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Knowledge Spillovers from FDI and Positioning of CEECs in Times of a Global Shift in Production and Innovation – A Policy Perspective

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Abstract: The paper deals with policy issues of knowledge spillovers via foreign direct investment (FDI) to help positioning CEEC economies in global shift in production and innovation. CEEC economies successfully attracted some FDI in R&D. However, considerable misalignment between domestic and foreign technological accumulation exists. This is partly related to the heterogeneity of foreign subsidiaries but even more so to weak performance and governance of national innovation systems as well as poor coordination of FDI and policies in the field of science and technology (S&T). The paper reviews existing relevant policy areas such as linkage promotion, R&D capabilities and technological linkages, horizontal policies, training incentives, as well as industrial, technological and science parks. The paper argues that an increased policy focus on technological aspects would not only improve the potential for technological spillovers from FDI but also the absorption capability of domestic firms. A way forward is to coordinate FDI policy better with R&D, innovation, and regional policy instruments. In this case, CEEC economies can use FDI as means to realign their national innovation systems with global knowledge creation and diffusion.

Content

1. Introduction

Accelerated liberalisation processes in the field of foreign direct investment (FDI) have resulted in the entry of new potential host countries including Central and East European Countries (CEECs) in the 'FDI market' in the last two decades. Increased inter-country competition has resulted in aggressive policies for attracting FDI. Widely used policy measures include investment incentives, image building, direct acquisition of FDI, and the provision of general services to investors. Investment incentives are at the core of FDI policy in theory and policy discussion. The use of incentives to attract FDI has considerably expanded in frequency and value. The widespread and growing incidence of both fiscal and financial incentives is well documented (Charlton 2003, OECD 2003, OECD 2005, UNCTAD 1996, Oman 2000).

Incentives can be used for attracting new FDI to a host country (locational incentives) or for making foreign affiliates in a country to undertake functions regarded as desirable (behavioural incentives). The objective of the former is primarily to increase FDI inflows, while the latter stimulates specific behaviour of foreign owned firms, such as R&D and innovation, export propensity, employment, regional aspects etc. Most incentives do not discriminate between domestic and foreign investors, but they sometimes implicitly target one of the two (UNCTAD 2003). Within the European Union (EU), investment incentives are, as a rule, non-selective i.e. directed at domestic and foreign investors alike.

The rationale for policy intervention with respect to FDI has frequently been associated with the potentially positive effect of FDI on the productivity of domestic firms via knowledge spillovers and linkage effects (Charlton 2003, UNCTAD 2003). However, there is no consistent evidence on positive knowledge spillovers from FDI in CEEC economies (for an overview see Jindra 2005, Rojec and Knell 2007, Rugraff 2008, Sinani and Meyer 2009, Damijan et al. 2013). This is often explained by a lack of absorptive capacity in domestic firms. Yet recent studies also underline that foreign firms are heterogeneous with regard to knowledge enhancing activities and technological linkages (Castellani and Zanfei 2006, Marin 2006, Marin and Bell 2006). Therefore, not every foreign firm provides the same knowledge opportunities or spillover potential for domestic firms (ibid.).

Rugraff (2008) claims that the lack of knowledge spillovers can be attributed, to a large extent, to the adoption of a particular model of FDI policies by CEECs, where multinational enterprises (MNEs) have taken the various advantages that they have been offered without sufficient incentives to interact with the local environment. As a result trade and FDI led to a successful integration of CEECs into the European production network, however, with limited effects in terms of stimulating local technological development. In contrast other, mainly Asian, emerging economies applied a more interventionist approach towards industrial upgrading that combined activities of foreign MNEs with various elements of industrial policy. Arguably these initiatives proved successful when following comparative-advantage-following rather than defying strategies (Lin 2012). The recent economic crisis was another major challenge for the policies pursued in many CEECs, and the region was hit by the crisis much harder than other parts of the emerging world, and is also recovering more slowly (Becker et al. 2010). Today policy makers face a rapidly changing global landscape of production and innovation with increasing flows of FDI being directed towards Asian emerging economies (UNCTAD 2013), which also become increasingly attractive as location for foreign R&D by western MNEs (UNCTAD 2005). This constitutes a major challenge for policy approaches towards FDI in the CEE region.

Our paper takes a closer look at policies that are relevant for fostering knowledge spillovers from inward FDI in CEECs. The reason for concentrating on FDI spillovers' policies is that it is spillovers which are of major importance for positioning of CEEC economies in global shift in production and innovation and, thus, for speeding-up their cohesion process. The objective is to see whether there is a room for more efficient policies and, if yes, in what direction should policies develop. The policy areas reviewed include investment incentives, regulation, or other instruments covering FDI, trade and technological linkages, R&D and innovation capability, horizontal policies, science and industry parks, as well as governance of innovation systems in CEEC economies. The paper is structured in the following way: firstly, we discuss the rationale and nature of FDI incentives. Secondly, we review the evidence on effectiveness and efficiency of FDI incentives. Thirdly, we review and discuss selected policies relevant to knowledge spillovers from FDI that have been applied in CEECs so far. The final section draws the conclusions related to policies intended to foster knowledge spillovers from FDI in CEEC economies.

2. Theoretical foundations of FDI incentives, their effectiveness and efficiency

2.1 FDI incentives and knowledge spillover theory

At a general level, government intervention is justified either when markets are characterised by certain distortions or because they are incomplete. Three arguments in favour of government intervention can be made: the presence of knowledge spillovers and dynamic scale economies; coordination failures; and informational externalities (Pack and Saggi 2006, Rodrik 2006). The rationale for policy intervention with respect to FDI has frequently been associated with the potential for FDI induced positive externalities on the productivity of domestic firms via knowledge spillovers (UNCTAD 2003). This rationale rests on the assumption that FDI is associated with a centrally accumulated technological advantage originating in the home country, which is transferred to the host country where it diffuses to the domestic economy automatically. In fact Findlay (1978) argued that the potential for technological diffusion via FDI is positively related to the relative technology gap between the home and host economy. He referred to the 'contagion effect' whereby technical innovations are most effectively copied when there is personal contact between those who already have knowledge of the innovation and those who eventually adopt it (Nelson 1968, Mansfield 1961, 1968).

