THE CONTRIBUTION OF MULTINATIONAL ENTERPRISES TO THE UPGRADING OF NATIONAL INNOVATION SYSTEMS IN THE EU NEW MEMBER STATES: POLICY IMPLICATIONS

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The contribution of multinational enterprises to the upgrading of national innovation systems in the EU new member states: policy implications

Rajneesh Narula* and José Guimón**

Abstract: This paper addresses the role of multinational enterprises (MNE) in the upgrading of national innovation systems and the policies that the new member states (NMS) of the European Union (EU) can put in place to enhance it. We use the innovation systems approach as a basis for analyzing policy options and focus on the MNE and the potential for linkages, rather than limiting our analysis to foreign direct investment (FDI) and spillovers. We also deliberately consider the scope and competence at the MNE subsidiary level. These two perspectives are useful in helping highlight the point that the tendency to focus on FDI inflows is flawed, since knowledge exchanges and innovation are establishment level phenomena. Instead, policies should focus on the embedding and upgrading of MNE subsidiaries already present in the country, with the aim of facilitating their evolution towards higher value adding activities and their tendency to engage in R&D. We argue that this approach requires a closer interplay between FDI, innovation and industrial policies. We also sustain that it is more practical for new member states to concentrate on attracting 'demand-driven' rather than 'supply-driven' R&D, and thus recommend governments to set up programmes that foster demand-oriented upgrading of human capital and public R&D.

Keywords: FDI, innovation systems, knowledge flows, linkages, MNE, R&D

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1. Introduction

Since 2004, the enlargement of the EU towards the East has made the heterogeneity of member states larger than ever. In this context it is increasingly obvious that it is not possible to have a common set of industrial and technological policies that can be applied across the board to promote growth, or even a single set of targets. In this paper we focus on the EU new member states (NMS), which share certain key features that can realistically constitute the basis for common policy recommendations. We contrast this group with the 'core countries' and with the 'cohesion countries' of the EU. Cohesion countries joined the EU in the 1970s and 1980s and consist of Spain, Portugal, Greece and Ireland. These countries have benefited from large amounts of EU funds and have been engaged in a process of convergence with the core countries. The NMS can be further divided into two sub-groups. The first consists of the Czech Republic, Slovakia, Hungary, Slovenia, Estonia and Poland, which have proceeded the furthest from a centrally-planned economic structure, and towards economic convergence. They are referred to here as the 'advanced NMS'. The second sub-group comprises Bulgaria, Romania, Latvia and Lithuania, which are still somewhat in transition. They are referred to here as the 'new NMS'[1].

The main purpose of this paper is to explore the policy options for the governments of NMS to attract more R&D activities from multinational enterprises (MNEs) and to better embed them into their national innovation systems. We focus on the promotion of innovation activities by MNEs, which requires a somewhat different approach than promoting FDI in general. The NMS relied heavily on foreign direct investment (FDI) for economic restructuring during the 1990s. As the processes of transition and convergence advance, the focus is shifting to FDI in higher value added activities, and in particular in R&D.

Two decades ago, MNE subsidiaries tended to be 'miniature replicas' of the home country operations with most or all aspects of the value chain being undertaken in each host country. This is now only the case in very few investment projects, reflecting important changes in the global economic milieu associated with increasing interdependencies between countries, industries and firms. MNEs are progressively fragmenting across regions and countries not only their production but also their R&D activities. In parallel, a growing number of countries are adopting liberal policies towards FDI and embracing development strategies based on the accumulation of scientific and technological knowledge. This leads to intensified competition among countries for internationally-mobile R&D, but only a few locations provide the specialised and well-developed innovation systems that are needed. It is against this background that we analyze the policy options for the NMS.

The paper proceeds as follows. The next section discusses and develops the innovation systems framework as a basis for understanding the transition of the NMS from centrally-planned towards 'conventional' national innovation systems. We use a broad definition of national innovation system, taking it to include not only science and technology based learning but also learning through experience and interaction (Lundvall 2007). Section 3 develops a general theoretical framework to analyze the role of MNEs in national innovation systems and applies it to the particular case of the NMS. Section 4 provides some policy suggestions for the governments of NMS, building on the interlocking nature of FDI, industrial and innovation policies. Finally, Section 5 presents some concluding remarks.

[1] Malta and Cyprus are excluded from this analysis given that they are significantly different from the rest of NMS. They both are small Mediterranean islands without a socialist past.

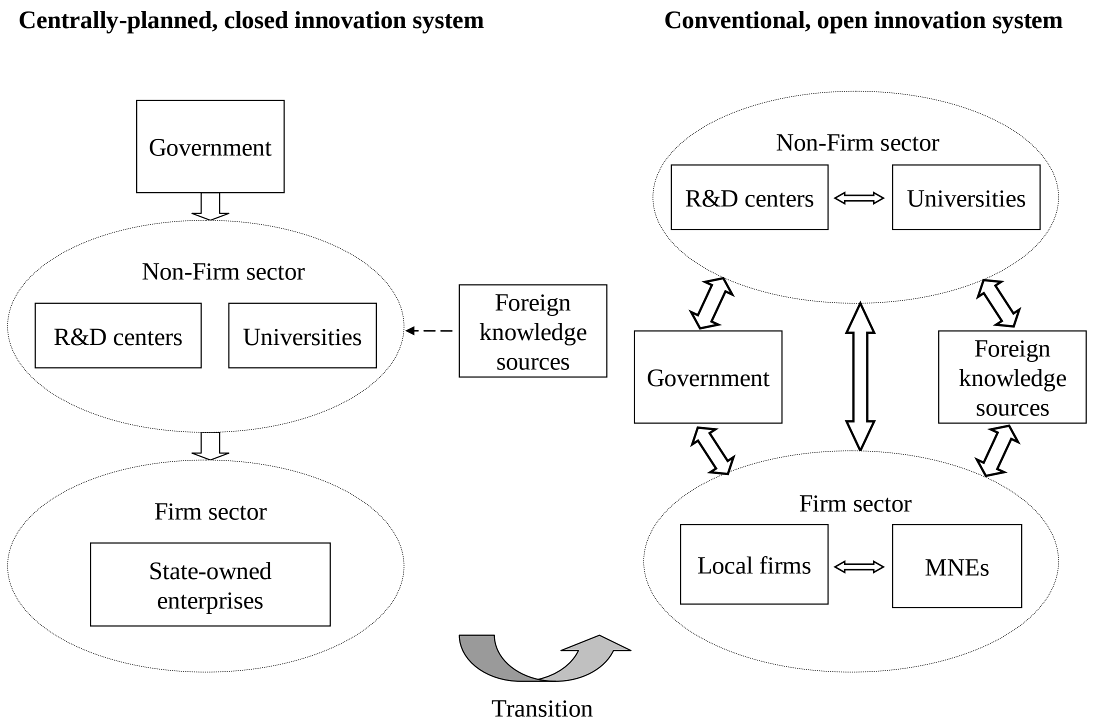
2. National innovation systems in transition

The literature on innovation systems has played an important role in shaping a new policy approach that pays more attention to the interactions and linkages between actors, bringing along the notion of 'systemic failures', beyond market failures, as a rationale for public intervention. Indeed, it is increasingly acknowledged that in order to understand innovation (or the lack thereof) from a policy perspective we need to understand the complex interactions between a firm and its environment. These consist, firstly, of interactions between firms, especially between a firm and its network of customers and suppliers. This includes interactions between MNE subsidiaries and local firms, which will be the main focus of this paper. Secondly, it involves interactions between firms and the non-firm sector (universities and R&D centres). In addition to the firm and non-firm sectors – which account for the majority of innovative activities – knowledge creation, dissemination, acquisition and utilisation are also shaped by the actions (or inactions) of governments. The environment also involves broader factors influencing the behaviour of firms: the social and cultural context; the institutional and organisational framework; infrastructures; the processes of generation and diffusion of scientific knowledge, and so on.

