to the West of the country. Sectorial changes also played a role, as manufacturing projects were mostly located in cities in the West of the country. There was no motorway network to spread new investments to the east of the country like in Hungary.

As concerns regional investment support, it would be difficult to establish a link between it and regional FDI development. Albeit there is such policy in principle with lower support ceilings to investments in more developed than in less developed regions, the low fiscal capacity of the Romanian government has seriously infringed the application of the state aid programme for large investors. The Ministry of Public Finance (MPF) approved financing for only 52 investments projects between 2007 and 2013 worth EUR 3.08 billion, of which EUR 727.19 million was state aid (MPF press release 24.01.2014) and the aid intensity remained below the eligible level. As most of the projects were initiated after 2010, the disbursed aid was only EUR 319 million. The approved state aid accounts for only one fourth of the total investment amount include in the support mechanism. Government policy and regional support are not among the prime location factors of foreign investments in Romania. A questionnaire survey undertaken in June 2011 among foreign manufacturing companies outside the Bucharest Ilfov region (Danciu and Strat 2012) discussed the location factor of efficiency seeking and market seeking (63 firms) firms. The result revealed that efficiency seekers were more interested in the existence of the nearby airports, the available labour force, low costs of labour and the existence of other companies with the same profile in the location as compared to market seekers.

In general conclusion on the basis of the three country studies we can state the following.

 Since 2008 FDI declined and the number of new FDI projects diminished in all new EU member states. Projects became smaller and shifted to new advanced service activities. Regional discrepancies between NUTS-2 in terms of per capita GDP became marginally smaller but mainly unrelated to the location of new foreign investments. Three country studies revealed significant regional gaps in attracting new FDI projects and a dominance of the capital.

Some of the less developed regions in Hungary and Poland could improve their positions in terms of FDI location relative to other parts of the country. Various policy tools applied to increase the FDI attractiveness of less developed regions contributed to this result. State aid for large investments, industrial parks and special economic zones were among the most powerful tools directing the location choice of new projects.

The fiscal capacity of Romania did not allow for redirecting FDI projects to the less developed regions. Although the dominance of the capital city diminished, the less developed regions of country

lost shares in new FDI projects. The access to aid, business parks and incubators was more successful in regions with superior development.

Regional policy focusing on NUTS-2 regions was not in the position of addressing the regional inequalities between agglomerations and rural areas. Regions do not matter much for investors' location choice because they first think in terms of countries with distinct legal and investment environment, and as a next step, they look at specific investment sites. Regions may only have importance in case these can offer significantly different business environments. Such difference can be the different aid intensity of NUTS-2 regions.

4. Policy implications and recommendations

With respect to CEECs, trade and inward foreign direct investment are generally regarded as important supports to economic growth and channels for technology transfer and knowledge creation (e.g. Crespo – Fontoura 2007; Günther 2005; Hunya 2000; Kaminski, 2001; Landesmann and Stehrer 2002). On this basis, an issue that might be quite delicate, in actual fact is not so. Namely, discussing the role played by external trade and foreign direct investment in the cohesion process of CEECs includes an examination, from the point of view of the socio-economic development of the CEECs, the role of one and a half and another half of the four basic freedoms: the free movement of goods, of a part of services and of a part of types of capital. We cannot say that this free movement has no unfavourable consequences but we can safely confirm that their favourable aspects dominate, and the solution to the problems arising does not have to be, and should not be, those freedoms' restriction.

4.1. EXTERNAL TRADE: GENERAL POLICY BACKGROUND

As concerns the freedom of trade, democratic politics is certainly unimaginable without the appearance, from time to time, of protectionist strivings but protectionism is harmful for society's welfare. Proving this old economic theorem again and again by analysis of the facts of life is necessary and will certainly remain so in the near and not so near future. Protectionist practices became more frequent during the crisis, which stimulated research, and new evidence was born, see e. g. Cebula 2010 and Chan – Dang 2010. Countries having weak, largely inefficient manufacturing sectors are most exposed to the attraction of protectionism. However, even among such countries – e. g., among some Caucasus and Central Asian former Soviet Republics – openness to trade yields better results than protectionist policies, see Nannicini –Billmeier 2011.

Openness to trade promotes economic growth. Theoretically, there are two arguments in favour of a positive effect of increased openness on growth: firstly, following the Ricardian tradition, the exploitation of comparative advantages through specialization fosters growth. Secondly, as advocated by the endogenous growth tradition, the exploitation of economies of scale or knowledge and technology spillovers results in higher growth. Empirically, evidence seems to point to a positive relationship between trade and income. For instance, Frankel – Romer 1999 demonstrate that trade has a non-negligible and significant effect on income. Specifically, they calculate that an increase in the ratio of trade to GDP by one percentage point increases income per capita by between 0.5 and 2%. And despite the heavy criticism that this analysis received for its proxy of trade, empirical analyses that corrected for its methodological shortcomings reach similar conclusions. For example, Noguer – Siscart 2005 use data from World Trade Database and find that trade has a large and significant effect on income. Similarly, a positive relationship is also found between trade and labour productivity, with causation running from trade to productivity. For example, for different proxies of trade exposure and openness, Ades – Glaeser 1999, Frankel – Romer 1999 and others find a positive and significant causal effect of trade on labour productivity. Additionally, empirical evidence also points at a positive trade-employment nexus. For instance, Sousa et al. 2012 shed light on the relationship between trade and employment and quantify the number of jobs in the EU that are supported by sales of goods and services to the rest of the world.

Kaminski 2001 underlines that the process of the CEECs' accession to the EU in actual fact had begun with the signing of the European Association Agreements (in most cases in 1991), after which the EU strongly influenced these countries' institutions, policies, and performance. Part of this influence has

been trade: the EU has provided an outlet initially for CEE countries' unskilled-labor-intensive and more recently increasingly for skilled-labor-intensive and technology-based products.

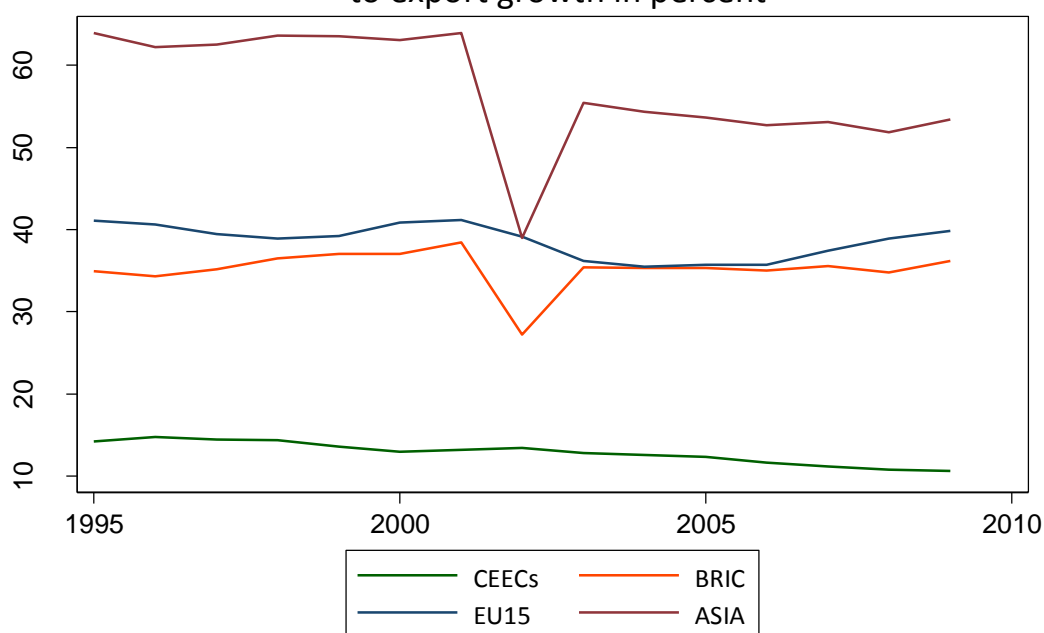### 4.2. OUR OWN POLICY CONCLUSIONS WITH RESPECT TO EXTERNAL TRADE

Weakening supply capacity: future of export growth in jeopardy

Reasons behind any country's export performance can be decomposed to its access to foreign markets on the one hand and its own supply capacity on the other.

