



ICEI Instituto Complutense
de Estudios Internacionales

Government Strategies to Attract R&D-Intensive FDI

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PP 03/07

Abstract

Competition among countries and regions to attract the R&D activities of multinational enterprises has increased substantially during the last years, but the strategies used by governments in this competition remain largely unexplored. This paper proposes a taxonomy of the main policy instruments available to stimulate inward R&D-intensive FDI and presents the results of a comparative case-study of two European countries: Spain and Ireland. The main conclusion is that an efficient promotion of R&D-intensive FDI calls for a closer coordination between innovation policy and inward investment promotion, which are two policy areas that have traditionally operated rather independently from each other. In addition, inward investment agencies targeting R&D-intensive FDI are advised to reconfigure the scope of services they provide by placing more emphasis on after-care, since R&D-intensive FDI tends to be evolutionary rather than greenfield.

Keywords: R&D, FDI, multinational enterprises.

Resumen

La competición entre países y regiones por atraer las actividades de I+D de las empresas multinacionales ha aumentado sustancialmente durante los últimos años, pero no hay suficientes estudios sobre las estrategias utilizadas por los gobiernos en esta competición. Este artículo propone una taxonomía de los principales instrumentos políticos para estimular la IED intensiva en I+D y presenta los resultados de un estudio de caso comparativo de dos países europeos: España e Irlanda. La principal conclusión es que una promoción eficiente de la IED intensiva en I+D requiere una mayor coordinación entre las políticas de innovación y las políticas de atracción de la IED, que tradicionalmente han funcionado de forma independiente. Otra recomendación que emana de este estudio es que las agencias de promoción de inversiones que deseen priorizar la IED intensiva en I+D deberían reconfigurar la gama de servicios que prestan para pasar a centrarse en los servicios post-inversión (o “after-care”), ya que la IED-intensiva en I+D tiende a ocurrir a través de un proceso evolutivo y no tanto a través de inversiones “greenfield”.

Palabras clave: I+D; IED; empresas multinacionales.

Acknowledgments

Thanks are due to the Institute of International Integration Studies of Trinity College Dublin for hosting me as a visiting researcher while developing this paper, and especially to Frances Ruane who provided invaluable feedback and assistance. I am also grateful to Paloma Sánchez, my PhD supervisor at Universidad Autónoma de Madrid, for her useful comments to an earlier draft of this paper. Thanks are also due to all the policy makers and business managers that agreed to be interviewed for this research, especially to Sean Dorgan and Antonio Hernandez.

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1. Introduction

Although corporate research and development (R&D) activities still remain highly concentrated close to headquarters, the evidence available shows that R&D-intensive foreign direct investment (FDI) has grown substantially in recent years. For example, according to UNCTAD (2005) almost 16% of the R&D expenditure of firms in 2003 occurred in their subsidiaries abroad, up from 10% a decade earlier¹. The existing literature suggests that inward R&D-intensive FDI constitutes a powerful mechanism of international technology transfer which can enable host locations to develop specialized clusters and integrate more advantageously in global value chains (Carlsson, 2006; Cantwell and Piscitello, 2000; Audretsch, 2000; Vazquez-Barquero, 1999). This has motivated an increasing interest in attracting the R&D activities of foreign multinationals among regions and countries worldwide (Zanatta et al, 2006). But while the existing literature is rich in discussing the new rationales for public intervention in an abstract level, it is weak at offering practical guidance regarding the strategic choices for policy makers and the implementation challenges (Borras et al, 2007). In response to this gap, the aim of this paper is twofold: 1) to clearly identify the main policy instruments available to stimulate inward R&D-intensive FDI, and 2) to explore how these policies are designed and implemented in practice.

The first objective is addressed in Sections 2 and 3, building on a review of the literature on R&D internationalization. Section 2 describes how multinational enterprises choose where to locate their offshore R&D units and defines the role of public policies in that context, while Section 3 proposes a taxonomy of the main policy instruments available. The second objective is addressed in Section 4 through a comparative case study of two EU countries: Spain and Ireland. Spain is the fifth largest EU member while Ireland is among the smallest, but they both are late-coming members of the EU which have received generous cohesion funds and have experienced a strong economic and social convergence with the more advanced European countries in the last two decades. During the last decades their success in attracting FDI has been partly driven by their

cost-competitiveness within the EU, but this advantage is now fading away as a result of their own economic progress and of the enlargement of the EU. Spain and Ireland are now intermediate countries, in the sense that they are not perceived as technological leaders in their fields nor can they compete on the basis of low costs alone. A manifestation of their intermediate nature is that their expenditure in R&D is under 1.25% of GDP (1.21% in Ireland and 1.13% in Spain), well below the 2% EU average (2005 data from Eurostat and INE). This intermediate nature makes them especially interesting for exploring policies towards R&D-intensive FDI, since technological leaders (e.g. the US, Germany, Finland) are more likely to figure in the minds of investors when deciding where to locate R&D centers and therefore may adopt a more passive approach to investment promotion, while low cost competitors often concentrate on other policy priorities such as reducing unemployment.

2. The location decision and the role of public policies

Understanding how multinational enterprises decide where to locate their R&D units abroad is a prerequisite for determining the role of policies and selecting the policy mix. The location decision depends on the nature of the R&D activities to be offshored and on the mode of entry of the investment, i.e. on whether it occurs through a greenfield investment, an expansion of an existing subsidiary or a transnational merger and acquisition (M&A). In the case of M&As, the only short term effect for the host country is a change of ownership but, in the medium to long run, the potential benefits in terms of foreign knowledge transfer are to be weighted against the risk that the acquirer ends up reducing the subsidiary's R&D mandate to avoid duplicities with other existing units. In general governments are not interested in promoting this kind of FDI in R&D. Instead, policies aimed at protecting the "national jewels" may be justified (Archibugi and Iammarino, 1999), although these are constrained by WTO regulations and, in the case of the EU, by European law supporting the Single Market. In contrast to M&As, in the case of both greenfield investments and expansions the potential benefits for the host country (and the rationale for public intervention) become more evident since these entry modes

¹ The estimations of UNCTAD, 2005 are based on the OECD AFA database and on national statistics.

represent the creation of new technological capacity in the country.