However, Wang and Blomström (1992) criticise this approach, in which a host country's production efficiency is simply modelled as an increasing function of foreign capital. Instead, they explicitly recognise the costs associated with technology transfer in MNEs, as suggested by Teece (1976, 1977), and learning costs of domestic firms. Thus, FDI externalities depend positively on the technical and managerial competence of the foreign subsidiary as well as the domestic firm's decision to invest in learning. The latter aspect has been also related linked to the concept of absorption capacity, which is defined as firm's ability to absorb, acquire, and internalize external knowledge and is assumed to be a function of firm's prior R&D (Cohen and Levinthal 1990). Whereas this aspect has been frequently confirmed in empirical research only more recent research underlines that knowledge-enhancing activities as well as technological cooperations between foreign subsidiaries and domestic firms are as well prerequisites for knowledge creation and diffusion (Marin and Bell 2004, Castellani and Zanfei 2006, Damijan et al. 2013, Jindra 2010, Giroud et al. 2012).

FDI spillover models suggest differentiation between FDI spillovers that occur between firms being vertically integrated with the MNE (vertical, inter-industry spillovers to domestic firms in upstream and downstream industries) or in direct competition with it (horizontal, intra-industry spillovers). The

economics behind this differentiation is based on the following: since MNEs have an incentive to prevent information leakages that would enhance the performance of their local competitors, but at the same time may want to transfer knowledge to their local suppliers, spillovers from FDI are more likely to be vertical rather than horizontal in nature. Vertical spillovers are of two types, backward linkages when domestic firms are suppliers of foreign affiliates, and forward linkages when domestic firms are customers of foreign affiliates. The authors, who explicitly bring the notion of vertical and horizontal spillovers in the literature, like Blalock (2001), Schoors and van der Tol (2001), Smarzynska (2001, 2003), Damijan et al. (2013) etc., predominantly provide evidence of positive FDI spillovers through backward linkages. The most important channels of backward linkages are direct knowledge transfer, higher requirement for product quality and on-time delivery introduced by MNEs and the fact that the MNE entry can increase demand for intermediate goods (see Javorcik, 2004; Lall, 1980: Smarzynska, 2003; Markusen and Venables, 1999). An example of forward linkages is positive effect of FDI in services on manufacturing productivity growth in Chile (Fernandes and Paunov, 2008). The existing evidence for CEECs also indicates that knowledge spillovers from FDI are more likely through vertical linkage relationships rather than horizontal links between competitors (Jindra 2005, Rojec and Knell 2007). It has also been demonstrated that direct knowledge transfer via backward linkages from foreign subsidiaries in CEECs to domestic firms (suppliers) is not a linear function of the extent of local sourcing but subject to the extent of knowledge-enhancing activities and decision-making autonomy of foreign affiliates (Giroud et al. 2009, Giroud et al. 2012).

In contrast to insights of the literature on new economic geography (Krugman 1991, Jaffe et al. 1993) most FDI spillover models assume that knowledge spillovers are not spatially bounded. This assumption was challenged by Aitken and Harrison (1999) and Driffield (2004, 2006) showing that FDI-induced intra-regional spillovers exceed the size of spillovers across regions. The evidence suggests that learning from FDI by domestic firms within and across industries will be local rather than national. Futhermore, Völlmecke et al. (2014) confirm a positive interaction between the stock of foreign capital, human resources in science and technology occupation and regional income growth across all EU27 regions as well as within regions of CEECs.

In sum, government incentives to attract FDI may be justified on the grounds of externalities. However, there are good reasons to remain cautious when granting incentives exclusively or unconditionally to foreign investors. Any investment incentive granted only to foreign investors can work against their domestic competitors (Markusen and Venables 1999, Barrios et al. 2006). In addition, investment incentives aiming to increase the potential for spillovers from FDI may be inefficient unless they are complemented by measures to improve domestic human capital and learning capability (Blomström 2002) as well as by policies that set incentives for foreign firms to engage in local R&D, innovation and technological cooperation.

2.2 Types of FDI incentives

Governments use three main categories of investment incentives to attract FDI: financial incentives (for example, grants, subsidies and loans at concessional interest rates), fiscal incentives (for example, tax holidays and reduced tax rates), and other incentives (for example, subsidised infrastructure or services, market preferences and regulatory concessions, including exemptions from labour or environmental laws). Incentives can be used for attracting new FDI to a host country (locational incentives) or for stimulating foreign affiliates based within a host country to undertake functions regarded as desirable (behavioural incentives). The objective of the former is primarily to increase FDI inflows (quantitative goal), while the latter stimulate specific behaviour of foreign

investors and foreign-owned firms (qualitative goals), such as transfer of technology, R&D activities in foreign subsidiaries, export propensity, employment, regional aspects etc.

In general, developed countries and economies in transition frequently employ financial incentives, while developing countries (which cannot afford a direct drain on the government budget) prefer fiscal measures (OECD, 2003: 124). Within the EU, investment incentives are, as a rule, directed at domestic and foreign investors alike but in a number of cases they are created with primarily foreign investors in mind (e.g. individually designed contractual regimes for large projects, special incentive packages for strategic investors, high-tech investments). Grants linked to R&D investments – either by domestic or foreign firms – in particular have been on a rising trend in both developed and developing countries (European Commission 2006a, UNCTAD 2005).

2.3 Effectiveness and efficiency of FDI incentives

When considering the efficiency of government incentives, a number of complex considerations need to be taken into account. First of all, governments might offer incentives to investors that would have invested anyway. Second, it is not possible to calculate the economic size of externalities ex ante to the actual investment. Third, a reduction of fiscal revenues (in the case of fiscal incentives) and/or increase of fiscal expenditures (in the case of financial incentives) reduce the amount of fiscal resources for other purposes. Fourth, there exist administrative costs related to the managing of incentive schemes. Fifth, there are potential efficiency losses if firms are induced to locate where incentives are most favourable, rather than where valid locational factors would suggest them to locate (UNCTAD 2003, Blomström 2002).