A country's foreign market access is not entirely independent of its own actions but still, it is predominantly given (e. g., the geographic distance from various markets). A country can, e. g., improve its foreign market access by joining a regional block but CEECs are already beyond this act, their accession to the EU, which indeed improved their export performance.

On the other hand, supply capacity depends on the country's own efforts, on its economic and other policies. Unfortunately, we have found that the contribution of supply capacity to the CEECs' export performance has been decreasing steadily since the high of year 2000, and has become smaller than that of other country groups studied (see Figure 1). Supply capacity in 2011 contributed less than five percent to CEECs' export performance, the remaining being accounted for by foreign market access. Interestingly, the financial and economic crisis of 2008-2009 didn't have a significant impact on this trend. It seems that along with the ongoing EU accession, the contribution of the foreign market access component to CEECs' exports has been gaining in importance. Thus, the export performance of CEECs in the last decade or so has been predominantly due to their better position in the EU market, while the contribution of their own supply capacity has been decreasing.

Figure 1. Dynamics of the contribution of supply capacity to export growth in percent

As concerns the various components of the supply capacity, productivity of the exporting country negatively impacts the supply capacity of CEECs. Given the fact that trends in real ULC of CEECs since their accession to the EU have not been at all favourable, i.e. they have not improved their wage

competitiveness vis-a-vis the EU-15 countries, this is in line with expectations. Inward FDI penetration has a positive impact on CEECs' export performance, with the size of the impact depending to a major extent on the share of FDI into manufacturing sectors. Export unit values, denoting the structural changes of CEECs' exports, have a significant negative impact on CEECs' supply capacity.

The policy conclusion here is that cost competitiveness has to be kept under control: much more attention has to be paid to the relationship between the increase of productivity and wages. This conclusion has to be completed and modified on the basis of the results of another strand of research. Namely, our thorough analysis of the exports of the Czech Republic, Hungary, Poland and Slovakia to Germany has shown, besides the importance of cost competitiveness, the role of product quality in competition. In the German market, these countries seem to compete with each other by quality but with other countries with prices. The respective competitor partners in these two fields may change but the importance of both for trade and, more generally, economic policies will remain.

Exporter companies and innovation

Innovations – both product, process, organisational and marketing innovations – can be important means of cost and also quality competitiveness. Our research has found that exporting companies in CEECs introduce less innovations (except for product innovations) than exporting companies of "old" EU member countries. This does not hold for foreign-owned companies. Promoting innovation activities of domestically owned exporter companies (and because the observed problem obviously reflects general weaknesses of the innovation culture, also other companies) seems to be an important task for economic policies.
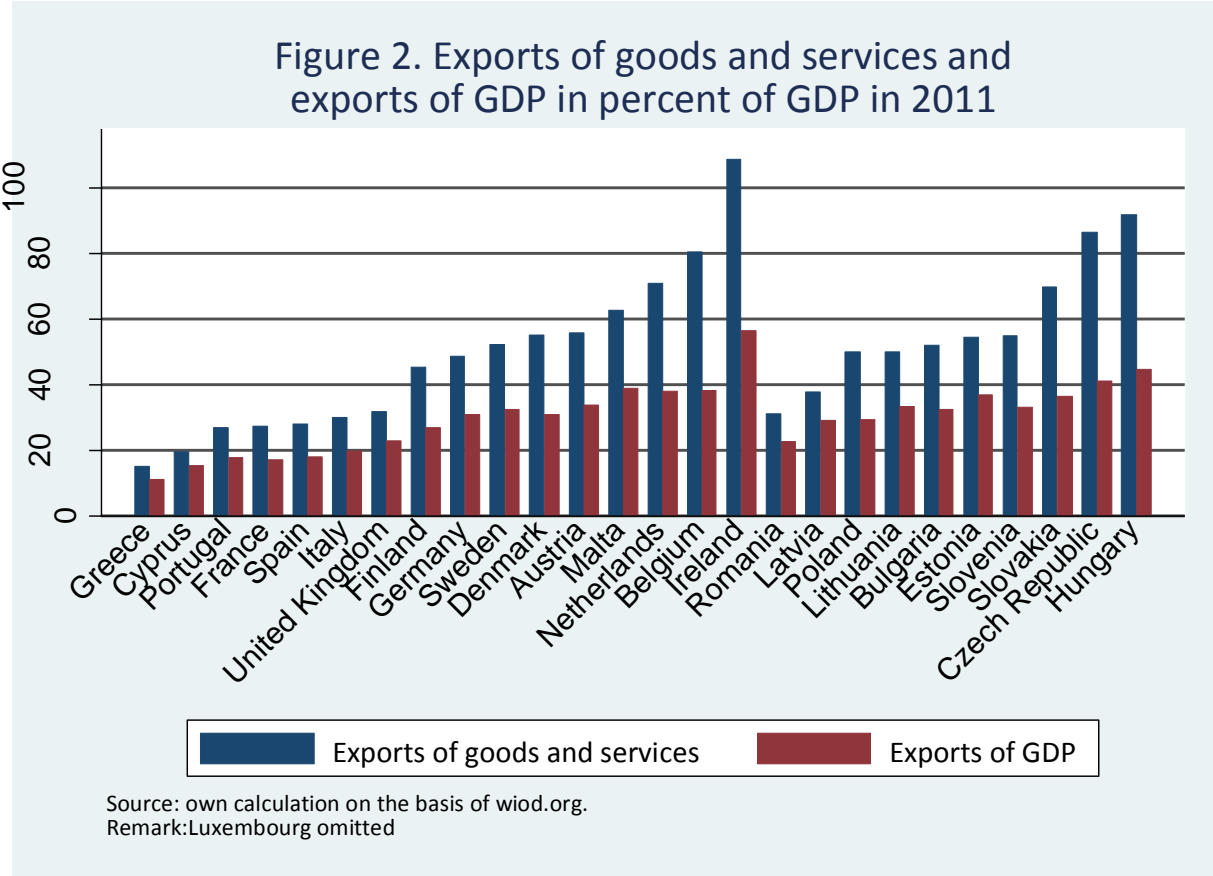
Participation in cross-border value chains (production networks) and concentration of exports

The spectacular growth of the CEECs' international trade from the beginning of transition was largely based on their integration into cross-border production networks or value chains. This pattern of trade growth largely means "reexporting" imported goods after processing, assembling them. This kind of trade has very important consequences for trade statistics: exports and imports get "blown up". Statistical data of exports describe exports of goods and services, but these data, besides the exporting country's export of its own value added, i. e., its own contribution to the value of the exported products and services, also include foreign value added, namely the import content of the country's exports. Because of this, the data of exports yield a distorted picture of the dependence of various countries' economies on foreign demand, as well as of their dependence on different segments of foreign demand. The actual dependence of a country's economy on foreign demand is not correctly expressed by the ratio of its total exports to its total GDP. In the right ratio the numerator has to be the part of its own GDP (value added) that is exported, rather than its total exports that include the import content of its exports. That is, the dependence of country A's economy on country B's final demand, or on the demand for the products or services of a given industry, has to be expressed by its own value added sold directly by it or indirectly by a third country to country B, or by its value added that directly or indirectly becomes part of the products or services, serving for final use, of that given industry, respectively.