In general terms, the location of R&D-intensive FDI is driven by the interplay of a wide array of (changing) factors which may be classified into three groups: host country characteristics, parent company strategies and, in the case of expansions, subsidiary potential (Birkinshaw, 2003). Firstly, regarding the parent company strategies, it needs to be acknowledged that the technological strategies of foreign multinational enterprises are largely outside the scope of influence of national policies. But, still, governments aim at understanding and monitoring them in order to evaluate how the country may fit into those strategies and to assess the impact of FDI.

Secondly, the factors related to the capabilities of subsidiaries are critical since R&D mandates are often assigned through a competitive process involving several potentially-capable subsidiaries of the multinational firm already present in different countries and regions. Success in this process is partly driven by the upward influence of subsidiary managers and their capacity to “sell issues” to headquarters (Ling et al, 2005; Simões and Nevado, 2001). Thus it becomes essential for multinational subsidiaries to develop “dynamic capabilities”, that is, the ability to identify and profit from new opportunities, and to reconfigure and protect their competences and knowledge in order to attain a sustainable competitiveness (Teece, 2000). In this sense R&D-intensive FDI can be seen mainly as an evolutionary process whereby the manufacturing or marketing units already located in the country get engaged in R&D after some time. The main aim of public policy would be to facilitate this transition.

Finally, among the factors related to the host country the empirical evidence available suggests that the main location drivers are the availability of world-class research infrastructure and skilled labour (EIU, 2004; Cantwel and Iammarino, 2001) as well as the dynamism of the national innovation system, that is, the degree of interaction and collaboration among different firms and other “knowledge producing and diffusing organizations” (universities and research centres, consultants, industrial associations, etc.) (Chaminade and Vang, 2006). The size of the market is also a relevant location factor, especially for “market-seeking” (or “asset-exploiting”) R&D-intensive FDI, which aims at adapting the product

(or the manufacturing process) to the local context (Mansfield et al 1979). However, the market size is not so relevant in the case of “technology-seeking” (or “asset-augmenting”) R&D-intensive FDI, which aims at building globally-oriented R&D centers or “centers of excellence” (Bas and Sierra 2002; Florida, 1997; Kuemmerle, 1996). The cost of labor may also be a relevant location driver, especially for lower-end and routine R&D activities. Other relevant drivers suggested in the existing literature are the presence of other multinational enterprises active in R&D; public incentives to corporate R&D; the intellectual property rights regime; the climate and quality of life; the English skills of the local population; and the bureaucracy; paper work and time associated with creating and functioning an R&D enterprise.

Public policies can be seen as an attraction factor in themselves (Mudambi, 1995), but they can also be seen as means of reinforcing the different attraction factors and making them more visible to the international investment community. Indeed, a key role of public policies is to stimulate R&D intensive FDI by acting upon the factors driving the location decision described above. However, while some of those attraction factors may be influenced by policy in the short term (e.g. incentives to business R&D), others can only be influenced in the medium to long term (e.g. human capital), and yet others are outside the scope of policies, such as the size of the market.

In addition to acting upon the attraction factors, a second role of policies is to make them more visible to the investment community and to influence the perceptions of the decision makers, for example through marketing campaigns, missions and personal networking. Finally, public policies also aim at increasing the benefits derived from the existing stock of inward R&D-intensive FDI (Rama, 2007). This can be achieved by promoting collaboration and linkages between foreign-controlled subsidiaries and local firms and research centers, that is, by “embedding” the R&D activities of the foreign firm in the national innovation system with the aim of facilitating knowledge spillovers. In addition, a high degree of embeddedness in the national innovation system may be critical for the sustainability and upgrading of foreign R&D investors already located in the country (Helmut and Nones, 2007).

3. A taxonomy of policy instruments

We conceptualize the attraction of R&D-intensive FDI as a horizontal policy which stands in the intersection between innovation policy and inward investment promotion. On the one hand, the role of innovation policy is to improve the investment climate for R&D by identifying and acting upon the strengths and weaknesses of the national innovation system. On

the other hand, the role of inward investment promotion is to improve the image of the country as an R&D location and to provide targeted services to both potential and existing foreign investors in R&D. Within each of those policy areas we have identified a set of key policy instruments (Table 1) which we will now describe separately, but it must be stressed that attracting R&D-intensive FDI requires a close coordination of these policy areas.

Table 1
Attracting R&D-intensive FDI: The policy framework

Policy area	Key policies
Innovation policy	<ul style="list-style-type: none"> • Fiscal and financial incentives to corporate R&D • Human capital development and attraction of foreign talent • Enhance the research infrastructure and promote collaboration and linkages • Improve the intellectual property rights regime
Inward investment promotion	<ul style="list-style-type: none"> • Target R&D-intensive FDI and build the image of the country as an R&D location • Provide R&D-specific pre-investment and implementation services • Emphasize after-care services • Policy advocacy

SOURCE: the author

3.1. INNOVATION POLICY TO ATTRACT R&D-INTENSIVE FDI

As discussed in Section 2, the existing literature suggests that the main location drivers for R&D-intensive FDI within the innovation policy domain are the availability of skilled employees; the quality of public research centers and technology parks; the propensity to collaborate of the different agents of the national innovation system; fiscal and financial incentives for R&D; and an efficient intellectual property rights regime. Therefore government strategies to attract R&D-intensive FDI are to act primarily upon these factors, after benchmarking the competitive strengths and weaknesses of the national innovation system against those of potential competitors.