Empirical research claims that investment incentives play only a limited role in determining the international pattern of FDI (Blomström et al. 2000). For the EU there exists conflicting evidence from cross-country aggregate data on the effect of cohesion or structural funds related investment incentives on the location of FDI (Breuss et al. 2010, Hubert and Pain 2002). Basile et al. (2008) using cross-country regionally disaggregated data found evidence for structural and cohesion funds played a significant role in attracting FDI to peripheral regions. For CEECs the evidence is mixed. Beyer (2002), and Holland and Owens (1996) found no effect of investment incentives on FDI inflows, while Semihradsky and Klazar (2001) even found negative correlation between investment incentives and FDI inflows in the Czech Republic, Poland and Hungary. The analysis of Mallya et al. (2004) of the Czech FDI incentives policy shows that only few investors entered the country, or decided to expand their existing operations because of the incentives offered. In contrast Jindra (2010) shows that the availability of investment funds within a region increases the location probability of MNEs in East German regions. However, in general we find a strong concentration of FDI in European capital cities and this applies in particular to CEECs (Gauselmann and Marek, 2012). There is only limited evidence that less developed regions in CEECs improved their positions in terms of FDI location relative to other region within the country (Hunya 2014). Various policy tools applied to increase the FDI attractiveness of less developed regions of CEECs contributed to positive examples. State aid for large investments, industrial parks and special economic zones were among the most powerful tools directing the location choice of new projects (ibid). Thus, investment incentives may well increase FDI inflows or location probability. However, given the cost of incentives the effects on the total capital stock are unclear (European Commission 2006a). As far as behaviour of foreign investors is concerned, in the Czech case, Mallya et al. (2004) find evidence of a link between FDI incentives and behaviour of foreign affiliates. Subsidized FDI projects are found to be larger, more often Greenfield projects, export oriented and have more often plans for follow-up-investment. In addition, such

projects have a particular sectoral composition and are more frequent in the technology intensive industries compared to non-subsidised FDI projects (ibid.).

The OECD (2003: 126) concludes that investment incentives can be effective in attracting and influencing the location and behaviour of foreign investors. Yet, the economic desirability of locational incentives is not clear. In particular if they detract from building competitive capabilities and encourage bidding wars. It has been argued that behavioural aspects of FDI incentives should have priority over the policy objective to maximise FDI inflows (see Lall 1996, Narula and Dunning 2000). Behavioural aspects of FDI incentives for example target R&D, innovation, and skills of foreign affiliates (UNCTAD 2005) as well as trade and technological linkages to the local economy (UNCTAD 2001). The OECD holds that such behavioural incentives are more likely to be effective in inducing benefits from FDI when complemented with other policy measures aimed, for example at enhancing the level of skills, technology and infrastructure quality (OECD 2003). In order not to prevent market distortion, the European Commission suggest that investment incentives should be available on equal terms to foreign and domestic investors irrespective of the industry (European Commission 2006a). Given the broad scope of behavioural performance-based investment incentives, they can be considered part of the economy's wider innovation and growth policies rather than a policy area that is of relevance only for foreign investors.

3. FDI relevant policies in CEEC economies

In the discussion of the efficiency of FDI incentives, Rugraff (2008) differentiates two main types of policies: the Irish model and the Taiwan–Korea–China (TKC) model. Both models try to promote an export-led strategy by opening the country to FDI. But whereas the Irish variant is based on the massive attraction of FDI mainly through a FDI-friendly policy environment and minimum of state intervention directed at sectoral policies (preference to high-tech sectors) and human capital upgrading, the TKC model is more constrained and is directed to promote the national priorities and in particular the emergence of competitive indigenous firms. In the words of Dunning (1993), the Irish model belongs to the non-interventionist approach to FDI policy, while the TKC model belongs to the structural adjustment and upgrading approach to FDI policy. Rugraff (2008) argues that CEECs such as Czech Republic, Hungary, Poland and Slovakia adopted an Irish model. Rugraff (2008) holds that these countries have been successful in attracting mainly export oriented FDI, but have failed to create spillover effects from MNEs' activity. Basically, knowledge transfer and spillover effects were inhibited by the technology gap between foreign and domestic firms as well as the power of MNEs' integrated global production networks. However, according to Rugraff (2008), the lack of spillovers can also be attributed, to a large extent, to the adoption by the Central European countries of the Irish model, where MNEs have taken the various advantages that they have been offered without sufficient incentives to interact with the local environment.

In the remainder of this section, we review various FDI incentive policies adopted in CEEC economies of the EU that are of specific relevance for knowledge transfer and spillover effects. Where relevant we draw also upon examples from other economies such as Ireland, Singapore or Portugal.

3.1 Linkage promotion

By definition, knowledge spillover effects from FDI to the host economy through vertical linkages require an adequate firm structure in up- and down-stream sectors. In fact, there is evidence that a diversified industry structure within a particular region fosters technological backward linkage effects (Jindra 2010). Therefore, a business linkage programme could be an effective way to facilitate the

generation of externalities between agents involved. Given an adequate firm structure in the respective fields of activity, investment promotion agencies (IPAs) activities could potentially foster linkages between foreign affiliates and local firms.

In the past, governments frequently attempted to 'force' foreign-owned companies into linkages with local companies by local content requirements, foreign equity ceilings, and joint ventures, sometimes even by direct requests to transfer technology from abroad. This was a kind of usual element of import-substitutive development concept and policies. Not surprising, there is evidence of high inefficiencies in industries that used domestic content requirements (for an overview see Moran 1998). Explanation for this basically lies in the criticism of the import-substitution policies, with adverse effects through limited economies of scale and lower incentive for technology transfer associated with an investment project under too coercive local content or joint venture requirements. With protected local markets and lower economies of scale, no transfer of cutting edge technology or managerial best practise is needed, the likelihood of spillovers from foreign to domestic firms is lower as well. Of course, the mere absence of local content requirements does not automatically lead to spillovers and industrial upgrading of domestic firms (Moran 1998). There is also evidence of a non-linear relationship between the extent of local sourcing and direct knowledge transfer from foreign to domestic firms for CEECs i.e. in countries which do not apply local content requirements (Giroud et al. 2012). Thus, in principal it does not only matter how much a foreign firm sources locally, it is also a question of the type of inputs. This in turn is related form the type of business function(s) implemented by foreign affiliates and depends from the existence of a competent local supplier base with a sufficient size of production capacity.

Policy makers increasingly strive to promote more 'natural' linkages. According to the OECD (2005), the success of linkage programmes greatly depends on the willingness of the existing foreign-owned companies to cooperate. Financial and organizational support, offered by a host country to foreign-owned companies, can potentially reduce the risks related to the engagement and upgrading of local suppliers (OECD 2005). Therefore, requirements about specific behaviour of foreign-owned companies have been mostly replaced by more flexible systems, in which foreign investors are offered incentives if they fulfil certain requirements. Such positive non-coercive incentives have led to the successful promotion of linkages between foreign-owned and local companies in countries such as Ireland, Singapore and Malaysia. Linkage promotion could entail activities such as: (i) informing foreign-owned companies about the possibilities of engaging local suppliers, (ii) matching foreign-owned and local companies, (iii) capacity upgrading with promotion of SME development, (iv) training of employees in potential local suppliers, and (v) assistance in financing the up-front production of inputs.