Thanks to "world input-output tables" created by a group of economists (see wiod.org), calculating the latter indicator is not impossible. On the basis of these tables (available for 1995-2011, 40 countries including the 27 pre-2013 member states of the EU plus the "rest of the world" and 35 NACE- and CPA-based sectors), input-output coefficients, Leontief inverses and exported value added

(GDP) data can be calculated, and can be compared to the (rough) data of exports of goods and services. Any country's exported GDP can also be determined in any combination of sectors and importing (final user) countries.

Taking the rough statistical data and based on such calculations, respectively, we display in Figure 2 the shares of the exports of goods and services and the shares of GDP exports in the GDP for 27 EU member countries.

Figure 2. Exports of goods and services and exports of GDP in percent of GDP in 2011

Source: own calculation on the basis of wiod.org.
Remark: Luxembourg omitted

The difference between exports of goods and services and exports of GDP is particularly large for those countries – among CEECs for Slovakia, the Czech Republic and Hungary – intensively participating in cross-border production networks but it is also useful, and useful for actors of economic policy, to understand that, e. g., approximately 30 percent of Poland's GDP is exported, and thus export-demand-dependent, rather than 50 percent, which might be thought on the basis of the exports of goods and services.

Data on the trade of goods and services also may and sometimes do seriously misrepresent the share of countries and country groups in the export markets of various countries. In our case, it is important to know that the density of cross-border production networks is bigger within the EU than between EU member countries and non-members. Thus the share of imported goods and services in intra-EU exports is higher than in extra-EU exports. Consequently, in all member countries, except for the heavily service-exporting Greece and Luxembourg, the extra-EU share of GDP exports is lower than that of the exports of goods and services, see figure 3.

Figure 3
Extra-EU exports of goods and services in percent of the total and extra-EU exports of GDP in percent of the total in 2011
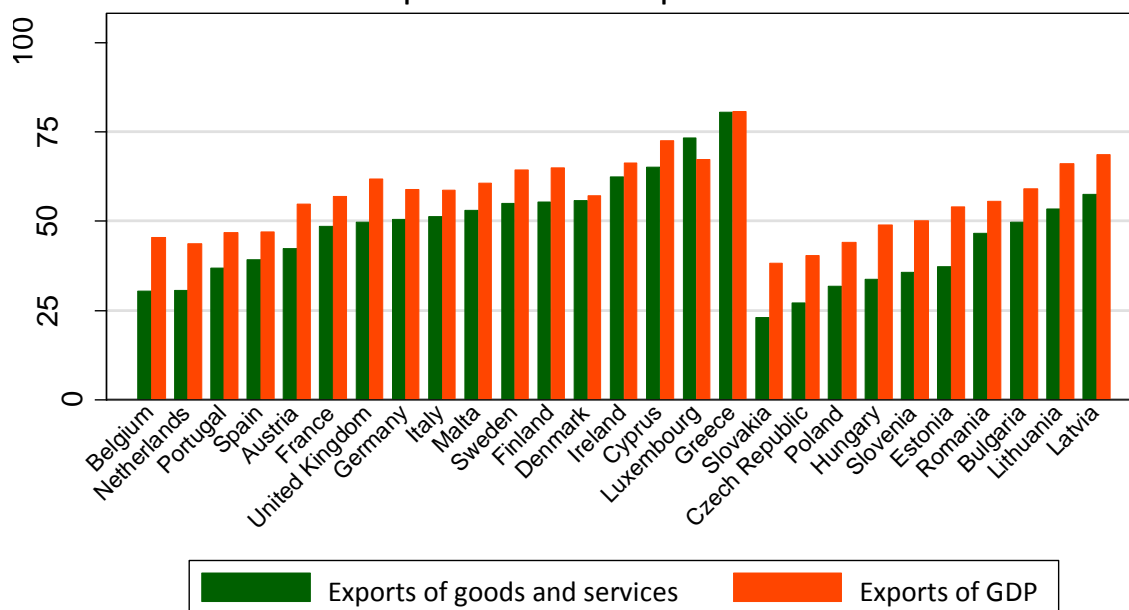
Source: Own calculations on the basis of wiod.org.

In the figure we can also observe that the difference between the two shares does not have everywhere the same size. The largest difference between the extra-EU share of GDP exports and exports of goods and services can be observed in Belgium, the Netherlands, Slovakia, the Czech Republic, Hungary, Slovenia and Estonia. In the case of these countries, the explanation of the difference in question is not restricted to the higher density of cross-border production networks within the EU. A further obvious reason why these countries' extra-EU GDP exports are high relative to their exports of goods and services is their important role of producers of component parts and subassemblies for extensive extra-EU exporters. (E. g., German cars exported to many countries in the world often have significant import content originating from the enumerated countries.) The fact that the enumerated countries' properly understood extra-EU export share is significantly higher than export statistics would suggest is important. Because of the slow economic and thus demand growth in the EU, several countries are striving to increase their extra-EU export shares. The basis of any such policies should be an accurate knowledge of the initial situation.

Besides exports' territorial (intra-EU) concentration, sectorial concentration is also distorted by exports of goods and services data. The basis of our analysis of this kind of concentration is the wiod.org database's 35 sectors. The largest export sectors of some countries are presented in Table 1.