The most straight-forward policy instrument is to provide *public incentives to business R&D*,

which may be both fiscal and financial². The impact of an R&D incentive package is affected by its scope of coverage, its magnitude relative to other countries, its ease of implementation in the different stages of the R&D cycle, and the balanced use of different fiscal and financial instruments (Tassey, 2007; Atkinson, 2007). While the specialized literature suggests that incentives are not a significant determinant of the location of R&D-intensive FDI, it is also recognized that they can influence the final decision when competing locations rate similarly in the rest of attraction factors (Zanatta et al, 2006; Mudambi, 1995; UNCTAD, 2005). In any case, there appears to be a widespread increase in the use by governments

² Fiscal incentives consist in a favorable tax treatment to R&D expenditure and may take the form of accelerated depreciation, tax credits, tax holidays or import tariff exemptions (Mudambi, 1999; IBFD, 2004). Financial incentives refer to the direct funding of enterprise R&D projects by the government through grants or subsidies, preferential loans (including interest allowances) or equity stakes.

of incentives to corporate R&D, resulting in a “bidding contest” among competing locations (Mudambi, 1999; OECD, 2003). In the past, financial incentives to foreign investors were partly constrained by EU regulations, but thanks to the increased importance attached to R&D in EU common policy, the degrees of freedom have increased significantly when it comes to promoting R&D-intensive FDI³.

Incentives can be across the board or discriminatory. Fiscal incentives are across the board since all firms that comply with the eligibility requirements may benefit from them. Financial incentives are sometimes across the board but more often are discriminatory, i.e. directed only to target sector or activities, or based on a bid from which only the best projects are selected. The EU Commission suggests that the beneficiaries of financial incentives should be chosen on the basis of open, transparent and non-discriminatory criteria in order to limit distortions on competition (European Commission, 2005) but in fact some European governments prefer a more flexible approach that allows them to respond faster and in a more tailored manner to individual investment projects. In particular, some governments are more proactive at offering tailored incentives to multinational enterprises, and their inward investment agencies may negotiate incentives directly, while others follow exactly the same procedures that apply to local firms, and their inward investment agencies only inform of the different incentives available but lack any control over the incentives themselves. Section 4 describes how Spain and Ireland are clear examples of these two distinct approaches.

Beyond incentives, it is obvious that the *availability of world-class researchers* is a more critical location driver for R&D-intensive FDI. This calls for policies to increase the number of scientists and engineers by encouraging the younger generations to chose a career in science and engineering, by offering grants and increasing the budgets of universities and research centers, and by facilitating the exchange of researchers between the public and the private spheres and the mechanisms for life-long learning. Building a strong human capital base is not only about growing indigenous talent; it is also about attracting and retaining talent.

³ The permissible grant under the EU VII Framework Program depends on whether it is experimental, industrial or fundamental research. The limit for the proportion of state aid is 25%, 50% or 100%, respectively (European Commission, 2005).

Thus the inflow of highly-skilled researchers from abroad should be facilitated, in order to enlarge the home talent base and to enable flexible intra-firm employee mobility as demanded by foreign investors (Inzelt, 2007). This can be encouraged through different policies, such as making the conditions of local researchers and university professors more attractive to foreign candidates; reforming the immigration legislation and procedures; reducing income taxation for high-skilled immigrants; or facilitating the accreditation of foreign qualifications. It is also critical to develop policy initiatives directed towards providing incentives for the return of national human resources located abroad, with the aim of transforming the original *brain drain* into *brain circulation* with benefits for the national innovation system.

It needs to be noted that in some cases R&D-intensive FDI projects are driven entirely by the bargaining power of highly talented scientists, which may convince multinational enterprises to open up R&D centers abroad when they are not willing to move to headquarters. A paradigmatic example of this was the decision of Microsoft to open up its first R&D center outside the US in Cambridge in the mid-nineties, to draw upon the expertise of Professor Needham (University of Cambridge, 1996). A recent example in Spain is the case of Yahoo!, which opened an R&D center in Barcelona in 2006 (see Box 1). The implication for governments is the need to provide targeted support to talented scientists in a flexible and personalized manner, and to build upon their expertise for investment promotion purposes.

Equally important are the policies aimed at *improving the country's research infrastructure*, including public research centers and government-driven technology parks and scientific platforms in key technology areas. In particular, technology parks are attractive infrastructures for foreign multinationals as they facilitate networking with other firms and research centers, provide the necessary infrastructure and administrative support, and offer a pleasant working and living environment for its employees. Attracting R&D-intensive FDI calls for policies such as offering ‘research hosting’ services to foreign firms through technology parks, which may include subsidized office space, administrative services and support in requesting incentives from the government. This kind of services increase the speed of im-

plementing an R&D center and reduce costs and bureaucracy, all of which are important issues in the FDI location decision.

In addition, it is important for governments to *promote interaction and collaboration* in the national innovation system. The importance of interaction and collaboration was already stressed in the earlier works on national innovation systems (Rosenberg, 1982; Nelson and Winter, 1982; Edquist, 1997) and further emphasized in the “triple helix” framework (Etzkowitz and Leydesdorff 2000), which supports the value of efficient industry-university-government collaboration in R&D. The importance of interaction in innovation systems is becoming more evident today as corporate R&D evolves from a central function of multinational enterprises’ value chains towards an activity that builds upon geographically dispersed R&D units and upon a closer collaboration with universities and other external organizations, including research centers and firms (Chesbrough 2003). In this context a key role for policies is to stimulate linkages of foreign subsidiaries with local firms and knowledge producing and diffusing organizations (Rama, 2007; Chaminade and Vang, 2006).

Finally, a fourth policy priority is to develop a transparent and enforceable *intellectual property (IP) rights regime*. Indeed, from a headquarter perspective among the main drawbacks of R&D offshoring are the potential loss of control over R&D and the risk of IP theft (EIU, 2007). The EU Commission is working

to introduce the so-called Community patent, which aims at reducing cost and bureaucracy and at increasing the enforceability of law across the EU and the speed of the approval and enforcement systems. It also aims at reducing patenting costs, which are more expensive in the EU than in the US or Japan. In order to stimulate the patenting activity of firms, an instrument used by several EU countries (including Spain and Ireland) is to offer financial or fiscal incentives to cover patenting costs and/or reduce taxes on income from patent licensing, which may be of interest to foreign investors in R&D. Governments are also recommended to try 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 can be contacted by potential foreign investors. Finally, in order to facilitate collaboration in research between foreign subsidiaries and indigenous organizations, governments are advised to develop clear rules over the ownership and exploitation of the resulting IP. Along this line, in 2006 the Irish government published a set of funding agency requirements and guidelines for managing IP generated in joint research projects (Enterprise Ireland et al., 2006). Ireland’s inward investment agency participated in the development of these guidelines and disseminated them widely throughout multinational enterprises located in the country and potential foreign investors in R&D.