A possibly best practice example in promoting linkages between foreign-owned and local companies is a linkage promotion programme implemented by the Irish Development Agency (Barry et al. 2003, IDA 2008). Enterprise Ireland developed since the 1980s various linkage programmes, whose intention has been to strengthen the integration of foreign-owned firms into the Irish economy. Within this linkage programme, the representatives of Enterprise Ireland visit foreign-owned firms to ascertain their needs for inputs and then try to find Irish suppliers for these inputs. Enterprise Ireland soon found that local suppliers face a number of problems in fulfilling the requests of foreign-owned firms. As a consequence, the programme has been increasingly upgraded in the direction of capacity building among domestic suppliers. In this process, Enterprise Ireland closely cooperates with the selected potential domestic suppliers, and is actively engaged in assisting them within the existing set of industrial policy instruments. It helps the prospective suppliers with establishing contacts with

foreign-owned companies (UNCTAD, 2001). The Singapore's Local Industry Upgrading Programme (LIUP) developed a different approach. It offers financial and organizational support to an engineer or manager of a foreign-owned company, which would assist domestic suppliers over the period of the next two to three years. The approach in Singapore combines a targeted strategy of attracting FDI with a linkage promotion programme, which has the potential to generate spillovers and to achieve economic deepening.

The main insights from the Irish experience are that linking local suppliers with foreign-owned companies and mediating these links require accompanying measures for capacity building of existing and potential domestic suppliers; efforts for the development of local suppliers should be selective, directed to those local companies which possess the best growth potential; close cooperation with foreign subsidiaries and their parent companies is crucial; and cooperation among various domestic agencies involved in assisting local suppliers is also necessary (Barry et al. 2003, IDA 2008). Yet, the linkage promotion programmes such as in Ireland and Singapore are rather expensive (approximately USD 40 million for countries with a population of less than 4 million). In addition, the respective agencies in charge (Singapore Economic Development Board, Irish Development Agency) had strong positions in their governments. Finally, both countries might have had a different human capital endowment and domestic supplier base compared to CEECs.

The promotion of linkages between MNEs and local firms become also integrated into the overall efforts of investment promotion agencies of selected CEECs. For example, in 1999 the supplier development programme of CzechInvest was launched (UNCTAD 2006). Within the framework of this EU-funded programme, a database of over 900 potential Czech subcontractors has been put on the Internet. CzechInvest also mediates contacts between foreign investors and Czech suppliers, and selected subcontractors are provided with active counselling aimed at increasing production quality. As part of this programme, Czech manufacturing companies are offered as potential partners for the creation of joint ventures with foreign manufacturers. The programme has been able to establish linkages between local suppliers and foreign affiliate manufacturers in the Czech Republic, building a relationship with existing inward investors, especially major MNEs (ibid).

Hungarian Investment and Trade Development Agency (ITDH) undertakes linkage promotion in particular cases. For example, ITDH was asked by Diamond Electric Hungary Kft. (DE Hungary) to assist in identifying suitable local SME suppliers (UNCTAD 2006). Based on its knowledge of local firms, ITDH helped to locate a number of local SMEs as potential partners of DE Hungary. In the end, 10 out of 119 local SMEs were selected to provide inputs to DE Hungary's manufacturing operations. For DE Hungary using local suppliers resulted in a net cost reduction of 15% compared to the products previously imported from Japan. The efforts of DE Hungary to reach out to local partners may be influenced, at least in part, by the policies of the automobile manufacturer it supplies. DE Hungary is currently supplying electronic parts to Suzuki's plant in Hungary, which actively encourages the use of parts and components from local primary and secondary suppliers (ibid).

In case of East Germany, the overarching IPA is Germany Trade and Invest (GTaI) under control of the Federal Ministry of Technology and Economy. The basic idea is that foreign investors contact GTaI and subsequently are referred to respective regional agencies ('Wirtschaftsfördergesellschaften') that provide further services. In practice, there is considerable competition between regional agencies for the acquisition of new investment projects. All regional agencies provide investors with services geared towards establishing business linkages with other East German firms (Jindra 2010). However, the extent and quality might differ, and the kind of coordinated approach including local

supplier upgrading by use of complementary policy measures might overstretch the current capacity of selected regional agencies. In this case, cooperation with private sector industry specific initiatives aimed at the promotion of linkages and upgrading might be an alternative (ibid).

To conclude, times of coercive requests and regulation for increasing the linkages of foreign affiliates with local firms are over. However, there are strong arguments in favour of policies of stimulating these linkages, which aims at matching foreign affiliates and local firms as well as upgrading of local firms (suppliers, customers) capabilities.

3.2 R&D capabilities and technological linkages

MNEs still concentrate their R&D activities mainly in developed home countries but locate increasingly R&D abroad by involving less developed and CEEC economies (Gassman and Han 2004, UNCTAD 2005). According to Eurostat the average foreign share in business R&D expenditures increased substantially for Latvia, Estonia and Hungary, less so in Slovenia, Slovakia, Poland and the Czech Republic in the period 2000-2003 compared to 1995-1999. Given the relatively small size of total national business R&D expenditures this resulted in a substantial or even dominant role of foreign firms with respect to business R&D in some CEECs. By 2003 the share of foreign affiliates in total business enterprise R&D expenditures reached a considerable size in Hungary (62.5%) and the Czech Republic (46.6%), less so in Poland (19.1%) and Slovakia (19.0%) (UNCTAD 2005). Statistics based on the LOCOmonitor commercial database shows that Poland, the Czech Republic and Hungary each attracted about 25 large foreign R&D projects between 2002 and 2006, a number that is close to the EU average for that period (LTT Research 2007). Given their small country size Latvia, Estonia and Slovenia are naturally at the end of this non-standardised distribution, with only a few large foreign R&D projects (ibid.). The majority of R&D laboratories acquired by foreign owners managed to adapt to increased competition from imported technologies and increased R&D expenditure after their privatisation (Kalotay and Hunya 2000). In addition, CEECs attracted a number of greenfield projects having considerable R&D mandates for regional or global markets (UNCTAD 2005).

However, today most foreign R&D of MNEs into emerging economies is located in Asia and China in particular. Still CEECs seem to offer relevant locations for foreign R&D by West European investors. This is less so in case of MNEs originating from the US. In case of German MNEs the total extent of foreign technological activities in CEECs exceeds those of Brazil, Russia and South Africa and is at comparable to China (Domiguez Lacasa et al. 2013). CEECs seem to be particular relevant locations for German R&D abroad in the technological area of transport. In general, however, CEECs (as other European economies) are mainly specializing in sectors losing technological dynamism such as Chemicals and/or Mechanical Engineering, while countries in Asia are increasingly specializing in Electrical Engineering, a sector with strong technological opportunities (Dominguez Lacasa and Giebler 2014). Thus, the foreign R&D sector in CEECs is coming increasingly under pressure.