Furthermore, learning processes are not constrained to intra-national interaction, but increasingly include international interaction. Foreign sources of knowledge comprise foreign firms, universities, R&D labs, governments and supranational institutions. Innovation systems link with foreign sources of knowledge through international scientific collaborations, technological alliances, technology trade, mobility of students and researchers, and so on. Thus, the sources of knowledge available in innovation systems are a complex blend of domestic and foreign ones. In particular, the pervasive role of MNEs in a globalising world, and their ability to utilise technological resources located elsewhere, makes the use of a purely national systems of innovation approach rather limiting (Narula and Zanfei 2004).

Innovation systems in centrally-planned economies, as those prevalent in most of the NMS up until the 1990s, differ largely from 'conventional', open innovation systems as those in developed market economies, including the core and cohesion EU countries (Figure 1). Pre-transition economies had a largely closed innovation system where knowledge sources were determined primarily by domestic elements (Radosevic 1999, 2003). The technological development trajectory was planned centrally in response to state-defined priorities. Likewise, domestic governmental organisations formulated domestic industrial policy, which in turn determined domestic industrial structure. National non-firm actors also defined the kinds of skills that the local labour force might possess; the kinds of technologies that these actors had appropriate expertise in; the kinds of technologies in which basic and applied research was conducted, and thereby, the industrial specialisation and competitive advantages of the firm sector. Technology planners in socialist systems were influenced by the linear model of innovation, which viewed technological progress as following a discrete path from basic and applied research to technological development and eventually to innovation. This led to rigid and hierarchical interactions between the different actors in the system. User-producer and university-industry linkages were ill developed, and the pressures for commercialization of R&D results were low. With regard to foreign sources of knowledge, FDI was almost non-existent prior to the transition era and any linkages to international sources were sporadic and state controlled. These weak foreign linkages were governed by a gap between technology used and the knowledge frontier, as well as by a tendency to reproduce foreign research in an autarkic economic environment (Inzelt 1999).

Figure 1. The transition from centrally-planned to ‘conventional’ innovation systems



Source: Adapted from Narula and Jormanainen 2008

With the transition from a socialist to a market system and with the subsequent process of accession into the EU, innovation systems of NMS experienced major transformations. One of the primary conditions for EU membership was that economic systems of candidate countries needed to demonstrate a convergence towards the EU norm. The required supranational institution-building impinged greatly on the restructuring of national institutions in post-communist states (Bruzst and McDermott 2008). EU-wide regulatory and competition policy, social and economic treaties and the like become binding and over-ride national law. This provides certain location advantages relative to non-member states but it also constrains policy options available to member states, as we shall discuss later.

It is useful to conceptualize innovation systems in the NMS as ‘systems in construction’, where most of the actors exist but the critical linkages among them are often weak (Chaminade and Vang 2008). Indeed, NMS still demonstrate significant artefacts of the pre-transition era in their innovation systems, although this varies considerably by countries as a result of path dependencies which reflect different socio-political and economic histories. Largely speaking, ‘advanced NMS’ have made more progress in the institutional change involved in redesigning their innovation systems around the conventional model, while ‘new NMS’ are still somehow in transition. The ability of different economies to transition reflects the strength of existing institutional arrangements and the political will to implement reforms (Newman 2000). It is important to stress that to modify and develop informal institutions is a complex and slow process, particularly since they cannot be created simply by government fiat. It takes considerable time and effort to create informal networks of government agencies, suppliers, politicians and researchers which, once created, have a low marginal cost of maintaining.

The transition process was characterized by rapid economic liberalization and massive privatisation. Foreign-owned MNEs became major investors in privatized enterprises, contributing to the growing significance of foreign knowledge sources. Adding on to that, universities and research centres –both as organizations and as individual research groups– increased their collaboration with other universities and research institutes in other countries. The framework programmes of the European Commission play an important role in facilitating cross-border collaboration between economic actors within the EU (Narula 2003), and this extends further to collaborations between public research organisations and firms (Arundel and Geuna 2004, Fontana et al. 2006). Foreign knowledge sources and associated interdependencies with domestic actors take many forms, but it is beyond the intention of this paper to analyse the broader implications of globalisation on knowledge systems in the NMS. Our focus remains on the role of the MNE in innovation systems, and the next section discusses this in greater detail.

3. The role of MNEs in national innovation systems

Given that MNEs undertake the bulk of global R&D expenditure, their location decisions determine to a large extent the geography of R&D activity (Jaruzelski and Dehoff 2008). The R&D function is gradually evolving from a centralized and hierarchical node of corporate supply chains towards one that builds upon a network of geographically disperse R&D centres deeply embedded in their host innovation systems. As a result, national innovation systems are becoming more integrated in global innovation networks and more dependent on foreign sources of knowledge. We first analyze the impact that MNE activity may have on the development of national innovation systems from a theoretical perspective, and then move on to the specific case of the NMS.

3.1. To what extent does MNE activity benefit national innovation systems?

Much of the literature focuses on the subject of FDI and on knowledge flows taking place through equity relationships, be it between the parent and the subsidiary or among the partners of a joint-venture. But for the purposes of this paper we take a broader perspective; that of the MNE and the linkages it creates. Indeed, MNEs develop a variety of other informal and non-equity agreements to engage in knowledge exchange, including trade of products and services, technology licensing, strategic partnerships, technological collaboration, and so on. It is through these linkages that domestic actors engage in the process of *learning through interacting with MNE subsidiaries*. Proximity and human capital mobility enhance the scope of this learning process (Audretsch 2000).

Thus, the benefits of attracting the R&D of MNEs comprise not only *direct* effects associated with increased R&D activity and employment, but also *indirect* effects that arise from linkages and knowledge spillovers. Among other indirect effects, the domestic R&D of MNE subsidiaries may allow locally produced components to be incorporated more easily at the design stage of new products. It may also enable the international transfer of tacit technological knowledge, which is hard to acquire by other means (Inkpen 2008). Other potential sources of indirect benefits include 'competition effects' (since foreign presence may induce local firms to adopt new technologies and improved management systems, as discussed by Görg and Strobl 2001) and 'imitation effects' (since the successful operation of an R&D subsidiary produces 'demonstration effects' that may lead to the affluence of a 'cascade of imitators', as Krugman 1997 argues in relation to Ireland).