Box 1 **The case of Yahoo! Spain**

In 2006 Yahoo! announced the opening of its first European R&D center in Barcelona, Spain. After learning that Yahoo! was looking into opening an R&D unit in Europe, Ricardo Baeza-Yates, a renowned expert in search technology, approached the company and offered to lead this project if it was done in Barcelona. He is of Chilean origin but was interested in staying in Barcelona after spending two years in the city under a research grant from the Catalanian government. During his previous stay in Barcelona he participated in the development of the Barcelona Media Innovation Center, a technological center hosted by UPF and funded by the Catalanian government which aims at developing the media and communications cluster in the city. His local connections and deep knowledge of Barcelona’s research infrastructure helped Baeza-Yates convince Yahoo! of his proposal, and the project was launched in January 2006. This case is a good example of how the location decision may be driven by the proposals of talented individuals. “*The most important factor behind location decisions are always people and networks of people*”, states Baeza-Yates.

SOURCE: Yahoo! Press Release, January 23, 2006, and interview with Ricardo Baeza-Yates, Director of Yahoo! Barcelona R&D center (April 2007).

3.2. INWARD INVESTMENT PROMOTION

In the previous section we have highlighted some key instruments of innovation policy which are critical for attracting the R&D of multinational enterprises. In addition to innovation policy, the second arm of government strategies to attract R&D-intensive FDI consists in a targeted promotion of these investments through inward investment agencies (IIAs). IIAs are usually part of, and financed by, the ministries of trade, economics or industry, and often have offices abroad and strong links to the ministries of foreign affairs, which facilitates overseas investment promotion. Inward investment promotion aims at increasing the international visibility of the country through marketing and at facilitating the investment process by offering tailored services to foreign-owned multinational enterprises. Different international organizations have developed guidelines to assist IIAs in developing successful FDI promotion strategies based on accumulated knowledge and international best practices⁴, but the specific promotion strategies for R&D-related FDI remain still largely uncovered. In a survey conducted by UNCTAD (2005) comprising 84 national IIAs, 55% declared that they actively promote R&D-intensive FDI (79% in developed countries and 46% in developing countries), which supports the need to reflect further on the different approaches and best practices.

Many countries and regions worldwide, including most EU countries (see Table 2), are attempting to position themselves in the minds of investors as locations for R&D, and are investing strongly in *image-building* for this purpose. Inward investment agencies often try to ensure that existing and new R&D-intensive FDI projects are properly announced and advertised through different channels including advertisements in targeted publications, newsletters and the news section of the their websites, since location decisions are influenced by “imitation” and “clustering” effects, which are in turn driven by “demonstration” effects and “herd behavior” (Krugman, 1997).

Beyond advertisement, a further (and more efficient) step is to select prospective companies for tailored presentations, missions, seminars and meetings. The *identification of pros-*

pective companies is followed by efforts to gain audiences with decision-makers in these companies but, in the words of Loewendahl (2001, p.22), “*approaching companies should not be seen as a methodical exercise: it is not about one-off approaches to a fixed number of companies each day, but rather a market intelligence gathering and relationship building campaign*”. The screening of FDI projects and potential investors against predefined criteria helps determine the extent of public support to provide (in the form of incentives or investment services) based on the expected benefits for the country/region.

The next step for inward investment agencies is to provide specific services to foreign investors in R&D before the actual investment (*pre-investment services*) and during the investment process (*implementation services*). In the pre-investment phase, it is advisable for IIAs to have a clear and up-to-date document explaining the strengths of the country as a location for R&D⁵. IIAs also prepare visits of potential investors to the country, including visits to R&D centers, universities, business and technology parks, and meetings with government departments and potential suppliers or partners. As noted in the previous section, some IIAs are capable of negotiating R&D incentives directly with foreign investors in the pre-investment phase, but in general their role is rather to inform investors of the different incentives available and (at most) assist them with the bureaucracy involved in applying for those incentives. To a larger or shorter extent, the role of IIAs is to offer some kind of “one-stop shop” to foreign investors, providing accurate information and assistance in processing permits; applying for incentives; recruiting local employees; subcontracting; etc.

⁴ For example, the OECD Strategic Guidelines for Investment Promotion; the Investment Promotion Toolkit of the World Bank/MIGA; and the Guidelines for Investment Promotion Agencies of UNIDO.

⁵ This information may be available in the IIA’s website as well as in brochures, fact-sheets or CDs to be distributed to potential investors. The information should also be provided to consulting companies and other investment brokers, so that they can translate it to their clients.

Table 2
Advertising as an R&D location across the EU. Selected examples

Country/Region	Slogans used by inward investment agencies
Germany	“Land of ideas”
Italy	“Log on to Italy”
United Kingdom	“Want to be part of the UK cutting-edge technological revolution?”
Ireland	“Knowledge is in our nature”
Sweden	“New Ways of Thinking”
Denmark	“Creative Denmark”
Spain	“Spain: Technology for life”
Madrid (Spain)	“Center for Excellence and Opportunity”
Catalonia (Spain)	“Look at innovation. Look at Catalonia”
Lower-Austria	“Enjoy high performance in the high-tech business – with a high quality of life”
Wallonia (Belgium)	“The pursuit of technological excellence”
Portugal	“Global Portugal: Technology from the heart”
Czech Republic	“The Skills Hub of Central Europe”

SOURCE: Websites of inward investment agencies and advertisements published in various international business magazines and newspapers.