In order to draw some policy suggestions for increasing foreign affiliates R&D activity and their technological linkages with foreign firms, one has first to look at determinants of foreign affiliates' R&D and innovation activity in CEECs. Kokko and Kravtsova (2008) who analyse determinants of innovative capability in MNE affiliates in four CEECs (Estonia, Hungary, Poland, Slovenia). According to them, the innovative capability of MNE affiliates depends on three sets of determinants: (i) the role of the affiliate in the MNE's international production network; (ii) some other affiliate characteristics, like size, age, and industry of origin; and (iii) host country and host industry characteristics, including the development level of the host industry and the competitive pressure

exerted by local firms. They find that the most independent affiliates are also those that have the strongest innovative capability in product and process technology. At the same time affiliates in high technology industries recorded lower levels of innovative capability. In a similar way, Damijan et al. (2010) find that the foreign affiliates with better access to R&D of foreign parent companies are more likely to innovate. They also find that market-seeking motivation of foreign investors has a negative impact on product innovation status findings, while transfer of responsibilities from headquarters to affiliates is conducive to process innovation.

Evidence from the 1990s showed that the majority of multinational subsidiaries based in CEEC economies use already existing MNE technology rather than established host-country specific technology, or own R&D (Manea and Pearce 2006). More recent case study evidence from the electronics and automotive industries in Hungary shows a prevalence of asset-augmenting or knowledge-seeking motives for R&D rather than local market adaptation (Sass 2013). In addition, there seem to be cases which not only support local production, but also carry out R&D tasks for the whole MNE, bearing a global responsibility (ibid).

Günther et al. (2009) show evidence that the majority of foreign affiliates can be considered as being locally technologically active in a broader sense but R&D and innovation seems to be largely detached from the host country's innovation systems. They find that technological linkages are subject to host country specific conditions and firm heterogeneity. Foreign firms that conduct R&D, implement a home base–augmenting technological strategies and enjoy a higher level of autonomy from parent investors seem more likely to engage in technological cooperation with domestic actors (Günther et al. 2009). Technological co-operations between foreign affiliates with local actors in CEECs seems also to be more likely in regions endowed with higher knowledge stocks (Gauselmann 2013).

It has been suggested that at the early stages of the transition process in CEECs linkages between foreign investors and nationally based R&D institutions were weak as foreign investors simply bypassed this component of the former socialist system due to their inefficiency (von Tunzelmann 2004). However, the creation of linkages between foreign and domestic firms in the field of FDI still seems to be inhibited by inadequate capacities of domestic firms and public R&D institutions (Dyker 2006, Varblane et al. 2007). As a result, principal learning processes are largely confined to the home country of the MNE, which restricts the long-term accumulation of knowledge and leads to a potential misalignment between foreign and domestic technological accumulation (von Tunzelmann 2004). Attracting of R&D intensive FDI which become embedded with the national innovation system could be a legitimate reason for a government to promote inward FDI, since it promotes technological accumulation and knowledge spillovers. In fact FDI in R&D is high on the political agenda of most EU member states, although the R&D part is usually included in more general FDI polices (European Union 2008). Grants linked to R&D investments – either by domestic or non-domestic firms – in particular have been on a rising trend in both developed and developing countries (European Commission 2006a, UNCTAD 2005). Although only a limited number of countries have specific policy instruments in place to stimulate spillovers from FDI in R&D there is a rising awareness to innovate policy measures in order: (i) to take advantage of inward FDI in R&D by means of embedding (former) high-tech enclaves with little knowledge diffusion in the local environment and to generate spillovers without hollowing out the local research base; (ii) to capture the scientific benefits of outward FDI in R&D (back) to domestic R&D environments; (iii) to adapt policy measures to the rationale of knowledge competition rather than cost competition.

To increase R&D activities of MNEs in CEEC economies and to strengthen knowledge spillovers from MNEs to local companies, Narula (2009) suggests several policy considerations for host countries. First, they should reduce the emphasis on cost advantages and increase the emphasis on specific specialized location-specific assets, which implies developing and fostering specific industries and technological trajectories, such that the location advantages they offer are less 'generic' and more specific, highly immobile and conducive to 'locking' mobile investments into these assets. Second, attempts should be made to create clusters around MNEs, requesting from host countries to focus on attracting the kinds of FDI projects that provide the greatest opportunity for embeddedness and linkages between domestic and foreign firms. Third, MNEs should be helped to create linkages with local firms as the main driver of knowledge spillovers from FDI. In order to maximise technological externalities from FDI it seems paramount to stimulate technological activities in existing foreign subsidiaries as well as technological cooperation between domestic firms and subsidiaries in CEEC economies. This seems particularly urgent in an environment where the locus of technological innovation increasingly resides at the interfaces between firms, universities, research laboratories, suppliers, and customers (Powell et al. 1996). Yet, policy makers are confronted with increasingly competitive bidding for FDI between 'high order' and 'intermediate' regions within and between countries (Cantwell and Iammarino, 2003). This could imply that only a few, and in practice the most developed regions within CEECs with established agglomeration advantages and technological specialisation are going to be competitive in this bidding process. Therefore, FDI policy must tackle region- and sector-specific misalignments between domestic and foreign technology accumulation, with a focus on particular regions within countries.

An efficient way to increase R&D capabilities of foreign affiliates and their technological linkages with local firms is coordinate all available policy measures to upgrade R&D, innovatory and entrepreneurship capacities of host economies. This includes measures to build research capacity in the public and private sector, instruments that target human resource capabilities as well as start-up firms and small and medium enterprises (SMEs). Within this context there is room for more specific FDI policy measures emphasising the development of specialized location-specific assets.

3.3 High-tech industries

Various countries including CEECs tend to promote investment in high-tech industries by tax incentives, normally as part of national development strategies and without differentiation between foreign and domestic investors. For example, Hungary provided industry-specific incentives (in the form of profit tax reductions to an amount of 80% of the investment value) for projects related to broadband internet, basic research, and applied research and development projects. Projects which are specifically promoted include investments in high-tech sectors and for establishing R&D centres (Economist Intelligence Unit 2003, ITDA 2008). Also the Czech Republic within its development strategy promoted the development of certain sectors. This includes incentives for high-tech manufacturing sectors by full or partial exemption of profit tax payment, subsidisation of job creation, subsidisation of training, incentives for business services and technological centres, investment in equipment, and employment subsidies. In Slovakia investment incentives depend on the region and the technological sophistication of production. The incentives policy distinguishes among: (i) manufacturing activity, distribution and logistics centres, (ii) strategic investments in high-tech sectors and centres of shared services, and (iii) R&D and technological centres. Tax incentives and subsidies range between 20% and 50% depending on the type of investment.