The presence of MNE subsidiaries active in R&D may provide better access to foreign knowledge and enable host locations to integrate more advantageously into global innovation networks (Cantwell and Piscitello 2000, Carlsson 2006, Santangelo 2005). MNE subsidiaries often act as 'anchor tenants' in their host innovation systems (Agrawal and Cockburn 2003) and as a catalyst for technological upgrading. In particular, many of the most successful technology clusters in Europe have emerged thanks to the contribution of foreign subsidiaries (Brown and Raines 2000, Dosi *et al*. 2006, Dunning 1998, Ruane and Buckley 2006, Rugman and D'Cruz 2000).

However, the constituents of national innovation systems need a certain level of technological expertise to be able to benefit from the indirect effects associated with the R&D activity of MNEs. Along these lines, Cohen and Levintahl (1989) define 'absorptive capacity' as the ability to acquire, assimilate and exploit knowledge developed elsewhere. Indeed, from a growth and learning perspective, externalities only matter if they can be captured by other economic actors in the host economy. For externalities to be optimally utilised there needs to be an appropriate match between the nature of potential externalities and the absorptive capacities of domestic actors.

The impact on national innovation systems is closely linked to the type of R&D activities that MNEs undertake, which may respond to different strategic motivations. In certain cases these may be demand oriented, such as the presence of a large market or the availability of generic price-sensitive inputs. In such cases, the internationalization of R&D is driven by asset-exploiting motivations such as the adaptation of products, services or processes to overseas markets. We refer to this as *demand-driven R&D*. In other circumstances MNEs seek to establish themselves in particular locations to undertake innovation because of specific location-bound knowledge assets, which may include quasi-public goods provided through universities and public research institutes. In this case, the internationalization of R&D is driven by asset-augmenting motivations and aims at tapping into foreign sources of knowledge and specialized clusters. Such R&D activities tend to be more autonomous and knowledge-intensive than demand-driven R&D. They also generally imply a considerably greater dependence on domestic knowledge sources and infrastructure. We refer to this as *supply-driven R&D*.

The type of R&D activities undertaken by MNE subsidiaries and their potential benefits should be interpreted in relation with the current structure and developmental aspirations of host innovation systems. The benefits for national innovation systems will be larger when MNEs engage in projects that contribute to enhancing domestic technological strengths and location specific assets (Pearce 2004). Complementarity between domestic and MNE activity may also be desirable. For example, if the national innovation system is specialized in basic research, the entry of MNEs that develop applied research may help to activate the system's latent capabilities and to increase the commercial orientation of innovative efforts (Manea and Pearce 2001).

The likeliness of MNEs to engage in R&D and the potential benefits that derive from an investment are also closely related to the scope and competence levels of the subsidiary. These are co-determined by a variety of factors, including MNE internal factors such as its internationalization strategy, the role of the new location in its global portfolio of subsidiaries and the motivation of the investment, in addition to the available location-specific resources which can be used for that purpose (Benito et al. 2003). The location of high competence and high scope activities within global corporate networks depends on the response of the different subsidiaries to the needs of headquarters through proposals that exploit both subsidiary capabilities and location advantages. To succeed, MNE subsidiaries need to develop 'dynamic capabilities', that is, the ability to identify and profit from new opportunities and to reconfigure and protect their competences and knowledge through time.

But high competence levels also require complementary assets which are non-generic in nature and often related with agglomeration effects, clusters, and the presence of highly specialized skills. This explains why MNE investments in high value-added activities (associated with high competence levels) have the tendency to be ‘sticky’. In particular, firms demonstrate greater ‘inertia’ when it comes to relocating R&D activities, which reflects the high costs and considerable time required to develop linkages with the innovation system (Narula 2002). Since firms tend to build incrementally, the embeddedness of firms in national innovation systems is often a function of the duration of their presence. R&D mandates usually emerge as a sequential process whereby manufacturing or customer support subsidiaries already located in the country get progressively engaged in R&D after accumulating the necessary knowledge, and may later expand the competence and scope of their R&D activity. In other words, knowledge exchanges and innovation are establishment level phenomena.

This does not preclude that a big share of international R&D investments occurs as a side effect of transnational mergers and acquisitions (Patel 1997). In this case, the only short term effect for the host country is a change of ownership; i.e. the direct effects are very limited. In the medium to long run there is a trade-off between, on the one hand, the potential for expansion and indirect benefits and, on the other, the risk that the foreign acquirer ends up downgrading the subsidiary’s R&D mandate to avoid duplicities with other existing units. Thus, many governments are not interested in receiving FDI in R&D through acquisitions but, rather, may be tempted to protect their ‘national champions’ from foreign acquirers (Archibugi and Iammarino 1999, Cantwell et al. 2004). However, with few exceptions, such protectionist policies are neither desirable nor compliant with international and EU law.

While we assume that the R&D activity of foreign MNEs is broadly beneficial for national innovation systems, there are also potential risks to be considered. Foreign presence might damage the technological competitiveness of local firms through intensified competition for limited specialized assets, including human capital (Girma et al. 2001, Meyer-Krahmer and Reger 1999). There might also be fears of loss of control over domestic innovative capacity. In the particular case of foreign acquisitions, as discussed above, there is a risk of rationalization and downgrading. In other specific cases, such as medical trials in developing countries, the R&D of MNEs may even represent a threat to public health and human rights (Shah 2007).

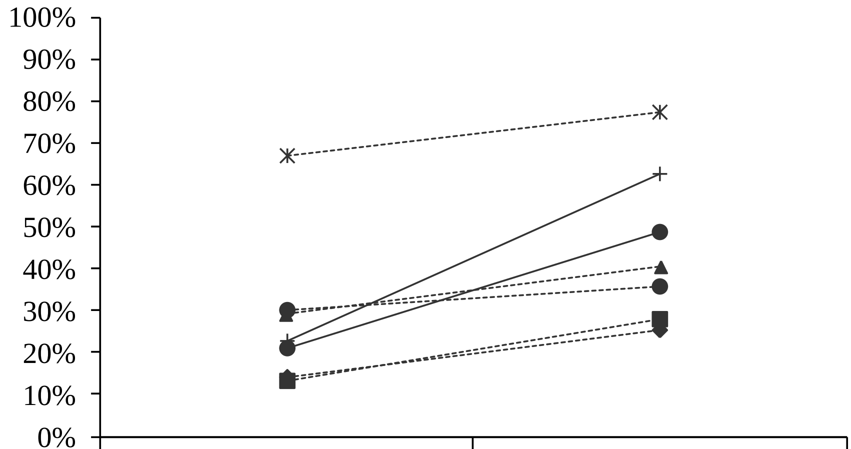
3.2. The case of the new member states

FDI in the centrally planned era was virtually non-existent. However, during the transition period, many industries dominated by domestic capital were transferred to foreign ownership through privatization. This was exacerbated by national budget constraints, pressures from supranational institutions (including EU, IMF, WTO) and, in some instances, the inability of domestic capitalists to compete effectively with foreign firms. As a result, the share of foreign ownership in total capital stock is already typically much higher than in older EU member states, although with considerable variation across sectors (Narula and Bellak 2009). Garmel et al. (2008) predict that three-quarters of capital in the NMS will ultimately be acquired by investors from the core member states in the long run.