Although pre-investment and implementation services are important for foreign investors, we argue that *after-care services* are more efficient when the objective is to promote R&D-intensive FDI since off-shore R&D centers rarely emerge overnight but rather through an evolutionary process whereby existing subsidiaries are progressively endowed with enhanced responsibilities over R&D once they have displayed competence in other activities such as manufacturing or marketing (see Section 2). Indeed, if this is the most general pathway for R&D internationalization, then IIAs should focus on assisting the existing stock of foreign-owned companies in their efforts to attract new R&D mandates (and retain existing ones). After-care services are customized to the needs of specific investors and the extent of services provided depends on the perceived social value of the project. In this sense, a key role of IIAs is to evaluate the existing stock of inward FDI with the aim of focusing their limited resources on those foreign subsidiaries which are more likely to attract new, and higher-quality, R&D mandates. In addition, the after-care services of IIAs often target foreign subsidiaries which are under a restructuring process, with the aim of transforming a potential risk of a divestment in manufacturing into the opportunity of a new investment in R&D.

Another key role of IIAs is to provide *policy advice* to the government bodies responsible for formulating and implementing innovation policy based the needs of R&D investors. IIAs hold a unique insight into the problems investors face and their impressions of the country as an investment location, based on which they may draw attention to different agents of the national innovation system to areas that are important for making a location more attractive for R&D-related FDI. To be effective in their policy advocacy role, it is crucial for IIAs to develop stronger links with other government ministries and agencies, as well as with the local managers of foreign multinationals and business and professional associations.

To conclude this section, it must be noted that determining the correct policy mix is an extremely difficult task since the relative efficiency of the different policy instruments is uncertain ex ante and hard to evaluate ex post. While the different policy instruments have been described separately, in reality many of these instruments are closely connected. Indeed, we sustain that in order to stimulate R&D-intensive FDI it is critical to build closer links between innovation policy and inward investment promotion.

4. The case of Spain and Ireland

Following the general discussion of the previous sections, this section analyzes the case of Spain and Ireland in comparative perspective, drawing attention to some key propositions that can be generalized to other countries or regions targeting R&D-intensive FDI. This comparative case-study is based on a literature review and a set of personal interviews with 22 senior executives from the government bodies responsible for innovation policy, from inward investment agencies and from the subsidiaries of multinational enterprises (see Annex 1). The interviews were conducted between July 2006 and March 2007, lasted one hour on average, and comprised a balanced mix of representatives from Spain and Ireland from the three kind of institutions addressed. They were recorded and a first draft of the paper was circulated to the interviewees with the aim of increasing the validity of the results with their feedback.

As explained in the introduction, a major challenge for intermediate countries like Spain and Ireland is to facilitate the transition from competing based on costs towards becoming knowledge providers in global value chains. To support this transition, increasing the R&D effort has become a national priority in both countries, as evidenced by the importance attached to their recently released new programs to promote innovation. These programs encompass an ambitious policy mix involving different government bodies and a substantial increase of public expenditure in R&D, including generous incentives to corporate R&D with a focus on larger-scale projects, collaborative research and public-private partnerships. The Irish government's "Strategy for Science, Technology and Innovation" (2006-2013), defines new measures and targets to increase R&D in the public and private spheres and to improve its quality. In Spain, short after the change of government on March 2004 the "Ingenio 2010" program (2005-2010) was launched with similar aims.

The instruments and objectives of these programs are very similar, but their approach towards R&D-intensive FDI is different. The Spanish government strongly supports corporate R&D in general, but lacks a differentiated strategy towards R&D-intensive FDI. Within the battery of target indicators included in the

Spanish Ingenio 2010, there is none specific to the R&D activity of foreign affiliates, i.e. there is no segmentation of business R&D targets according to the ownership of the firm. In the words of Salvador Barberá, former Secretary of State for Scientific and Technology Policy of the Spanish Government (2004-2006): "*Unfortunately, promoting the R&D activity of foreign multinational affiliates is not an important part of the industrial or innovation policy debate in Spain, although promoting innovation in general has become a much more important priority in recent years*" (interview by author, August 2006). The policy emphasis in Spain seems to be more tilted towards promoting outward rather than inward FDI and its government has often been criticized for its policies in support of national champions (e.g. The Economist, 2006, 2007; Willman, 2007)⁶.

In contrast, foreign multinationals are a central part of Irish R&D policy, and the Irish Strategy for Science, Technology and Innovation contains differentiated targets for the R&D of foreign multinationals, such as:

- Business expenditure on R&D in foreign-owned companies to grow to 1.675 billion euro by 2013.
- Number of foreign affiliates with minimum scale R&D activity (in excess of 100,000 euro) to reach 520 by 2010.
- Number of foreign affiliates performing significant levels of R&D (in excess of 2 million euro) to reach 150 by 2010.

Industrial policy in Ireland is more sensitive to the importance of attracting R&D-intensive FDI than in Spain, which is a reflection of the differing importance of foreign-owned firms in the Irish and Spanish economies, and in particular in their national innovation systems. FDI has been the key driver of Ireland's economic boom during the last decades (Gray, 1997) and its inward FDI stock as a percentage of GDP is today among the highest in the world (UNCTAD, 2006). Spain, in contrast, was a very closed economy until the late nineteen sixties as a consequence of forty years of fascist dictatorship, although during the last two decades the country has integrated fully

⁶ A part of the Spanish government's strategy of building national champions consists in providing incentives to outward FDI. For example, Spanish law grants tax breaks to Spanish firms that acquire foreign companies (by allowing them to write-off goodwill against tax).

into the world economy and its FDI stock stands today close to the EU average.