Table 1. The largest GDP-exporting sectors in some countries by wiod.org industries
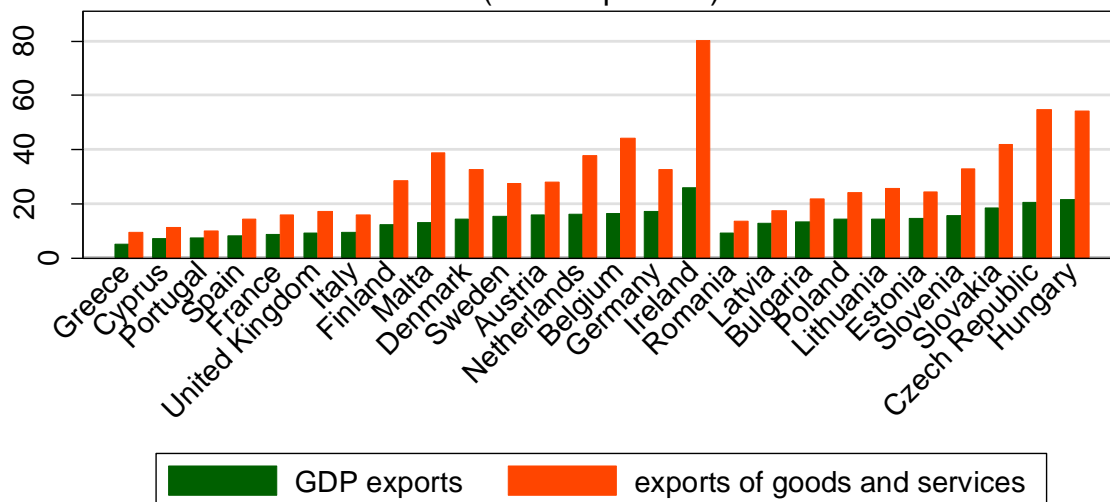
Country	largest	2nd	3rd	4th	5th
Czech R.	15	18	13	14	3
Hungary	15	13	14	18	3
Slovakia	15	14	18	3	13
Austria	18	15	13	3	14

Italy	13	15	18	3	4
Netherlands	3	18	15	13	9
China	14	4	18	15	13
Mexico	15	18	14	3	31

wiod industry		Corresponding CPA/NACE rev 1 (ISIC rev 2) industry
3	15to16	Food, Beverages and Tobacco
4	17to18	Textiles and Textile Products
9	24	Chemicals and Chemical Products
13	29	Machinery, Nec
14	30to33	Electrical and Optical Equipment
15	34to35	Transport Equipment
18	F	Construction
31	L	Public Admin and Defence; Compulsory Social Security

Source: own calculations on the basis of wiod. org.

One usual measure of exports concentration is the share of the five largest sectorial exports in total exports. These shares are displayed for EU member countries, for both GDP exports and exports of goods and services, in Figure 4. The high concentration of the exports of goods and services is extreme in the cases of the Czech Republic, Slovakia and Hungary, but their GDP exports' concentration isalso outstandingly high; Estonia and Slovenia's indicators are also rather high.

Figure 4
The share of the five largest sectorial exports in percent of total exports of goods and services and the share of the five largest sectorial GDP exports in total GDP exports in 2011
(Data in percent)

Source: own calculations based in wiod.org.
Remark: Luxembourg is omitted.

And let us also mention that our indicator reflects only the level of dependence of exports (exports of GDP or of goods and services) on the demand for the products and services of the largest export sectors of the CEE countries, whereas the really interesting issue is the level of dependence of total GDP. The latter dependence is the function of export concentration and of the exported share of the GDP. Export shares of the GDP are displayed in Figure 2 above, and they show that for the five

countries' they are also outstandingly high, which increases their exposure to foreign demand, enhancing the potential danger of the strong sectorial concentration of their exports.

The largest export sectors of these countries are different fields of engineering, primarily automotive industry, and construction. The establishment of clusters of these industries in these (and even though to a lesser extent in some other) CEECs entails obvious synergies, advantages in technological development and other fields. However, the strong dependence on the automotive industry – one of those industries having the largest idle production capacities in the world – also entails dangers which were felt by Slovakia at the trough of the "big recession" in 2009. Actors of economic policy of at least Slovakia, Hungary and the Czech Republic should consider the orientation of investment incentives and other export and manufacturing production promotion measures mostly towards other sectors.

FOREIGN DIRECT INVESTMENT: GENERAL POLICY BACKGROUND

Besides rapidly increasing mutual trade, the Europe Association Agreements of the CEECs also accelerated FDI inflow into the region, contributing to the increasing structural similarity of CEECs' exports to those of „old" EU member contries, see Crespo – Fontoura 2007. Medve-Bálint 2014 shows that the EU has actively shaped foreign capital inflows to the region. First, the EU had an important role in the attainment of a liberal shift in CEECs' FDI policies. Second, after enlargement, the EU has reinforced CEECs' locational advantages through its practice of approving most of the incentive schemes offered by them to foreign investors. The region's heavy reliance on FDI, and FDI primarily coming from EU15 and the USA, have also produced a (favourable) reverse effect: Central and Eastern European investments have enhanced the global competitiveness of western European firms. At this point let us also underline that the research of increasing FDI in the new member states, in spite of all contrary anecdotal evidence, has not found traces of any redirection of FDI from the Southern EU to the CEECs, see Buch – Kokta – Piazolo 2003.

Differently from trade, foreign direct investment does not help economic growth under all circumstances – but, according to De Mello 1999, its negative impact on growth is restricted to the low-income range of developing countries; none of the CEECs belong to this category. The author, using a sample of OECD and non-OECD countries over the period 1970-90, concludes that the long-term growth in host countries is determined by the spillovers of technology and knowledge from the investing countries to host countries, and its extent is determined by the complementarity and substitution between FDI and domestic investment. In the non-OECD sample, he demonstrated no causation from FDI to growth based on fixed effects regressions and a negative short run impact of FDI on GDP, indicating that growth benefits may be restricted to higher income countries. Along the same theme, Blomstrom – Lipsey – Zejan 1994 also found in a cross-country analysis of 78 developing countries that FDI had positive effect on growth rates for higher income developing countries, but not for lower income ones. Another approach resulted in finding another dividing line among developing countries with respect to FDI's impact on economic growth. Namely, Balasubramanyam, – Salisu, – Sapsford 1996, analysing annual cross-sectional data for 46 developing countries have found evidence supporting that the growth effect of FDI is positive in the export promoting countries but negative in the import substituting ones. CEECs stand on the good side of this dividing line, too.

Many authors have demonstrated that positive business climate strongly promotes inward FDI. A recent example is Bayraktar 2013. This author finds that the amount of developing countries' FDI inflow depends on their score in the World Bank's „Doing business" system of indicators. As concerns

the content of the „business climate", Göndör – Nistor 2012, using data of CEECs, have found that fiscal competition between governments for FDI is not primarily a corporate tax rates competition. It is largely a business environment competition, which is determined primarily by fiscal policy. A low corporate tax rate will not attract FDI if the fiscal policy generates an unfriendly business environment marked by unpredictability, lock of transparency, fiscal ambiguity, tax avoidance and tax fraud. We know from Bellak – Leibrecht, M – Damijan 2009 that corporate tax rates – importantly effective, i. e. actually paid tax rates, rather than statutory ones – do influence FDI location decisions. But besides them, as research results of Hunady – Orviska 2014, based on EU countries' data show, labour costs, openness of the economy, low firing costs, larger GDP per capita and low public debt in the country also have significant effect on FDI location decisions. Good protection of intellectual property rights promotes FDI, too, see Tanaka – Iwaisako, 2014.

Let us also mention FDI's interaction with human capital, an important observation of Borensztein – De Gregorio – Lee 1998. They find in a cross-country regression framework for 69 less-developed countries in the period 1970-89 that inward FDI has positive effects on growth through its interaction with human capital. According to their research results, FDI contributed more to growth than domestic investment and it also had the effect of increasing domestic investment. They find that growth equations are extremely sensitive to proxies of human capital.