This inevitably has been accompanied by a growing relevance of MNEs in national innovation systems, which contributed to institutional change and economic convergence (Radosevic 2006). A typical way of measuring the importance of foreign firms in national innovation systems is to look at the R&D expenditure of MNE subsidiaries relative to total business expenditure in R&D. Figure 2 shows the evolution of this indicator from 1994 to 2004. The source only provides complete data for two NMS: Czech Republic and Hungary. We compare these with three core countries (France, Germany, UK) and two cohesion countries (Spain, Ireland). The NMS are represented with a continuous line in the graph and the rest of countries with a dashed line. The graph shows how this indicator grew much faster in the Czech Republic and Hungary than in the rest of countries, reaching around 60% in the former and 50% in the latter. This means that the R&D expenditure of MNE subsidiaries is greater or equal to that of local firms.

In 2004, only Ireland showed a higher degree of foreign participation than the Czech Republic or Hungary, but Ireland is a special case in terms of its degree of openness and its MNE-centred technological development strategy.

Figure 2. Share of R&D expenditure of MNE subsidiaries in total business R&D



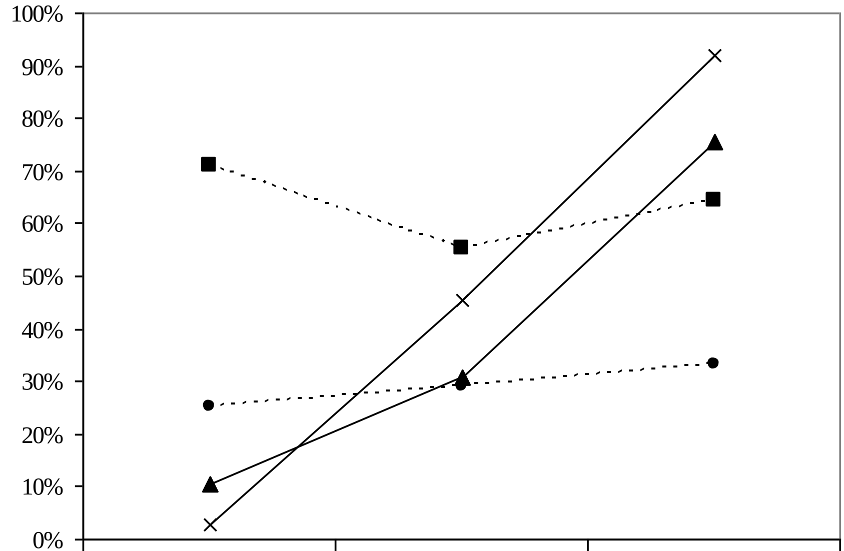
	1994	2004
France	14%	25%
Germany (1,2,3)	13%	28%
United Kingdom	29%	40%
Spain (2,3)	30%	36%
Ireland (1,2)	67%	77%
Czech Republic (2)	21%	49%
Hungary (1)	23%	63%

Notes:
1. 2003 instead of 2004
2. 1995 instead of 1994
3. Manufacturing sector only

Sources: OECD Science, Technology and Industry Scoreboard 2007 and UNCTAD World Investment Report 2005.

The R&D expenditure of subsidiaries is a limited source for our analysis because we lack data for many of the NMS and for the period prior to the 1990s. An alternative way of quantifying foreign participation in national innovation systems is through patents, which allows us to cover all countries and a longer time frame. Patent documents report the name of the inventor(s) and the owner(s), along with their countries of residence. When the owner's and inventor's country of residence differ this indicates cross-border ownership of inventions. In such cases, the owner is usually an MNE and the inventors are employees of a foreign subsidiary (Guellec and van Pottelsberghe de la Potterie 2001). Thus, foreign ownership of domestic inventions reflects the international expansion of the innovative activities of MNEs and expresses the extent to which foreign firms control domestic inventions. Based on patents filed in the U.S. patent office, Figure 3 shows that while foreign ownership of domestic inventions has remained more or less stable in the core and cohesion countries during the last two decades, it has grown dramatically in the NMS, reaching higher levels that in the core and cohesion countries. In the advanced NMS, over 75% of all domestic inventions during the period 2001-2005 were owned by foreign entities (up from 10.7% in 1981-1985), while the figure jumps to over 90% in the new NMS (up from around 3% in 1981-1985). This does not mean, however, that the latter group of countries has been more successful than the former in attracting the R&D activities of MNEs, since a higher value can also be a reflection of the lack of patenting activity in local firms. There are also large differences across countries within all of the different groups considered, as Annex 1 shows. Despite these and other possible caveats, the data shows clearly the pervasive process of increased foreign dependence of national innovation systems in the NMS.

Figure 3. Foreign ownership of domestic inventions



	1981-1985	1991-1995	2001-2005
Core countries	25.3%	28.9%	33.0%
Cohesion countries	70.9%	55.2%	64.2%
Advanced NMS	10.7%	30.7%	75.7%
New NMS	2.9%	45.5%	92.0%

Note: Share of USPTO patents owned by foreign residents in total patents invented domestically.

Source: Authors' calculations based on patent counts in the United States Patent and Trademark Office (USPTO) (see Annex 1).

Foreign-led upgrading of national innovation systems in transition is evidenced by the fact that MNE subsidiaries performed significantly better than local firms (Djankov and Murrel 2002). Most MNE subsidiaries in Central and Eastern European countries are to some extent technologically active in terms of conducting their own R&D and generating product and process innovations, and this stimulates technological transfer and upgrading (Günther et al. 2009). However, the R&D of MNE subsidiaries has been primarily demand-driven, while tapping into localised knowledge and technology seems to be less relevant (Radosevic 2006). This means that few of these countries have developed their science and technology infrastructure to the level that they possess an absolute advantage in basic research for which MNEs will in rare circumstances seek to locate a stand-alone, specialised R&D facility. Where this might occur would be in the advanced NMS, of which there is some activity in the Czech Republic and Hungary (OECD 2008).

Furthermore, few foreign MNEs have built the kind of linkages with domestic actors that enhance the indigenous innovation milieu, and this situation limits the developmental impact. The interaction between the local firm sector and foreign-owned firm sector is often constrained because local firms and universities lack sufficient absorptive capacity, because they operate largely in different sectors, or because they have evolved separately from foreign owned firms. In some instances, local actors were reluctant to integrate MNEs into the system (Damijan et al. 2003, Sinani and Meyer 2004, Javorcik and Spatareanu 2008). Most often, the activities conducted by local firms as a result of their interaction with MNEs were in the lower value-adding segments of the value chain and characterized by a somewhat hierarchical relationship with the MNE. Cases of deeply embedded MNEs are often attributable to 'domestic production substitution', i.e. the replacement of previous state-owned firms by MNEs in the industrial milieu of the host country through privatization. In some cases the domestic linkages of the acquired firms have been maintained, but in other cases a considerable part of these linkages have been substituted with those of the parent MNEs global network of affiliates and partners.