The Spanish economy is clearly less reliant on foreign multinationals than the Irish, and this influences the importance attributed to inward FDI promotion. Ireland's IIA, the Industrial Development Agency (or IDA Ireland), was created in 1949 and today is recognized internationally as one of the most efficient IIAs in the world and as one of Ireland's most important economic institutions (Barry, 2006). In Spain, FDI promotion is mainly managed at the regional level, which is natural given that its size is roughly ten times that of Ireland and that it is composed of 17 regions with strong competencies in industrial and innovation policy. That said, a new national inward investment agency called INTERES was created in 2005. In any case, the joint budget of all inward investment agencies in Spain is lower than Ireland's despite the country's larger size.⁷

The higher importance of inward FDI in Ireland also translates into its national innovation system (see Table 3). More than two thirds of total business expenditure in Ireland and of the total patents registered in the US with an Irish inventor originate from subsidiaries of foreign-owned firms. In other words, foreign-owned subsidiaries have a dominant role in both the inputs and the outputs of the national innovation system. In Spain (and the EU on average) the role of foreign multinationals is also significant, but nationally-owned firms are dominant in the national innovation system.

In sum, Spain's larger size and decentralized political structure and Ireland's higher dependency on foreign multinationals determine a different approach to industrial policy in general and to the promotion of R&D-intensive FDI in particular. Even though we are focusing on intermediate EU countries, it becomes apparent that the internationalization of corporate R&D means different things to different countries and that there is not a unique strategy towards R&D-intensive FDI. This leads to

⁷ IDA Ireland has around 280 employees including its overseas offices, and its expenditure in 2005 was 150 million euro while INTERES had 20 employees in 2007 and an annual budget of around 3 million euro, and the biggest regional IIAs in Spain, Madrid and Catalonia, have 13 and 20 employees respectively (and refused to disclose their annual budget during our interview). Both Madrid and Catalonia have a higher population than Ireland. Madrid represents 52% of the Spanish inward FDI stock while Catalonia is host to 32%. The IIA of Catalonia was created in 1985 and was the first IIA in Spain. Madrid's was created in 1994. The next biggest recipient is the Basque Country, with around 7% of the inward stock (INTERES, 2006).

our first proposition, which might seem very obvious but still needs to be stressed in order to avoid the risks of a "one-size-fits-all" reasoning:

Proposition 1: Government strategies to attract inward R&D-intensive FDI differ across countries depending on their size, on their institutional profile, and on the relevance of existing foreign subsidiaries in the national innovation system.

A clear manifestation of the differences between Spain and Ireland appears in their approach towards incentives to R&D-intensive FDI. The Irish system is more flexible at offering tailored incentives to multinational enterprises, and its inward investment agency may negotiate incentives directly, while in Spain foreign multinationals that aim at receiving incentives are subject to the same procedures that apply to local firms, and its inward investment agencies only inform of the different incentives available but lack any control over the incentives themselves. According to Séamus Bannon, a manager of Forfás: *"Ireland has a different approach to a lot of European countries including Spain. We actually intervene in a more structured and focused way. Given our limited resources and the small size of the country, we think it is better to be discriminative as opposed to 'catholic' in terms of distributing incentives to R&D"* (interview by author, September 2006).

The Irish government created in 2002 a state agency to distribute R&D funding called Science Foundation Ireland (SFI). But, in addition, its inward investment agency, IDA Ireland, has wide powers to negotiate directly incentives with foreign investors. In fact, whilst most other countries separate this function for accountability reasons, IDA Ireland is among the few investment promotion agencies in the world that has control over incentives and can put an "offer on the table" to an investor even before it has committed to invest (Loewendahl, 2001). Financial incentives to R&D in Ireland are targeted, tailored to specific circumstances, and proactively aimed at "picking-up winners" in relevant clusters or platform technologies. In the words of Sean Dorgan, the CEO of IDA Ireland: *"We have a mentality of connecting with companies and doing whatever is necessary to have them build R&D activity here. This is an attribute which reflects the Irish way of doing things, which is more informal, and shows an ability to respond to a*

particular need in a customized way. We recognize that flair, and we want to continue that, but we need to support it with more systematic analysis, reflecting the more sophisticated part of the value chain where we are trying to position ourselves for investment,

and we also need strong governance arrangements that ensure that our systems have very high levels of integrity” (interview by author, January 2007).

Table 3
Relevance of foreign affiliates in national innovation systems

	R&D expenditure of foreign-owned subsidiaries (% of business expenditure in R&D), 2003 ⁽¹⁾	Patents with domestic inventor but foreign owner (% of total patents registered in USPTO), 2001-2005 ⁽²⁾
Spain	27.3	58.6
Ireland	72.1	70.8
EU-15 ⁽³⁾	30.8	50

Notes:

(1) Source: OECD-AFA Database.

(2) Source: Own calculations through patent counts in the US Patent and Trademark Office (www.uspto.gov), following the methodology proposed by Guellec and van Pottelsberghe (2001).

(3) The EU-15 figure is the arithmetic average for the member states. In the case of R&D expenditure Austria, Belgium, Denmark and Luxembourg are excluded because they are not covered in the OECD AFA Database. For other countries with no R&D figure available for 2003, the closest year available is used.

Adding on to that, Mark Keane, the acting director of SFI, notes that the Irish approach is characterized by speed and by close coordination between the agencies: *“When you try to promote industrial R&D it is very important to be quick, responsive, open, and to get the activity going as quickly as possible. Our intention is to upgrade the mandate of multinational enterprises here. We are trying to support them to get into R&D, even if it is a very small R&D activity, with the hope that it will grow with time. We have now helped a lot of foreign companies establish an R&D activity in Ireland, and we are seeing that once the affiliate has done some R&D, it finds it much easier to get into other R&D engagements. Another success factor is that we have partnered very closely with IDA Ireland, we are in the same building and very close to each other all the time, whereas in other countries the research funding body and the investment promotion agencies do not interact that much”* (interview by author, October 2006).

In Spain, in contrast, investment promotion agencies normally do not negotiate incentives directly, but rather inform of the different incentives available and of the different application processes and deadlines. At the national level, financial incentives to business R&D are managed mainly by CDTI (Spanish acronym

for “Center for Technological and Industrial Development”), a government agency created in 1976, and there is little coordination between CDTI and the inward investment agencies. CDTI makes no difference between indigenous firms and foreign controlled subsidiaries, and the application process is identical for both. However, starting in mid-2007 the Spanish national FDI promotion agency (INTERES) will also manage some funds to provide R&D incentives to foreign multinationals⁸.