However, the rationale for a focus of investment incentives on high-tech industries or sectors is increasingly disputed (von Tunzelmann and Acha 2005, Varblane et al. 2007). The main point is that each industry has low and high tech activities. Therefore, the promotion of a particular set of the so called high-tech industries could attract the location of low-tech (often low cost) activities in high-tech industries or could inhibit the adoption and diffusion of high tech activities in other sectors of major importance to the economy (ibid). In fact, Damijan and Rojec (2007), in analysing sectoral restructuring and productivity impact of FDI in CEECs, claim that when it comes to FDI in high technology industries, foreign investors are mostly engaged in lower-end segments and transfer less than up-to-date technologies, which reduces the impact on productivity growth. Following this logic, investment incentives scheme should be of an open nature and should target high-tech *activities* rather than high-tech *industries* .

In case of East Germany, the investment grant scheme (joint task for the improvement of the regional economic structure) could be characterised as primarily locational rather than of behavioural nature (see Jindra 2010). However, the behavioural aspects are mainly related to the employment effect of new investment. This could create a possible distortion by reducing incentives for capital intensive production. The scheme provides incentives to all firms for investment in embodied technology (machinery and equipment) as well as process innovation. However, there is a restriction of incentives related to training, applied R&D, and product innovation only to SMEs. This obviously limits the potential of incentives for large multinational affiliates to invest in such activities and does not foster their evolution towards competence creating business functions, which would increase the spillover potential (ibid).

A number of countries apply a specific contractual regime for large technology- and R&D-intensive projects. The Czech Republic gives subsidies to larger investments in high-tech sectors. In Slovakia, the lower limit to qualify for incentives is 1.3 million Euros for high-tech sectors and strategic services, and 1 million Euros for investment in R&D centres. Yet, apart from size and high-tech sectors, the granting of a contractual regime to an investment project could also be linked – and with greater likelihood of success – to technology transfer, R&D activity, training of employees etc. The advantage of a contractual regime is that it enables the creation of 'individually tailored packages' of incentives and a stricter control of contract implementation by the investor. A complementary approach could be incentives for the location of particular business functions. For example, the Smart Program in Hungary provides subsidies for enterprises that intend to establish European regional headquarters, encompassing mainly investment in information technology, logistics, financial services and technological R&D.

In sum incentives favouring investment in high-tech industries, not activities does not seem to be the right solution. Experiences seem to be in favour of promoting investment in high-tech activities regardless of the industry, by horizontal measures that promote such activities and relate to R&D, training, entrepreneurship, provision of infrastructural facilities etc., as well as by measures specifically targeted to high-tech projects via promoting specific business functions.

3.4 Incentives for employee training

Human capital formation plays a crucial in foreign subsidiaries capability to perform R&D and innovation and other higher value business functions, it is equally important as a condition for domestic firms' to benefit from FDI spillovers. It should be noted that most CEECs are characterized by fairly high rates of human resources in science and technology occupations close to EU28 average level and far above selected Asian emerging economies such as China (OECD 2013). We also find a

considerably higher intensity of R&D personnel in CEECs compared to China (ibid). Thus FDI policies might seem appropriate to promote high skilled and knowledge intensive jobs in foreign affiliates. This could be facilitated by co-financing the salaries of employees being trained in-house for the introduction of new technologies and/or production programmes. Subsidies should then be strictly linked to the period of training and to the new technologies/production programmes. We can note some country cases of incentives for the training of employees in the introduction of new technologies. For example, Ireland offers as part of its so-called 'R&D capability grant scheme' incentives for the creation and/or expansion of R&D capacity in enterprises. Apart from co-financing equipment, advisers and supporting services it subsidises the costs of in-house researchers. Training costs in individual projects could also be co-financed via the 'Research Technology and Innovation' programme. Since 2004, all the companies registered in Ireland have also been eligible for tax incentives for resources invested in R&D.

The Czech Republic supports the general training of employees in traditional sectors in the case of larger new investment projects or expansion of the existing ones. The value of the subsidy cannot exceed 35% of the total training costs. The Czech Republic also offers subsidies for the training of employees in more advanced technological activities, such as technological centres and supporting business services. Here, the value of the subsidy cannot exceed 60% of the total training costs. In Slovakia, the subsidies for the training of employees cannot exceed 330 Euro per employee. The employer should guarantee that an employee who goes through the training process will remain to be employed at least for another year. This scheme also discriminates in favour of high-tech sectors, strategic services and R&D centres.

One can conclude that CEECs seem to systematically promote investments in the creation of better jobs. The main policy instruments are co-financing the costs of researchers, subsidies for requalification and training/education, or allowing training costs as a tax relief. CEEC economies also co-finance the training of employees and management. These incentives are often combined with incentives for investment in technologically more advanced industries, such as tax reliefs for investment in R&D, subsidies for the acquisition of specific equipment, etc. Taking into account the fact that, together with subsidization of R&D, subsidization of training is considered to be among the best performing types of state aids (see, for instance, Meiklejohn 1999, Blondal et al 2002), incentives for employee training seem also an appropriate policy tool to foster knowledge spillover from FDI.

3.5 Industrial, technological, and science parks

Increasing inter-country convergence of tax and financial incentives for foreign investors has led to the introduction of new types of incentives. One of the most promising types, with no discrimination between foreign and domestic investors, involves scheme to establish industrial, technological and science parks. They differ from traditional industrial zones by the very concept of organization. Industrial parks, as a rule, include spatial planning with necessary road and other infrastructure (Kelleher and Thompstone, 2000).

Science and technological parks are usually closely interlinked with universities in the respective region. In Europe most of such parks are managed by private companies. In the neighbourhood of larger towns or outside big urban conglomerates these parks are usually managed by public organizations, such as local authorities (for example, the industrial park in Kolin, Czech Republic) or state-owned enterprises for the development of industrial parks (for example, IDA in Ireland). This type of parks act as an location incentive for foreign investors, because they enable them to start up

their activities in a rather short period of time (they can buy or hire the prefabricated premises immediately, or alternatively immediately begin to construct premises on the land, which they buy or hire) and, at the same time, offer appropriate working conditions and environments to employees.