Figure 4 shows the functional structure of FDI projects in the different groups of EU countries, including R&D as one of the functions. This is based on an analysis of the European Investment Monitor database from Ernst and Young, which comprises a sample of 22,510 announcements of inward FDI projects in EU countries made by European and non-European firms from 1997 to 2006. It includes greenfield investments and expansions but excludes mergers and acquisitions. It also excludes real estate investments; retail, leisure and hotel facilities; fixed infrastructure investments; extraction activities; portfolio investments and not-for-profit organisations. The information was compiled through global, national and regional media; financial information providers (such as Reuters); corporate websites; and government websites (such as the websites of investment promotion agencies). According to this source, the share of R&D projects in total FDI projects is much larger in the core and cohesion countries than in the NMS[2]. The share of investment in headquarter functions is also lower in the NMS, while the share of manufacturing projects is higher. It should be noted that this analysis by function is based on the number of project announcements, but does not consider the quantity of the investment nor the number of jobs created.

Similarly, Majcen et al. (2009) discuss how EU countries that are at an early stage of transition, furthest away from convergence with the EU norm and with poorly defined innovation systems are often host to single-activity subsidiaries, primarily in sales and marketing or labour-intensive manufacturing and assembly, as well as in natural resource extraction. In contrast, the most advanced economies with domestic technological capacity, such as the core EU countries, have hosted the least truncated subsidiaries, often with R&D departments and (regional) headquarter functions.

Figure 4. Functional structure of FDI announcements (1997-2006)

	Core countries	Cohesion countries	Advanced NMS	New NMS	EU 27
R&D	9.2%	9.9%	3.8%	2.5%	6.4%
Manufacturing	27.1%	41.5%	65.4%	54.1%	41.2%
Sales & Marketing	36.3%	26.7%	17.4%	32.1%	31.8%
Logistics	9.0%	6.8%	8.0%	7.8%	7.6%
Headquarter	10.1%	4.7%	0.5%	0.6%	5.0%
Other	6.5%	10.3%	4.8%	2.9%	7.2%
Total	100%	100%	100%	100%	100%
Sample size	15,427	2,533	3,479	1,064	22,510

Note: Share of each function in total FDI announcements.
Source: Authors' calculations based on European Investment Monitor database from Ernst and Young (see Annex 2).

[2] It is striking to see that the share of R&D announcements in cohesion countries is higher than in core countries, although this difference is explained by the special case of Ireland: if we exclude this country, the share of R&D projects for the cohesion group would decrease to 7.1%, below the level in core countries.

4. Policy recommendations

There has been tendency for many governments of NMS to measure their potential attractiveness to MNEs based on their basic infrastructure and relatively low labour cost. But these kinds of location advantages are generic, in the sense that they are widely available. Furthermore, MNEs do not tend to locate their R&D activities based on cheap factor inputs, and where they do so, it tends to be of the sort that is footloose, such as clinical trials for pharmaceuticals (Filippov and Kalotay 2008). It is axiomatic that as industrial development takes place, the comparative advantage of the NMS needs to shift away from low value adding activities to higher value adding activities, but the infrastructures that are necessary to achieve this (which form an important quasi-public good) have not always been made available. Only in those sectors where specialised location advantages associated with higher value adding exist can host countries benefit significantly from MNE activity in the long run. This requires a considerable amount of government interaction and investment into tangible and intangible infrastructure. As countries reach a threshold level of technological capabilities, governments need to provide more active support through macro-organizational policies. This implies developing and fostering specific clusters and technological trajectories, such that the location advantages they offer are less generic and more specific, highly immobile and such that they encourage mobile investments to be locked into these assets. Many of the NMS have the basis for creating such science based location advantages. For instance, Poland has strengths in certain natural and life sciences, as does Hungary in electro-mechanical sectors.

Of course, adapting to such challenges is not costless from three points of view. First, countries need considerable resources to invest in such vertical industrial policy actions. Many industrial policies to foster new sectors have failed because investment is often limited to building up only one part of the innovation system. For instance, Norway's biotechnology initiative did not eventually maintain the initial momentum to encourage domestic and foreign firms to undertake R&D, since it failed to invest in PhD programmes in universities in the natural sciences. Second, introducing targeted programmes requires considerable political will and discipline, not just because picking one sector or industry requires others to be given less priority, but also because other industries will necessarily need to be 'wound down'. Third, fostering new sectors requires major institutional change. Such radical systemic change requires resources and an effective period of transition given the inertia associated with informal institutions. Thus, developing a new sector needs to be undertaken in a 10-15 year time frame.

A clear conclusion emerging from section 3 is that governments of the NMS should focus their efforts on the promotion of sequential investments that pull the MNE's activities such that they become simultaneously deeply integrated with the MNE global structure and deeply embedded within the domestic innovation system. The underlying goal is to increase the strategic importance of the MNE's domestic subsidiary to the MNE headquarters, such that sequential investments are increasingly knowledge intensive. This approach is based on the view that firms engage in R&D investment abroad either sequentially or through the acquisition of an existing foreign entity, but rarely through greenfield investments. Thus, policies should primarily focus on the embedding and upgrading of MNE subsidiaries already present in the country rather than on the attraction of new FDI in R&D (Costa and Filippov 2008, Guimón 2009). Governments should evaluate the existing stock of foreign subsidiaries with the view of identifying individual opportunities for upgrading, which would be followed by enhanced dialogue and collaboration with subsidiary managers and by the offering of customized aftercare services and incentives. The aim is to support them to engage in R&D even if it is a small scale activity, with the hope that it will grow with time. Once the subsidiary has done some R&D, it might find it much easier to get into other R&D engagements.

This involves a shift from a mindset that prioritized *quantity* and FDI attraction towards one where the focus is on *quality* and subsidiary development, which calls for a closer connection between FDI, industrial and innovation policies. However, the tendency in most NMS has been to focus on FDI flows, but not on the after-care or embedding aspect necessary for FDI-assisted development (Chobanova 2009). While some countries – such as Hungary, Czech Republic, Slovakia and Romania– have tended to consider FDI policy in tandem with industrial policy, others have focused on the two separately, or at best have made a loose connection between MNE activity and industrial restructuring and growth. Few countries – even among the core EU economies – have seen the necessity of a three way link between FDI policies, industrial policies and innovation policies. In our view, the three are inextricably linked. Against this background, governments should strive to create clusters around MNEs and to stimulate linkages, and we discuss this further in Section 4.1.