Among the different types of financial incentives for R&D one of the most widely used today is the funding of research consortia to promote collaboration among different firms and between private firms and public universities or research centers. In Ireland these programs are called “Centres for Science, Engineering and Technology (CSETS)” and the first seven were established in 2003. In Spain, they are called CENIT (Spanish acronym for “National Strategic Consortia for Technological Research”) and the first consortia, seventeen in total, were established in 2006. In both cases, projects are selected based on a compe-

⁸ According to the managers of INTERES, the government has agreed that INTERES will manage a part of the EU Technology Fund for 2007-2013, specifically 16 out of the 2000 million euro expected to be received.

titive bidding process, and only domestically-located firms can apply (they are open to foreign multinationals as long as they have a subsidiary in the country already). The programs are designed to bring together small groups of private companies with similar research needs and assist their evolution as a network, forge a common purpose by identifying common research needs, and support specific research to meet these needs through industry-university collaboration. The Irish CSETS are managed by SFI, but IDA Ireland plays a critical role by encouraging foreign controlled subsidiaries to participate and by assisting them in creating links with academic expertise and other organizations. In Spain, however, there is no such “active courting” of foreign subsidiaries: investment promotion agencies do not get involved at all in CENITs, which are left to the sole management of CDTI. In general, CDTI does not approach companies either. In the words of Juan Carlos Fernández of CDTI, “*we do not attempt to push demand but rather to respond to it*” (interview by author, October 2006).

The participation of foreign multinationals in these programs is significantly different. In Ireland all principal industrial partners are foreign controlled subsidiaries⁹, whereas in Spain only one out of the sixteen¹⁰. Moreover, in Ireland 67% of all participant firms in CSETS are foreign subsidiaries (in line with the proportion of business R&D performed by foreign subsidiaries) whereas in Spain just 6% (well below the relative weight of foreign subsidiaries in business R&D) (see Table 4). The low participation of foreign firms in Spain has also been documented in broader empirical studies (Herrera and Heijs, 2006). The high participation of foreign firms in Ireland may reflect an inadequate development of indigenous firms but part of the reason for Ireland’s success at involving foreign controlled subsidiaries is to be attributed to the proactive role of IDA Ireland.

With regard to fiscal incentives, it is interesting to note how Spain and Ireland are following markedly different paths: the Irish government did not use to provide fiscal incen-

tives but started doing so just a few years ago, whereas the Spanish government provides one of the most favorable tax treatments to R&D but has recently announced its plan to phase it out in a few years. Among developed countries, Spain has one of the most favorable tax regimes towards R&D expenditure (OECD, 2003), the main features of which are a tax credit of 30% for R&D expenditures and an additional 20% for labor costs of full-time researchers and for R&D work subcontracted to universities or public research centers. This fiscal credit was established in 1995 and was further enhanced through different regulations. However, in 2006 the Spanish Government announced a change in the corporate tax regulations whereby the tax credit for R&D would be gradually eliminated in the context of a wider reform comprising a reduction of the general corporate tax rate from the current 35% to 30% over two years. In addition, it was decided to introduce a new incentive consisting on a 40% reduction of social security charges of research employees¹¹. Altogether, the generous tax incentives to R&D continue being an important advantage of Spain as an R&D location, even though critics claim it is too complicated and should be simplified.

Ireland, in contrast, offers below-average fiscal incentives to R&D (OECD, 2003), but the situation substantially improved since a 20% tax credit for incremental R&D was introduced in 2004. However, many voices in Ireland claim the tax credit should be more generous and, in particular, that it should be on the full amount rather than incremental over a base (e.g. American Chamber of Commerce Ireland, 2006). This discussion about the use of fiscal and financial incentives in Spain and Ireland is a good example of how governments with similar objectives end up structuring their support packages to R&D-intensive FDI in different ways. Spain stands out internationally for its generous fiscal incentives to R&D while Ireland stands out for its proactive and flexible use of financial incentives. Another marked difference between Spain and Ireland appears in the different level of involvement of their inward investment agencies.

⁹ In particular, the main industrial partners of the first CSETS were: Intel, Hewlett Packard, Bell Labs, Medtronic Vascular, Procter & Gamble, GlaxoSmithKline (GSK), Analog Devices and Becton Dickinson.

¹⁰ The only foreign controlled subsidiary which acts as principal industrial partner in Spain is SEAT, a formerly Spanish car manufacturer now owned by Volkswagen.

¹¹ This incentive has the advantage of being easier to apply for and to control, and of being more focussed on creating employment in R&D. In addition, it is attractive not only for firms that declare a profit but also for firms with losses that do not pay corporate tax and thus do not benefit from a tax deduction.

Table 4
Participation of foreign subsidiaries in CENIT and CSETS

	CSETS – Ireland	CENIT – Spain
Number of funded projects	7	16
Number of participant firms	33	175
- indigenous firms	11 (33%)	165 (94%)
- foreign subsidiaries	22 (67%)	10 (6%)

SOURCES: www.sfi.ie and information provided by CDTI. Only refers to the first call for proposals (2006 for CENIT and 2003 for CSETS), and excludes subsequent calls that were awarded in 2007.

But there are other ways of improving the attractiveness of the country as an R&D location which may be more important than incentives to business R&D, such as developing the human capital base, building the research infrastructure or improving the patent regime (see Section 3.1.). As mentioned earlier, the Spanish and Irish governments are taking big steps to improve all these factors through their new national innovation strategies, and in fact they are using similar policy instruments. However, the Irish government is more concerned with the specific needs of foreign-owned multinational enterprises, a clear example of which is the involvement of its inward investment agency in building new research infrastructure in the country. For example, IDA Ireland approached Georgia Tech, a US university specialized in R&D and engineering, and offered it an incentive package which led to the creation of a small R&D centre in Ireland,

the first R&D unit of Georgia Tech outside the US. The project of IDA Ireland was to attract a foreign institution renowned in “translational research” (i.e. aimed at translating research results into commercial applications) that would contribute to the development of the national innovation system by interacting with domestic corporations (including the subsidiaries of foreign multinationals) and with public research centers, and by creating a connection with foreign sources of knowledge. In this process, IDA Ireland also approached other leading international R&D centers including Stanford Research and Fraunhofer (Source: interview with Sean Dorgan, CEO of IDA Ireland). The objective of IDA Ireland was to increase the attractiveness of Ireland as an R&D location for foreign multinationals, as was also the case when it financed a new institute for bioprocessing research and training (Box 2).