We also have to stress here one important unfavourable consequence of FDI (and what we propose to cope with it). Hungarian economists (see Kertesi – Köllő 2000) and more recently Maskin of Harvard (Maskin 2014) have observed that foreign investors in emerging market countries employ relatively high-skilled labour in above average share. If FDI „occupies" an important part of the economy then this trend may entail a significant level of „skimming off" of higher-skill labour by foreign-owned companies. Within the EU, this phenomenon is combined with the freedom of movement of people within the EU, which entails that many more or less high-skilled people (who are more mobile than the unskilled and low-skilled) move from NMS to more advanced „old" member states for work.

The consequence of all this is scarcity of such labour for domestically owned companies. This is harmful because the employment of unskilled, low-skilled labour requires the work of higher skilled workers (complementarity of various skill levels, Maskin 2014). In the final analysis, the scarcity of skilled labour entails difficulties in the employment of unskilled, low-skilled workers, thus it may entail higher level of unemployment of the latter. Data seem to support this trend, see Figure 5. In almost all CEECs (the exceptions are Romania and Slovenia) the ratio between the share of unemployment of working-age low-skilled people and the unemployment of all working-agge people is higher than in the average of the 15 „old" EU-member countries.

Figure 5. The relative unemployment rate of low-skilled people:EU15 and NMS

(Unemployment rate of people with ISCED 2 level
in percent of the u. r. of people of all ISCED levels)
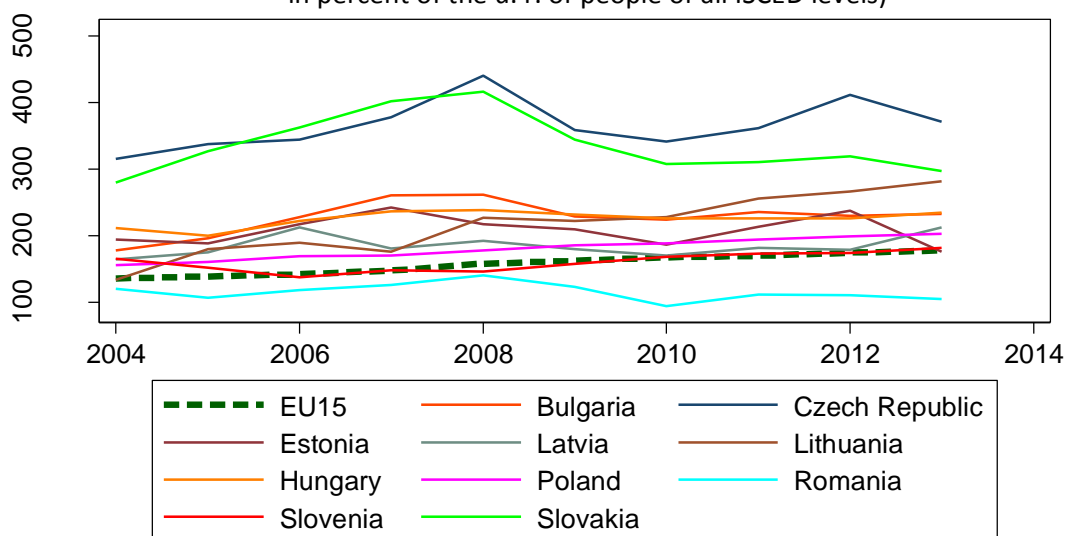
Source: Own calculations based on Eurostat.

The only rational way to cope with this problem is the improvement of the quantitative and qualitative performance of the education system.

OUR OWN POLICY CONCLUSIONS WITH RESPECT TO FOREIGN DIRECT INVESTMENT

Influencing the regional allocation and regional efficiency of FDI

A rather general and well-known problem in CEECs is the tendency of foreign investors to prefer locations in the capital cities and other more advanced regions of the countries. In other words, FDI tends to enhance, rather than mitigate, regional imbalances of economic development. What can governments do against this unfavourable trend, and how can FDI contribute more strongly to economic development (GDP growth) in less advanced regions? Two strands of our research have contributed to answering these questions.

As concerns the regional allocation of FDI, a general striving of governments has been the promotion of FDI in their countries' less developed regions. This has been pursued by various subsidy schemes, free/industrial/business zones and other investment support schemes. While domestic and foreign investments have been treated on an equal basis, foreign investors could get extra benefits due to their larger investment value and higher job creation than domestic investors. Small investors could benefit from SME policy instruments which have been less differentiated by development regions. After EU accession, the regional state aid intensity has become the major differeciating factor in terms of investment support. Thus the investment projects in the capital city regions e.g. Warsaw, Budapest and Bucharest were elegible to 30%, but in less developed regions to 50% aid of the investment costs.

Aid could take different forms; e.g. in Hungary, non-refundable direct cash subsidy based on an individual government decision can be given for selected investment projects. The value of the project must be at least EUR 10 million. The minimal number of new workplaces and the subsidy rate are also determined. Our analysis of the relevant data revealed that this regional FDI-reorientation

policy did have some success at least in two less developed NUTS2 regions: Northern Hungary and the Northern Great Hungarian plains. We have to add: although, on this basis, new FDI projects and the location of large investment projects have become more decentralized over the years, this could not change the discrepancies in per capital GDP.

It must be kept in mind that any shift in the regional allocation of new FDI projects since 2008 took place under conditions when severe declines occurred in terms of the total number of new FDI projects and even more in terms of investment values and job creation (source fdimarkets.com). In Poland for example, in the post-crisis years the number of projects was 17% lower and the number of jobs was 66% lower than is the pre-crisis period. The crisis related setback in the number of projects was the highest in four of the more developed regions. At the same time, there was a significant increase in many of the less developed regions, first of all in Swietokrzyskie but also in Lubelskie and Podkarpatskie. Some mid-range regions, like Lodzkie, maintained their shares by the number of new projects. The most serious setbacks took place in two of the less developed regions namely Lubuskie and Warminsko-Mazurskie. These changes were important, even though after these changes, most less developed regions still had few projects compared to their share in the country's GDP, and the most developed regions still remained in good positions, see Figure 6.

## Figure 6. Share in FDI projects per share in GDP by region and year in Poland in 2005-2011
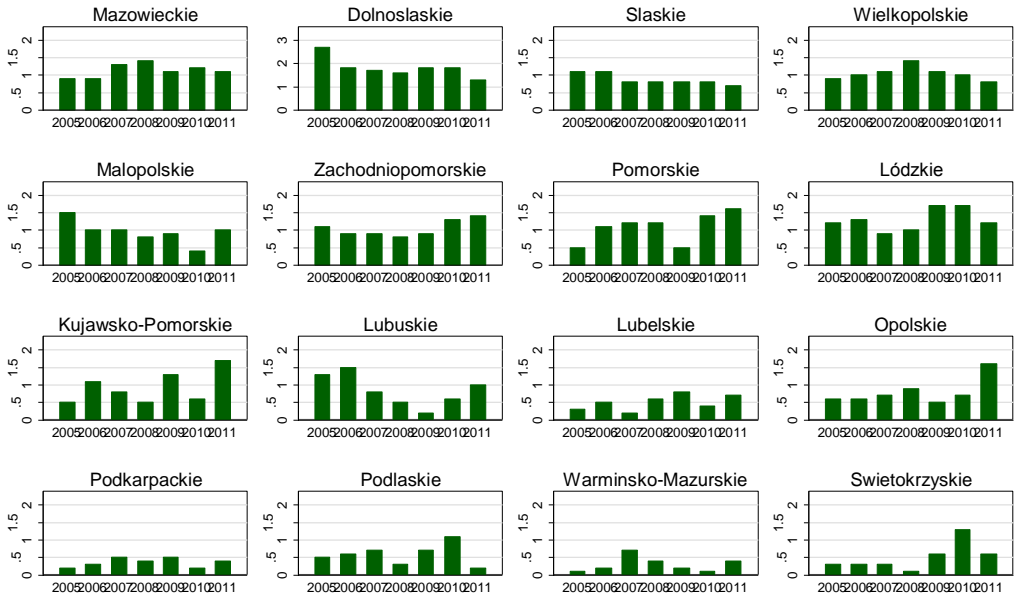
Source: own calculations on the basis of EUROSTAT and fdimarkets.com