Another point we stressed in section 3 is that the R&D activity of MNEs in the NMS is primarily of the demand-driven kind. It seems clear that the NMS are not likely to attract significant supply-driven R&D in the future, since there are only a few locations within the EU which have the appropriate science and technology infrastructure to achieve this. Thus, we believe it is more practical to recommend that they focus on fostering demand-driven R&D. The appropriate policy approach in this case does not differ greatly from that applicable to MNE-embedding policies. The objective remains to facilitate the upward evolution of existing manufacturing and sales operations. In Section 4.2 we provide some suggestions for demand-oriented upgrading of human capital and public R&D, aimed at creating the conditions that encourage existing subsidiaries to engage in R&D. Another typical role of governments is to provide subsidies and tax incentives to MNEs, which we discuss in Section 4.3. To conclude, in Section 4.4 we discuss briefly other policy options related to competition policy, intellectual property rights and public procurement.

4.1. Creating clusters around MNEs and fostering linkages

In many countries, large projects are attracted with the intention of acting as a 'seed', such that a cluster can be built around them. Large incentives and subsidies are provided with the intention that not only will other foreign investors come to the same region, but there will be substantial linkages and growth of the domestic sector. The Toyota investment in St Petersburg is a case where sequential investments have occurred because other Japanese firms followed in Toyota's wake, but little or no attention was paid to the knock-on effects in terms of opportunities for domestic suppliers. The St Petersburg-Leningrad Oblast area has other large automotive sector firms and therefore considerable opportunities to link the skills and capabilities available, for instance, in the Kirov tractor and tank facility, but these opportunities were ignored. Policy makers focused entirely on the capital flows and employment, rather than on linkages. This can be contrasted with the success of Costa Rica in attracting a huge investment by Intel, but taken in the first instance to be the basis for building a sizable domestic industry of both foreign and local firms (Mortimore and Vergara 2006, Mytelka and Barclay 2006). Intel's decision to invest in Costa Rica in the mid 1990s had a huge impact on the Costa Rican economy, and represented the consolidation of the national strategy to diversify out of apparel and natural resources toward electronics. Costa Rica then successfully implemented a new development strategy based on attracting FDI to upgrade into more technologically-sophisticated activities. A considerable amount of success was achieved in electronics, medical devices and logistics by way of selective interventions related to improving domestic capabilities to attract FDI, implementing an active and targeted FDI policy reflecting national developmental priorities, negotiating firm-level package and implementing specific industrial policies to promote productive linkages.

As MNE increasingly seek to rationalize their activities, decisions about local linkages are not always made at the subsidiary level, but rather at the headquarters level by comparing the various options available to the MNE globally. Thus governments need to create incentives for the MNE to consider local partners, and not expect these to happen naturally. In most transition countries there are often existing firms which, while in the appropriate industry, do not currently meet the quality and reliability requirements of the MNE. Thus policies to upgrade reliability and quality in local firms are important. Along these lines, the Irish government has invested substantial resources to offer a comprehensive range of services to assist local firms to develop their business strategy and enhance their skills[3]. Besides building the necessary technological capacity to profit from the externalities derived from MNE activity, governments often put in place specific programmes to assist foreign investors to find suitable local suppliers or partners. This reflects the fact that it takes considerable efforts for outsiders to become familiar with new institutions and local firms, in order to become 'club members' of the innovation system. The Irish government was one of the first to do so by setting the "National Linkage Program" in the early 1980s to foster linkages between inward investors and the domestic industry. Among the NMS, the Czech Republic set up a "Supplier Development Programme" in 1999, with the objective of intensifying and strengthening contacts between domestic suppliers and multinational manufacturers already operating in the Czech Republic or planning to invest there[4].

Prior to EU accession, a number of NMS –Czech Republic and Hungary in particular– attempted to encourage MNE embeddedness by using protectionist policy measures: high tariffs and customs duties, rule of origin, local content, etc. However, upon accession, many MNEs –even in low-technology areas such as Food and Beverages– relocated activities when such policy tools became redundant (Chobanova 2009). When left to their own devices, and unrestricted by distortions in markets introduced by regulation, MNEs preferred to see economies of scale and scope in their existing activities within the core EU countries despite the low cost advantages the NMS offered. Such import-substitution type policies were therefore only a short-term (and short-sighted) strategy, as EU and WTO law require that MNEs receive national treatment. Moreover, 'forced embeddedness' does not provide the kind of sustainable competitive advantages that enable upgrading in corporate value chains. Instead, the proper role for governments of NMS is as linkage facilitators and skills coordinators. This is not limited to promoting linkages between MNEs and domestic suppliers. It should also include linkages with universities and public research centres, and extend further to provide assistance to MNEs in recruiting local researchers and bringing scientists and engineers from abroad, as many EU countries are already doing.

One of the challenges in creating clusters around MNEs is associated with matching the industrial structure and comparative advantage of the region with the kinds of FDI that are being attracted. As highlighted in the previous section, benefits from FDI are maximised when the kinds of investment projects being attracted are matched with the potential clusters of domestic competitiveness which MNEs may be able to tap into. Innovation policy should place the endowments of the innovation system in a global context, identifying spaces for coupling domestic innovatory capacities with the dynamics of global value chains. We advocate here for a selective approach to FDI promotion, where limited resources are placed in efforts to attract the kind of investment projects that provide the greatest opportunity for linkages between foreign firms and domestic actors.

[3] http://www.enterprise-ireland.com/Grow/

[4] http://www.czechinvest.org/en/czech-suppliers

4.2. Demand-oriented upgrading of human capital and public R&D

As argued earlier, governments should aim at creating the conditions that enable existing subsidiaries to penetrate into higher value-added nodes of global value chains, and in particular into R&D. This entails an incremental upgrading of public R&D and human capital in response to MNE current activities, rather than radical (and expensive) actions to specialize in new R&D areas with the hope that this will be followed by greenfield FDI in higher value adding activities.

Firstly, with regard to building research capacity in the public sector, there are two aspects to be considered. On the one hand, there are investments in supply-side R&D generation. This includes investments in long-term research projects in specific areas, as is the case with national laboratories, academies of science, etc. These generate outputs such as academic publications, patents, etc., which act as an important source of knowledge inputs for larger research establishments by MNEs and domestic firms. Public research institutes are also necessary to provide technical services for testing and as a consultancy service to firms as part of the infrastructure for metrology, standards, testing and quality control. On the other hand, there are demand-driven public institutes which actively work in particular sectors or clusters, whose primary purpose is to develop specific innovations to meet the need of a sector or group of firms. At the current stage of development of their national innovation systems, our suggestion for the NMS is that they focus on this second type of public R&D. Specific government actions and strategies should follow from an intelligence gathering and technology foresight exercise in continuous dialogue with MNE subsidiaries.