For example, the Czech Republic provided incentives for the development of technological centres and supporting business services. Technological centres intended for the development of innovations in production, centres for the development of software equipment, high-tech service centres, call centres for the support of customers, regional headquarters etc. and related high value-added services are eligible for incentives to the amount of 50% of the project costs in the form of investment in fixed assets and/or salaries. Domestic and foreign investors are treated equally.

Thus, in principal subsidizing industrial/technological/science parks could be a promising way of stimulating knowledge transfer, without discrimination between foreign and domestic investors. However many such parks in reality are either poorly aligned with the real technological needs of the host country more generally, or achieve too little apart from benefiting from generous subsidies to locate themselves on pleasant greenfield sites. It is a key task for host-country governments to ensure that the resource potential of FDI is not squandered in such ways.

4. Performance and governance of national innovation systems

The above discussion of various policy areas indicated that the question how to foster knowledge spillovers from FDI in CEECs cannot be treated independent from the performance and governance of national innovation systems in CEECs. Since the start of transition national innovation systems have been undergoing fundamental structural change. In the socialist era R&D systems were characterised by a strong national element but poorly developed local and international networks (von Tunzelmann 2004). The function of technology production – entrusted to centrally planned R&D institutes and design bureaux – was disconnected from the technology use in enterprises, which limited the extent of technology diffusion. Transition, however, led to a semi-collapse of the formerly strong national element. At the same time, the transition process opened up access to global R&D networks through international trade and in particular FDI (ibid.).

Although all CEECs, except Croatia, Poland and Slovakia, showed above EU average growth of innovation performance (measured by innovation index) in 2006-2013, their existing level of innovation performance is much below EU average. Thus, in 2013, overall EU Summary Innovation Index (SII) was 0.554, Bulgaria (SII = 0,188), Latvia (0.221) and Romania (0.237) were in the lowest performing group of 'Modest Innovators', Poland (0.279), Lithuania (0.289), Croatia (0.306), Slovakia (0.328), Hungary (0.351) and Czech Republic (0.422) were in the group of 'Moderate Innovators', and Estonia (0.502) and Slovenia (0.513) in the group of 'Innovation Followers'. None of CEECs was in the group of 'Innovation Leaders' and for the vast majority of CEECs quite some time will pass to achive the existing average of EU innovation performance (European Commission 2014). The first evidence from the CIS data shows that CEEC economies' innovative activity is below the EU-25 average with regard to new or improved products and processes as well as organisational change.

Considering performance in terms patenting, CEECs converged towards the EU15 patterns of technological specialization but at the same time reduced patenting activities drastically in absolute and per capita terms after 1990 and maintain now a stable level below the EU15 average and the former USSR (Dominguez Lacasa and Giebler 2014). Also the science basis of CEECs has been subject to change. Recent evidence shows that CEE as a region is catching up both in terms of quantity of

publications as well as citations, while it has reduced its excessive specialization in fundamental science and has shifted more towards applied sciences (Radosevic and Yoruk 2013). This has been accompanied by a divergence from the former USSR and a convergence towards EU15 from 1981-89 period to 2001-2011 period. While former USSR continues on its divergent path when compared to other regions, CEE region has clearly been converging. However, great imbalance between deficits in life sciences and specialization in fundamental sciences continue to characterize CEE science systems The CEEC regions continues to be specialized in fundamental sciences when compared to other world regions which suggest that these regions are facing disproportionally higher problem of (ir)relevance of their science base for technological and industrial bases (ibid).

Between 1992 and 2002 the total share of R&D expenditures in GDP as well as the number of total R&D personnel declined in most Central and Eastern European economies (Freeman 2006). For the period between 1996 and 2002 the region's share in total world business enterprise R&D expenditures continued to decline, against a background of a dominant and growing share of South, East and South-East Asia. In 2002 the latter region accounted for two thirds of all business R&D expenditure outside the developed countries (UNCTAD, 2005). In CEEC economies it is business enterprise R&D expenditures and applied research rather than government or higher education research that received the most severe cuts (von Tunzelmann 2004). This downward trend was related to a combination of demand-side factors (GDP and investment) and supply-side policies (R&D budgetary policies) (Radosevic and Auriol 1999). The share of R&D in business innovation expenditure is significantly below the EU-15 average and concentrated in (often imported) new machinery and equipment (Radosevic 2006). In contrast to these trends in CEE, Asian emerging economies such as China and Korea have increased their technological activities notably since the 1990s. In 2011 China and Korea are within the group of top-5 countries in terms of absolute R&D expenditures (OECD 2013). Although, the intensity of Chinese R&D expenditures is comparable to the Czech Republic, they exceed levels attained in Poland or Hungary and in general developed much more dynamic between 2001 and 2011. In addition, the share of private sector R&D remains considerably lower in selected CEECs compared with China (ibid).

Another key challenge is to close the gap in terms of human resources for innovation and R&D. In particular, there is a necessity to increase the number of new Science & Engineering graduates. Again take Hungary as an example. Here the number of new S&E graduates corresponds to only 39% of the EU-25 average (European Commission 2006b). Furthermore, the ratio of S&E graduates among the population aged between 20 and 29 is only 4.8%, which puts Hungary in 21st position out of the EU-25 member states. In this context, it seems appropriate to give some historical perspective: in 2003, the number of S&E graduates fell by 30% in comparison with 1988, which is significant given the sharp increase in the number of students in that period. The overall number of R&D personnel during the same period decreased by 48 per cent (ibid.).

Furthermore, an underdeveloped extent of cooperation between business and science continues to hold back the performance of national innovation systems in all CEECs. The share of business contributions to higher education R&D is comparatively low across all CEEC economies (European Commission 2006b). Evidence from the Community Innovation Survey (CIS4) shows a certain variation in business–science cooperation, with low frequencies for Poland and Estonia, however acceptable or even comparatively high levels in the cases of the Czech Republic and Slovenia respectively (Klitkou and Frølich 2009). Research shows hardly any co-patenting or co-authorship activities between science and industry (Klitkou et al. 2006). Another indicator would be a limited capacity at universities for supporting entrepreneurship and the ability to manage spin-off processes

(Spilling 2009). The underdeveloped co-operation and intensity of network relationships between science and industry severely limits the diffusion of technological knowledge in the region.

Weaknesses in innovation drivers such as low R&D, underdeveloped R&D and innovation cooperation, a shortage of S&E graduates, and a lack of demand for innovation, are bound to create low innovation outputs..