As concerns the means used in investment policies in Poland, they were primarily based on the EU differentiated state aid regulations. In the 2007-2013 period, six out of 16 Polish regions (voivodships) were allowed only low aid ceilings, 30% of the eligible investment costs in Mazowieckie, 40% in five other regions, while the rest of the country enjoyed 50%. Assuming that in the first couple of years of the 2007-2013 financing period investments projects were based on decision taken before 2007 the pre- and post-crisis years more or less correspond to the two regional aid periods. The overall setback in the crisis years was more severe in the low-aid regions than in the high-aid regions, especially in terms of the number of projects. Differentiated aid intensities can thus

be related to the regional distribution of investments projects shown in figure 6. The share of regions with high aid intensity increased in the total number of projects and job creation but still they accounted only for a bit more than one quarter of the new projects in the 2009-2012 period. Besides public aid ceilings, Polish investment policies also influenced the regional distribution of FDI by the support of special economic zones and their expansion in less developed regions in the North and the South-East of Poland.

Contrary to Hungary and Poland, we cannot speak about a success of regional FDI policies in Romania. In 2006-2008 FDI boomed in the latter country, partly because of important privatisations. Its drop thereafter was the consequence not only of the crisis but also of the end of the large privatisation drive. The regional pattern of the drop of the inflow is displayed in Figure 7.

Figure 7. The number of greenfield FDI projects and jobs created by them in 2009-2012 in Romania
(In percent of the corresponding values in 2005-2008)
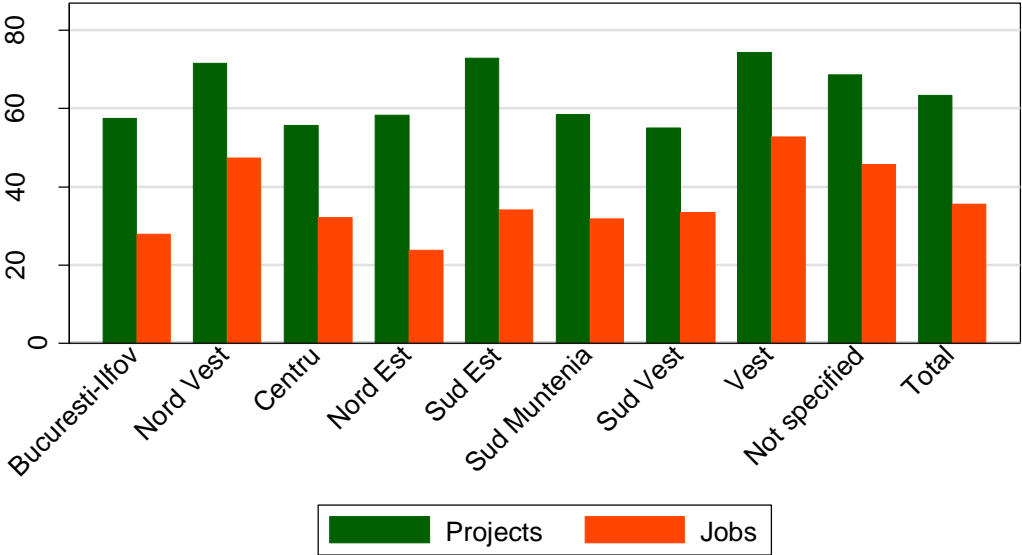
Source: fdimarkets.com

The two more developed regions along the Western border of country, Vest and Nord Vest, managed through the crisis with much less loss than the other regions. Their shares in the country increased in terms of new foreign investment projects which were in line with their growing shares in FDI stock and GDP. Geographic proximity to the main markets coincided here with more advanced industrial tradition and better infrastructure while wages were not significantly higher than in the rest of the country. Thus all the most important location factors supported the shift of projects to the West of the country.

It would be difficult to establish a link between investment support and regional FDI development in Romania. Albeit there is such policy in principle with lower ceilings to investment aid in more developed than in less developed regions, the low fiscal capacity of the country has seriously infringed the application of the state aid programmes. The Ministry of Public Finance (MPF) approved financing for only 52 investments projects between 2007 and 2013 worth EUR 3 billion, of which only EUR 0.7 billion was state aid. The aid intensity remained below the eligible level, including in the less developed, in principle preferential, regions.

The conclusion for economic policy is that if sufficient funds can be put behind the investment support schemes, FDI inflow to less developed regions can be enhanced. Differentiated regional aid ceilings have been maintained for the 2014-2020 programming period benefiting under-developed regions. This will allow governments to support the catching up process. They will need to find ways to implement these policies also in line with the horizontal targets of smart specialization. However, the main issue currently is how to restart economic growth, investments and FDI flows in Europe. Beyond macro-economic policies, regional and buttom-up projects improving competitiveness in specific regions e.g. by clustering and business support can bring good results.

As concerns regional efficiency of FDI, our work is partly an application of the Markov chain method for the examination of cohesion or no-cohesion processes in the GDP growth of EU regions (EU26 sample) and separately only of CEECs' regions(CEECs' sample). Another direction of the same work, which is important for the purposes of economic policy, can be considered an important extension of Borensztein – De Gregorio – Lee 1998, cited above. We examine the FDI – human capital interaction and its role in GDP growth at the regional level.

Our FDI-related research hypotheses have been the following.

The 2nd hypothesis has dealt with the effect of accumulated FDI on the whole economic growth performance of a region. The endowment of regions with a high initial FDI stock is positively associated with the probability to accomplish a long-term growth within the income distribution.

Hypothesis 3a has been that the potential of knowledge spillover, in terms of highly skilled human capital, positively affects the FDI-led income growth of a region. 3b: this underlying rational is positively associated with the catching-up process of CEEC regions in post-transition economies.

As concerns hypothesis 2, for the EU26 sample we have found that the initial distribution indicates that regions with an above average FDI density were already richer from the start. However, the estimated transition probabilities of the Markov chain's "limiting distribution" reveal no evidence for a significant positive association of FDI stocks and long-run growth. Results for the CEECs sample have been otherwise similar to the former, but in contrast to them, CEEC regions with a higher FDI density face a higher probability of moving upwards into higher income classes.