For example, the Irish investment promotion agency, IDA Ireland, dedicated 70 million euro to the creation of the National Institute of Bioprocessing Research and Training (NIBRT), its most costly project in 2005. This is a rare role for an investment promotion agency and a clear manifestation of how FDI policies and innovation policies are becoming more closely interconnected. IDA Ireland saw bioprocessing as a strategic industry where existing MNE subsidiaries had the potential to upgrade their R&D activity, and saw the necessity to create this centre in order to stimulate the upgrading process. Although the NIBRT is now run by a consortium of universities, IDA Ireland conceived the project and still participates in its strategic management[5].

Secondly, upgrading in corporate value chains involves improving human resources capabilities in line with demand. Innovation requires not only engineers and scientists, but rather a broad range of qualifications, including technicians, administrative staff and skilled workers. It is important that tertiary education institutions focus on all of these different levels, and that programmes are developed in the appropriate industries and specialisations for which demand exists, in addition to generic subject areas. For example, in Singapore the Ministry of Trade and Industry, the Economic Development Board and the Council for Professional and Technical Education work closely together to monitor future skills needs, drawing on inputs from foreign and local investors as well as from education and training institutions. This information is matched against national policy objectives and used to build targets for various components of universities, polytechnic schools and the Institute for Technical Education (UNCTAD 2005). These include building up educational skills of teachers, trainers and university lecturers, in addition to those needed to run basic infrastructure projects such as electrical power generation, construction, and the like. More generic skills such as accounting, actuarial sciences, management, etc., are also targeted.

[5] http://www.nibrt.ie

In addition, universities and polytechnics can be encouraged to work with specific MNEs to provide customized training in two ways. First, there are specific on-the-job training programmes to develop skills in particular areas for *existing employees*. A common policy is to offer FDI subsidies tied in to the foreign investor providing some level of specialised training to potential employees, which are co-financed by the government. Second, MNEs sometimes seek specialist training programmes in institutions of higher learning to promote the proper training of *potential employees*, but this is largely the initiative of the firms in question, and is a model that is only viable for large MNEs which have special needs, and can afford to do so (Chobanova 2009). In some countries, the government requires that every firm provides a certain number of internships in technical positions as part of the educational curriculum of technical schools. This raises the quality of educational institutions and at the same time constitutes a mechanism for the firm to identify young potential employees.

For example, the U.S. state of South Carolina operates the Center for Accelerated Technology Training (CATT) to help investors find appropriately qualified workers and to provide some level of specific training to employees. CATT's services are provided through state tax dollars at minimal or no cost to the qualifying client. CATT specializes in custom-designed, short- and long-term, company-specific training for industries seeking to locate or expand in South Carolina. It also provides recruiting, assessment, management and implementation services to customers who are creating new jobs. Training may be delivered through pre-employment or on the job activities dependent on the time frames and individual needs of the customer[6].

4.3. Providing subsidies and tax incentives?

During the last decade, most EU countries have increased their tax incentives to business R&D, to the point that they now constitute a substantial part of the total public effort to support business R&D in the EU (European Commission 2006). Incentives vary in design across the EU, with some countries using a flat or volume-based tax and others an incremental rate based on the increase in R&D spending or a mixture of both (PRO INNO Europe 2007). The cost of participating in this competition might be prohibitive for the NMS. Indeed, a recent study by Harris et al. (2008) sustains that disadvantaged regions of the EU would need substantial increases in the tax credit, at a level that would negate the potential benefits.

Instead, we advocate for a cautious, selective and flexible use of subsidies, linking them to after-care services and MNE-embedding policies. For example, a typical approach in many EU countries is to offer ‘research hosting’ services to foreign firms through technology parks, which may include subsidized office space, access to research equipment, recruitment, searching for suppliers and partners, and so on. The increased competition for high quality FDI calls for an ‘activist’ policy approach aimed at ‘targeting’ the most appropriate investment projects and at ‘tailoring’ the most appropriate incentive packages for the individual firms being targeted (Cantwell and Mudambi 2000). But subsidies should always be offered cautiously, after considering very carefully what the potential spillovers and linkages will be, and how these can be converted to actual benefits. Building on the previous sections, we sustain that subsidies should be designed in a way that induce ‘behavioral additionality’ effects, in particular the propensity of MNE subsidiaries to collaborate with other agents in their R&D efforts (OECD 2006).

State support to foreign investors is partly constrained by EU regulations, but the degrees of freedom are much larger when it comes to promoting R&D (European Commission 2005). In addition, EU cohesion

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[6] http://www.cattsc.com

policies are becoming more targeted to innovation and knowledge, which opens up new funding opportunities for the NMS. For example, in 2009 Spain was the first country to use the new European Technology Fund (2007-2013), and the Spanish government decided to dedicate part of it to stimulating the R&D activity of MNE subsidiaries by providing 24 million euro for subsidies to the national investment promotion agency[7].

4.4. Other policy options

EU law supersedes national regulatory frameworks. Among other things, accepting the *acquis communautaire* implies that competition policy and other forms of regulation are determined at the EU level and, likewise, that discrimination between domestic and foreign firms is no longer possible. For example, competition policy is a relevant area that countries such as China have used to great effect, by offering large MNEs oligopolistic markets on the condition that knowledge-intensive and R&D activities are undertaken locally, whether independently or in conjunction with domestic firms (Liang 2007). Apart from the fact that it contravenes EU competition policy as well as WTO rules (they are in effect a performance requirement), China has the added advantage of its large market size to use as a bargaining tool.

The intellectual property (IP) regime is another policy area constrained by EU membership but available to third countries. However, there still are some possibilities for national policy intervention. For instance, several EU countries offer financial or fiscal incentives to cover patenting costs and tax deductions on income from patent licensing, which may be of interest to foreign investors in R&D. Another possible role of governments is to ensure that an adequate skill formation in IP is available in the country, for example by sponsoring IP specific seminars and courses, and by identifying specialized law firms and consultants that could be contacted by foreign investors in R&D.

Another policy option is to spur demand for R&D through specific regulations and public procurement. These include ‘green’ public procurement, energy-efficient construction and transport, renewable energy projects, bio-fuels, infrastructure renewal, e-government platforms, and so on (Cunningham 2009). For example, since the 1970s, Germany has introduced strict environment protection regulations for households and firms which increased demand for environmental technologies and services, stimulating innovation in these areas. As a result, Germany became a lead market for a number of environmental technologies, which helped attract internationally-mobile R&D.

5. Conclusions

To what extent the NMS will be able to benefit from an increase in the quality of MNE activity in the future is unclear. The global crises that started in 2007 has added impetus to the restructuring of MNE operations in the EU, and in 2008 and 2009 the NMS have been strongly affected by downsizing and job cuts (Kalotay and Filippov 2009). The risk of downgrading and subsequent specialization in the lower value adding segments of corporate value chains has turned into a critical concern for the NMS.

The proper role for governments of the NMS in this context is a subject of much debate. We have recommended a coordinated, flexible and systemic approach, focussed on subsidiary development and linkage facilitation. Our analysis suggests that it is more practical for governments of the NMS to concentrate efforts on the incremental upgrading of existing subsidiaries towards demand-driven R&D, rather than on attracting greenfield investments in supply-driven R&D. We have discussed a set of policy

[7] http://www.investinspain.org

measures to achieve this and a set of selected examples from different countries that may inform policy learning in the NMS. However, our suggestions are to be taken as illustrative only, since it was beyond the scope of this paper to cover all possibilities. Moreover, it should be stressed that each individual country would require a different mix of policies depending on its technological and institutional profile.