In order to enhance knowledge spillovers from inward FDI and to overcome the misalignment between foreign and domestic technological accumulation in CEECs, it seems paramount to improve the performance of national innovation systems with an appropriate policy mix. During their EU accession process, new member states have made substantial progress towards a more informed, evidence-based and well-structured S&T policy; most countries have created new ministries, implementation agencies and co-ordination councils over recent years. However, most of them have very much retained old governance features of their S&T policies with domination of science- or technology-push model. Market and government failures hamper the establishment of networks and clusters of knowledge generation and exploitation.

Despite setting up new structures, co-ordination is limited and stakeholder involvement underdeveloped in the CEEC economies. The challenge is to establish a complex, interactive multi-actor governing system enhancing innovation and furthering knowledge production. Obviously, among the important stakeholders in this system are the MNEs, given their share of total technological activities in CEEC economies. This seems to be a particular pressing issue, since only rapidly improving innovation systems in CEECs will be able to compete for location and expansion of foreign R&D and innovation activities in context of rising competition from other emerging economies.

5. Policy lessons from CEECs

Theoretical considerations and the practical experiences of host countries in FDI policies clearly demonstrate that general economic policies and regulatory frameworks are more important than specific, targeted instruments and measures directed at FDI. However, in order to facilitate knowledge transfer to foreign subsidiaries, upgrading in foreign subsidiaries to higher value activities as well as knowledge spillovers to the domestic economy policies related to governance of S&T, R&D and innovation, education and training etc., are of specific importance. Arguably, only within a coordinated policy framework could specific FDI policies be successful.

In CEECs enduring weaknesses in innovation drivers such as low R&D, underdeveloped R&D and innovation cooperation, a shortage of S&E graduates lead to low innovation outputs. CEECs countries are capable of attracting MNEs' R&D and innovation activities, which are not limited to local production purposes but often largely detached from the host country's innovation system. The evidence for technological spillovers effects from FDI, which amongst other things depends upon foreign subsidiaries' technological activities as well as their production and innovation networks with domestic actors, is very limited. In order to overcome the misalignment between foreign and domestic technological accumulation, it seems paramount to improve the performance of national innovation systems with an appropriate policy mix. Therefore, R&D and innovation policy should support the local evolution of multinational affiliates towards competence creating technological activities and should simultaneously strengthen domestic firms' absorptive capacity. Policy should continue to foster R&D cooperation, joint product development, co-design and standard setting in networks that link multinational affiliates with other private and public actors of the respective innovation systems.

The lack of knowledge spillovers from FDI to CEECs also seems to be partly due to an inappropriate FDI policy approach, i.e. to the adoption of the so-called Irish model, where MNEs have taken the various advantages that they have been offered without sufficient incentives to interact with the local environment. In contrast the model adopted by Asian emerging economies such as Taiwan, Korea and China is explicitly directed to promote national priorities and in particular the emergence of competitive indigenous firms and more recently promotes actively human resources and technological development. This model puts more emphasis on: (i) selective / discriminatory / criteria-based awarding of incentives; (ii) less general incentives and more incentives with specific targets, such as introduction of new technologies, export promotion, R&D activities, employment (in particular of highly skilled labour), environmental-friendly projects, etc.; (iii) establishing a spillover promotion programme and strengthening the absorptive capacity of domestic firms is crucial in this context; (iv) stricter, frequently project-related monitoring of the efficiency of incentives grants, along with sanctions in the case of not fulfilling the expected results. Within this structural adjustment and upgrading approach to FDI policy, the following aspects deserve special attention:

a/ *Linkage promotion.* There are strong arguments in favour of non-coercive policies of stimulating linkages of foreign affiliates with local firms. The main tasks of any such policy are matching between foreign affiliates and local firms, and upgrading of local firms (suppliers) capabilities. Therefore, there is a need for coordination between simple matching programmes and general policy schemes directed at investment, finance, training, as well as R&D and innovation. However, the need for a linkage promotion policy as well as its coordination with other measures might vary across CEEC economies as well as industries.

b/ *R&D capabilities and technological linkages.* An efficient way to increase R&D capabilities of foreign affiliates and their technological linkages is to build research capacities in the public sector, and to use and coordinated all the available policy tools to upgrade R&D, innovatory and entrepreneurship capacities of host economies. Within this context policy could reduce the emphasis on cost advantages and instead increase the emphasis on development of specific specialized location-specific assets. However, FDI policy must tackle region- and sector-specific misalignments between domestic and foreign technology accumulation, with a regionally differentiated approach within CEECs as not all regions/industries will be able to upgrade sufficiently in order to align with global innovation networks.

c/ *High tech industries*. With regards to incentives favouring investment in high-tech industries, a traditional sectoral approach with promoting investment in particular industries and not activities seems inappropriate. Instead we would favour investment promotion in high-tech activities regardless of the industry, by horizontal measures that promote such activities and relate to R&D, training, entrepreneurship, provision of infrastructural facilities etc. There might be room for measures specifically targeting “high-tech” projects via promoting R&D or regional headquarter specific business functions.

d/ *Incentives for employee training*. CEECs enjoy to some extent advantages over other emerging economies with regard to human capital endowment including in science and technology occupations. CEECs seem to systematically promote investments in the creation of better jobs by co-financing the costs of researchers, management and other employees, subsidies for requalification and training/education, or allowing training costs as a tax relief. These incentives are often combined with incentives for investment in technologically more advanced industries. Incentives for employee training seem to be the right type of policy intervention to reinforce

existing advantages. Increasing attention should be paid to an appropriate supply of science and engineering graduates and sufficient entry possibilities into the private sector in the post crisis context

e/ *Industrial, technological and science parks*. Subsidizing of industrial / technological / science parks could be a promising way of stimulating knowledge transfer, without discrimination between foreign and domestic investors. However, often such parks are either poorly aligned with the real technological needs of the host country more generally, or achieve too little apart from benefiting from generous subsidies to locate themselves on pleasant Greenfield sites. Such site specific development should be coordinated with the national regional development and innovation strategy in order to be more successful.

In sum, CEEC economies attracted a substantial amount of FDI and increasingly participate in FDI in R&D. However, CEECs come under increasing pressure in particular Asian emerging economies in terms of location of production and innovation activities. In CEECs we find considerable misalignment between domestic and foreign technological accumulation. This is partly related to the heterogeneity of foreign subsidiaries as well as the weak performance and governance of national innovation systems. 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. A way forward is to coordinate FDI policy through R&D, innovation, and regional policy instruments.

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