In analysing the regional income impact of human capital endowment, we use for the measurement of the latter the human resources in science and technology occupations (below HRSTO) index. Estimation results indicate that the increases of long-term growth rates in European regions are conditional upon a high accumulation of HRSTO. EU regions with a high share of HRSTO face higher probabilities of being in one of the two above-median income classes than EU regions with a low density of HRSTO.

To identify the combined impact of FDI and human capital endowment on income growth, we distribute the 269 NUTS-2 regions of the EU into four groups: (1) those with high density of FDI and low density of HRSTO, (2) those with high density of FDI and high density of HRSTO, (3) those with low density of FDI and high density of HRSTO and (4) those with low density of FDI and low density of HRSTO. The limiting distributions for these four subsamples indicate that the FDI-led increases of long-term growth rates in European regions are conditional upon a high accumulation of HRSTO: group (2) has the best results. Also, group 3 has better results than group 1, meaning that human capital has larger impact than FDI.

Similarly to the results for all European regions, we find that regions in CEECs characterized by high FDI stocks as well as high HRSTO endowment are more likely to experience catch-up growth. The group of regions where a high share of HRSTO is complemented by high initial FDI stocks shows considerably higher probabilities (about 65 % in graphs (2) and (3)) of remaining in the high income classes. The message for policies is clear: FDI and good quantitative and qualitative performance of the education system are joint conditions for economic development, also on the regional level.

FDI's contribution to foreign technology linkages of domestically owned companies

Previous research shows that MNEs' investment into CEE transition economies is dominated by market- and efficiency seeking motives; the search for knowledge and technology is of secondary importance, but has essentially gained importance over time.

Our research has been based on the 2009 survey data on the IWH FDI Micro database,1,245 foreign subsidiaries based in Poland, Hungary, the Czech Republ ic, Slovakia, Romania and East Germany. Our work continues the strand of research of Günther et al. (2008), who focus on foreign subsidiaries' technology and knowledge sourcing in East Germany and find that a competence-augmenting strategy increases the likelihood for linkages.

In our whole sample, we have found that 38% of the foreign subsidiaries in East Germany and 21% of the foreign subsidiaries in the selected CEE countries did source and transfer knowledge and technology by R&D co-operation from and to the regional innovation system. In our econometric analysis, we have worked partly with the whole sample of companies and partly with an East German and a CEE sub-sample, in order to control for regional and developmental differences.

According to our estimation results, in the whole sample as well as in subsamples the R&D mandate of the foreign subsidiary is significantly positively associated with the probability of regional R&D co-operation and so is the foreign subsidiary's internal technological embeddedness. The foreign subsidiary's technological capability is positively and significantly associated with R&D co-operation in the region of location in the whole sample. The regional knowledge stock is also positively and significantly associated with the probability of regional R&D co-operation and appears especially significant - with a positive sign - for the CEE sub-sample and for co-operation with customers and research institutions.

We can conclude that results based on 2009 survey evidence show that firm- as well as region-specific determinants influence the heterogeneity of foreign subsidiaries' R&D cooperation with the regional economy. Results suggest that especially the foreign subsidiary's mandate in terms of R&D, its embeddedness in the multinational enterprise's (MNE's) internal knowledge base, its own technological capability and the regional knowledge stock are positively associated with these linkages. Our regression results show little difference to the explanatory determinants found in studies on developed countries. This suggests that the European post-transition countries have developed towards knowledge-based economies. The policy conclusion seems to be clear: research and education policies should be developed in ways corresponding to those of knowledge-based societies.

We have also examined relationships between FDI and R&D on the basis of company case studies prepared in the automotive and electronics sectors in Hungary, a country in which the larger part of private R&D expenditure is being spent by foreign-owned companies in these sectors. Interviews were conducted with leading managers at 20 companies.

Our starting point has been that MNEs have a certain "home-country-bias" in R&D activities, and they have compared it to those advantages, which result from transferring R&D activities abroad. What can be the motives of companies to internationalise R&D activities?

The international literature of the topic knows a series of demand and supply factors that push or attract companies towards allocating a part of their R&D activities abroad. It is also acknowledged that these factors have changed dynamically over the course of the years, resulting in more and more R&D activities being transferred abroad. While first almost exclusively production-related R&D activities were located close to production, preceded by the relocation of production to lower-wage countries, later efficiency-seeking motives also started to play a role in transferring R&D activities abroad.

In our interviews the answers to the – importantly: open – question on locational advantages were relatively unanimous. There were eight factors mentioned at least by two managers. These are the following: previous production (10), knowledge base (9) and costs, especially those of skilled labour (9), the level of education (8), previous personal contacts (3) and availability of skilled engineers (3), previous experience (2) and buyers' requirements (2). In our sample, contrary to the findings of the literature, cost considerations are as frequently mentioned as the knowledge factor. The importance of the level of local education, however, further underlines the role of the local knowledge base. The set of factors differs for the production-related and stand-alone R&D units. Understandably, for all production-related units, the presence of relevant production is the most important locational factor. For stand-alone units the most important locational factor is usually the knowledge base. The latter's importance is the main policy message of this research. Some managers complained because of the bottleneck caused by the quality and quantity of fresh graduate engineers – this fact also strengthens the message.

Spillover effects of FDI

Besides direct impact, FDI very often also has indirect impact on the technology level and labour productivity in the host country. Such indirect impact on locally owned companies is called spillovers. We have investigated such spillover effects in two combinations:

- Spillover effects of foreign-owned manufacturing companies on domestically owned manufacturing companies;
- Spillover effects of foreign-owned service companies on domestically owned manufacturing companies

Spillovers between manufacturing firms take place when the entry or presence of foreign affiliates, which typically have better technologies and organizational skills than domestically owned firms, increases the knowledge of domestically owned firms and foreign investors do not fully internalize the value of these benefits (Griliches 1979, 1992). FDI spillovers can occur between firms that are vertically integrated with the MNC (vertical, inter-industry spillovers) or in direct competition with it (horizontal, intra-industry spillovers). The substantial body of empirical literature on FDI spillovers, which has developed over the last 30 years, has produced mixed empirical results. Econometric analyses have found positive, neutral, and negative spillovers from foreign subsidiaries to domestically owned firms. The overall impression of the lack of evidence on FDI spillovers is predominantly due to the results of the firm-level panel data analysis. This is important because this is the most appropriate way to account for FDI spillovers.

For the estimation, we used panel data for 10 transition economies: Bulgaria, the Czech Republic, Croatia, Estonia, Latvia, Lithuania, Poland, Romania, Slovenia and Ukraine.

By applying the firm-level panel data analysis, our research has specifically tackled some of the problems of accounting for FDI spillover as outlined by Görg and Greenaway (2001, 2004). We distinguish between vertical and horizontal spillovers and introduce the heterogeneity of domestically owned firms with respect to technological capacities, productivity, human capital and size. These factors determine domestically owned firms' absorption capacity for spillovers.

In our estimations, we have found that without control for firm heterogeneity none of the ten countries under examination show positive and significant horizontal spillovers from foreign affiliates. These results, however, change when we control for the absorptive capacity of firms. We have found positive horizontal spillovers in six out of ten countries (Czech Republic, Croatia, Estonia, Romania, Slovenia and Ukraine) once we control for individual firms' wage levels as proxies for the levels of human capital. . There are only three countries (Croatia, Romania and Slovenia) where horizontal spillovers seem to accrue in a non-discriminatory way regardless of firm size. In all three countries, positive horizontal spillover effects tend to increase with firm size.