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Annex 1. Foreign ownership of domestic inventions in EU countries

	1981-1985			1991-1995			2001-2005		
	Total[1]	Foreign[2]	Share[3]	Total	Foreign	Share	Total	Foreign	Share
Austria	1,158	725	62.6%	2,230	1,024	45.9%	2,858	1,653	57.8%
Belgium	1,125	602	53.5%	1,851	1,022	55.2%	4,066	2,446	60.2%
Denmark	614	213	34.7%	1,209	548	45.3%	2,596	920	35.4%
Finland	630	181	28.7%	1,422	279	19.6%	3,830	557	14.5%
France	8,893	2,020	22.7%	13,259	2,976	22.4%	18,738	5,772	30.8%
Germany	28,612	5,018	17.5%	30,835	6,181	20%	51,210	11,413	22.3%
Italy	3,385	1,034	30.5%	5,882	1,649	28%	8,675	3,068	35.4%
Luxembourg	130	59	45.4%	206	128	62.1%	331	260	78.5%
Netherlands	2,897	1,745	60.2%	4,353	2,598	59.7%	7,449	3,231	43.4%
Sweden	3,271	1,169	35.7%	3,264	1,099	33.7%	7,356	1,771	24.1%
United Kingdom	87	82	94.3%	3,084	2,012	65.2%	19,443	10,726	55.2%
Core EU [4]	50,802	12,848	25.3%	67,595	19,516	28.9%	126,552	41,817	33%
Greece	59	49	83.1%	52	42	80.8%	132	107	81.1%
Ireland	120	97	80.8%	274	176	64.2%	887	628	70.8%
Portugal	26	25	96.2%	33	25	75.8%	86	70	81.4%
Spain	279	172	61.6%	773	382	49.4%	1,714	1,004	58.6%
Cohesion EU	484	343	70.9%	1,132	625	55.2%	2,819	1,809	64.2%
Czech Republic	0	0	-	1	0	0%	205	161	78.5%
Estonia	0	0	-	1	1	100%	21	18	85.7%
Hungary	434	32	7.4%	304	64	21.1%	287	206	71.8%
Poland	110	26	23.6%	55	44	80%	175	153	87.4%
Slovakia	0	0	-	0	0	-	52	41	78.8%
Slovenia	0	0	-	14	6	42.9%	90	49	54.4%
Advanced NMS	544	58	10.7%	375	115	30.7%	830	628	75.7%
Bulgaria	82	2	4.5%	25	10	62.5%	43	37	100%
Latvia	0	0	-	0	0	-	11	9	81.8%
Lithuania	0	0	-	0	0	-	18	17	94.4%
Romania	22	1	2.4%	8	5	40%	41	41	86%
New NMS	104	3	2.9%	33	15	45.5%	113	104	92%
Cyprus	1	1	100%	7	5	71.4%	12	11	91.7%
Malta	0	0	-	3	3	100%	8	2	25%
Other NMS	1	1	100%	10	8	80%	20	13	65%
Total EU 27	51,935	13,243	25,5%	69,145	20,279	29,3%	130,334	44,371	34,0%

Notes:

1. Number of patents filed in USPTO with at least one domestic inventor.
2. Number of patents from 1 that are owned by a foreign entity.
3. Share of 2 in 1.
4. Sum for all the countries comprising each group.

Source: Authors' calculations based on patent counts in USPTO; www.uspto.gov

Annex 2. Functional structure of FDI announcements in EU countries (1997-2006)

	R&D	Manu-facturing	Sales & Marketing	Logistics	Head-quarters	Other[2]	Sample size
Austria	12.5%	33.3%	29.4%	13.8%	6.6%	4.3%	513
Belgium	5%	37.5%	26%	18%	6.5%	7.1%	1,190
Denmark	11.1%	10.4%	42.9%	6.1%	26.8%	2.8%	396
Finland	14.4%	26%	49.3%	4.1%	3.4%	2.7%	146
France	6.7%	45.4%	6.7%	10.5%	5.4%	5.8%	3,867
Germany	8.3%	30.1%	39.4%	8.4%	6.3%	7.5%	1,818
Italy	11%	24.3%	48%	5%	4.5%	7.2%	444
Luxembourg	5.7%	22.6%	43.4%	7.5%	13.2%	7.5%	53
Netherlands	5.5%	25%	31.8%	15.1%	13.7%	8.8%	780
Sweden	12.6%	14.7%	51%	4.7%	8.5%	8.5%	681
UK	8.6%	28.8%	31.6%	5.4%	16.3%	9.2%	5,539
Core EU[1]	9.2%	27.1%	36.3%	9%	10.1%	8.3%	15,427
Greece	7%	29.8%	43.9%	7%	5.3%	7%	57
Ireland	18.3%	32.9%	20.9%	2.7%	7.2%	17.9%	884
Portugal	4.3%	57.4%	18.4%	9.4%	1.1%	9.4%	277
Spain	10%	46%	23.5%	8.2%	5.4%	6.8%	1,315
Cohesion EU	9.9%	41.5%	26.7%	6.8%	4.7%	10.3%	2,533
Czech Republic	6.4%	69.8%	12.4%	4.9%	0.9%	5.5%	849
Estonia	0.6%	58.4%	21.3%	11.2%	0%	8.4%	178
Hungary	4.2%	67.1%	12.5%	8.4%	1.4%	6.5%	1,026
Poland	3.1%	67.2%	15.2%	8.7%	0.7%	5.2%	1,046
Slovakia	2.1%	73.8%	13.9%	6.6%	0.3%	3.3%	332
Slovenia	6.3%	56.3%	29.2%	8.3%	0%	0%	48
Advanced NMS	3.8%	65.4%	17.4%	8%	0.5%	4.8%	3,479
Bulgaria	3.1%	60.8%	29.9%	5.2%	0.3%	0.7%	291
Latvia	1.6%	42.3%	37.4%	13%	0%	5.7%	123
Lithuania	1.3%	48.3%	40.4%	7.9%	0.7%	1.3%	151
Romania	4%	64.9%	20.6%	5.2%	1.2%	4%	499
New NMS	2.5%	54.1%	32.1%	7.8%	0.6%	2.9%	1,064
Cyprus	0%	0%	100%	0%	0%	0%	2
Malta	0%	40%	20%	0%	0%	40%	5
Other NMS	0%	20%	60%	0%	0%	20%	7
Total EU 27	6.4%	41.2%	31.8%	7.6%	5%	7.9%	22,510

Notes:

1. Mean for all countries comprising each group.
2. Other functions include: contact centres, shared services centres, testing & servicing, and others.

Source: Authors' calculations based on European Investment Monitor database from Ernst and Young; http://www.eyeim.com