In the case of vertical spillovers of foreign affiliates on domestically owned firms, we focus on backward linkages only, as our preliminary results and other empirical studies (Smarzynska-Javorcik 2004; Halpern and Murakozy 2007) demonstrate that forward linkages are rather low or insignificant in transition countries. Unlike the horizontal spillovers, vertical spillovers seem to have more heterogeneous effects. Abstracting from the absorption capacity and heterogeneity of firms, there are only two countries (Slovenia and Ukraine) that show positive vertical spillovers from FDI at the NACE 2-digit sector level, while there are four countries (Bulgaria, the Czech Republic, Poland and Romania) that demonstrate significant negative vertical spillover effects. These results change slightly when allowing for the absorptive capacity of firms. In Bulgaria, the Czech Republic and Poland, firms with higher absorption capacity (human capital) are shown to be able to reap positive spillovers from their upstream linkages with foreign firms.

Despite the sporadic appearance of negative spillovers, this research, demonstrating the predominance of positive spillovers, sheds further light on the importance of inward FDI in manufacturing. Our other spillover-oriented research strand underlines the importance of FDI in the service sector.

The impact of FDI in services in CEECs is an important issue since services dominate inward FDI in general and in the new EU member states (NMS) in particular. At end 2009, services accounted for 67.5% of total inward FDI stock in the 10 CEECs, business activities having the highest 19.4% share, followed by finance with 18.8%, trade 13.1%, transport, storage and communications 6.8%, electricity, gas and water 5.8%, construction 2.5%, and all other services with 1.1% share. Various kinds of spillovers from foreign-owned firms to domestically owned ones have been subject to research, however, empirical studies on the impact of vertical spillovers from services FDI to manufacturing are sparse.

There are two basic reasons for hypothesizing positive spillovers from services FDI to manufacturing. Firstly, there is a theoretical proposition that benefits of foreign affiliates' superior technologies and organizational skills may spill over to domestic firms, as foreign investors could not fully internalize the value of these benefits (Griliches, 1979, 1992). Secondly, service inputs play a distinctive role in the production of goods and other services. It is generally recognized (e. g. Francois 1990) and

empirically evidenced (e. g. Inklaar et al. 2007) that the impact of services on growth and productivity of other sectors, most notably of the manufacturing sector, is important. For CEECs the underdeveloped services sectors were an onerous socialist legacy. The transition process has brought distinctive liberalisation and development of services in these countries.

The literature on services' sector liberalization mainly deals with its impact on other sectors, most notably manufacturing. Liberalization of services involves entrance of new domestic and foreign providers which leads to lower prices, higher quality and greater variety of services (Arnold et al. 2011). The empirical evidence of positive impact of services liberalization on manufacturing does not leave any doubt. It reports on the positive impact on manufacturing exports (e. g. Francois – Woerz 2008), and productivity (e. g. Fernald 1999).

Specific research of spillovers from services FDI is relatively new. Services FDI could increase manufacturing sector productivity by lower prices of services, higher quality of services, greater variety of services, but also via increasing competition and knowledge (horizontal) spillovers to local service firms (Arnold – Javorcik – Mattoo 2011).

In our econometric estimation we have worked with the data of Bulgaria, the Czech Republic, Estonia, Romania, Slovakia and Slovenia. In the various estimations we have found everywhere positive and significant impact of service FDI on domestically owned firms' productivity, since we could distinguish the impact of services provided by foreign controlled firms. We have also calculated the foreign-owned companies' service linkage measure for five service sectors separately: energy supply, wholesale and retail trade, transportation and telecommunication, financial services and business services. The results show that for the whole sample the foreign presence in the energy sector drives the positive effect of the aggregate service linkage. The policy implication is clear here, too.

5. Dissemination: stakeholder events

Three dissemination events with stakeholders (primarily investment promotion agencies) were foreseen, for IWH, IEHAS and IER, respectively.

IWH implemented its share at a policy oriented workshop organised under the title "FDI in Europe - Effects, Perceptions and Reactions" that took place on the 13th and 14th November 2014 at the Leibniz Institute for Regional Geography (IfL) and primarily targeted policy makers at different levels including regional investment promotion agencies.

Organising a dissemination event in 2014 in Hungary would not have been practical, mainly because of the ongoing reorganisation of the investment promotion agency. Because of this, the Hungarian side proposed to organise the event in Vienna, and also to widen it with the presentation of the other two strictly economic WPs – WP1 and WP3. This event was held on 13 October in WIIW.

IER's dissemination event will be held in January 2015 in Ljubljana.

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6. Appendices

List of working papers and reports

P2.1. (T1), Unit values, unit labor costs and trade performance in four Central European Countries (IEHAS)

P2.2. (T1), The Role of Intra-Industry Trade in the Industrial Upgrading of the 10 CEECs New Members of the European Union, (IEHAS),

P2.3. (T1), Bright past, shady future? Past and potential future export performance of CEE countries in a comparative perspective, (IER),

P2.4. (T2), Effects of Trade Variety on the Skill Premiums in CEECs: A Comparative Analysis, (WIIW),

P2.5. (T2), Trade integration, production fragmentation and performance in Europe - blessing or curse? A comparative analysis of the New Member States and the EU-15, (WIIW),

P2.6. (T2), Exporting status and success in innovation: Evidence from Community Innovation Survey micro data for EU countries, (IER),

P2.7. (T3), Firm heterogeneity and FDI productivity spillovers: the Case of Central and Eastern European Countries, (IER, IWH),

P2.8. (T3), Outward FDI and company performance in CEECs (IER),

P2.9. (T4), Methodological Report on the Cross-Country Survey 2013 In Hungary, Czech Republic, Poland, Romania, Slovakia, and East Germany (including Berlin) (IWH),

P2.10. (T4), MNEs and Regional R&D Co-operation: Evidence from Post-TransitionEconomies, (IWH),

P2.10. (T4), Functional Upgrading and Productivity Growth of Multinational Subsidiaries in European Transition Economies,

P2.11. (T4), Case study evidence of foreign subsidiaries' R&D and innovation capability – paper, (IEHAS), (month no.

P2.12. (T5), Regional growth dynamics in the new EU member states – The role of FDI and human capital, (UCL, IWH), (month no. 24 – D22)

P2.13. (T5), Regional policy and FDI location – an overview of the larger new EU member states (WIIW),

P2.13. (T5), European integration and outward FDI from Central and East Europe, (IWH),

P2.14. (T6), Knowledge Spillovers from FDI and Positioning of CEECs in Times of a Global Shift in Production and Innovation – A Policy Perspective (IER and IWH)

P2.15. (T6), GRINCOH Dissemination event organised under the title „Cohesion in the new EU member states: catching-up, structural change and the role of trade and FDI" in the Vienna Institute for International Economic Studies (Wiener Institut für Internationale Wirtschaftsvergleiche, WIIW) on 30 October 2014.

P2.15. (T6), Stakeholder event with investment promotion agencies – workshop (IWH)

P2.15. (T6), Dissemination activities (stakeholder events organized with the participation) of the IER Institute for Economic Research (Ljubljana, Slovenia)