Box 2
The case of Ireland’s NIBRT

IDA Ireland dedicated over 70 million euro to the creation of the National Institute of Bioprocessing Research and Training (NIBRT), its more costly project in 2005. The ambition of NIBRT is to see the bioprocessing technology applied in a new way that will help to place Ireland at the centre of the European Pharmaceutical Industry. This is how the project was conceived, according to Sean Dorgan, the CEO of IDA Ireland: *“We identified bioprocessing as a target industry, and in the last few years Ireland has won some of the best investments globally in that industry, including Wyeth’s biopharmaceutical campus, recent investments by Johnson & Johnson, and also other companies. We saw it as a strategic industry and realized we needed a bioprocessing research and training center. Since there was no other government agency with such plans underway, we spoke with SFI and decided to do it ourselves, so we ran a competition among universities which was won by a consortium.”* IDA Ireland conceived the NIBRT from the start and still participates in its strategic management. This is a rare role for an investment promotion agency and a clear manifestation of how innovation policy and inward investment promotion are becoming more closely connected.

SOURCES: www.nibrt.ie, IDA Annual Report 2005 and interview with Sean Dorgan, January 2007.

We will now turn our attention to the second arm of the policy framework described in Section 3: inward investment promotion. In recent years, Spain and Ireland have changed their investment promotion discourse by placing a stronger emphasis on their attractiveness as locations for higher value added tasks, and in particular for R&D. Ireland now focuses its advertisements on the quality of its human capital, with slogans such as “knowledge is in our nature”, or “the Irish mind: the raw material used by the world’s top technology companies”. The Spanish government is also trying to change the perceptions of the international investment community towards the country. In the past, the promotion of Spain was mostly targeted to tourism, but now INTERES emphasizes that “Spain is much more than sun and sand”. The advertisements of the main regional investment promotion agencies (Madrid and Catalonia) now focus on R&D, innovation and the capacity to attract international talent.

That said, Ireland’s emphasis on building its international image as an R&D location is more evident. For example, the website of IDA Ireland has a very visible link in its home page towards a section titled “Research and Development in Ireland” and subtitled “Many leading global companies do research and development in Ireland”, which contains a detailed description of the most relevant R&D-intensive FDI projects, as well as an overview of the features of Ireland’s national innovation system and of the policies in place to improve it. In contrast, in the websites of Spanish IIAs there is no specific section dedicated to R&D and, although information on R&D is provided, it is mixed with news of other FDI projects and of the general investment climate in the country.

With regard to sectors, in the past years Ireland has mainly targeted the ICT, biotechnological and financial services sector. Spain has a wider approach, which reflects its bigger size, although in the new strategic plan approved by INTERES in 2007 the priority sectors are more narrowly defined as ICT, renewable energies, biotechnology and environmental technologies. In addition, governments have become aware that they need to move away from sector targeting towards targeting technology platforms and key disciplines. In the words of Eamonn Sheehy, a manager of IDA Ireland: “*We have realized that targeting is no longer only by sector, because there is a convergence*

across sectors (such as ICT-pharma-life sciences-medical devices). We are now working to identify areas of convergence, or platform technologies, where we can be competitive globally” (interview by author, October 2006).

In the past, both Spain and Ireland had very high unemployment rates, and so the interest of incoming FDI was measured primarily by the number of jobs created. This remains an important target today, but the attention is shifting to other indicators. Now that Ireland is at full-employment and Spain’s unemployment rate is around the EU average, both countries are becoming more interested in increasing the quality rather than the quantity of jobs created. This calls for new methods to evaluate and screen potential investment projects related to R&D. Along these lines, the Spanish inward investment agency, INTERES, has recently developed a Customer Relationships Management (CRM) model which rates incoming projects and existing investors according to four criteria, two quantitative and two qualitative. The quantitative are ‘financial investment’ and ‘number of employees’. The qualitative are ‘quality of jobs created’ and ‘functional focus of the project’. To determine the score in each criteria, a Likert-type scale from one to five is used. In ‘functional focus of the project’, the highest score (5) is assigned if it is an R&D center or a regional Headquarter. In ‘quality of employment’, the highest score (5) is assigned if most of the employees will be researchers and PhDs. The final rating is based on a weighted average of the four categories, and the qualitative indicators have a higher weight than the quantitative in the final rating, so R&D-intensive projects tend to be very highly rated.

In Ireland, IDA has recently introduced a detailed screening or checklist of all of the relevant factors for assessing the quality of an R&D proposal which will determine what the level of their support will be. IDA Ireland also rates the R&D activity of the existing base of multinational subsidiaries based on different qualitative measures, in order to determine the level of after-care service to offer. For the firms with the highest rankings, IDA Ireland performs a more detailed analysis of what could be done to enhance their R&D activities.

The rating obtained by incoming FDI projects determines the extent of support and services provided by the agencies, and may determine

the incentive package offered. But in practice screening systems are used in a flexible manner; they are useful in a first stage, but there is always room for the subjective evaluation of the managers of inward investment agencies. Sean Dorgan, CEO of IDA Ireland, explains that “*we use some measures but we always allow the intuitive factors, the gut instinct, and we have less formal assessment processes, even internally, than perhaps a lot of other promotion agencies, but we have very good critical assessment that is not strictly model-based*” (interview by author, January 2007). The challenge of creating new assessment methods is extensible to any other investment promotion agency targeting R&D-intensive FDI, which leads to the following general proposition:

Proposition 2: Targeting R&D-intensive FDI efficiently requires the development of new methods to evaluate and screen potential investment projects.

The review of a broad sample of recent R&D-intensive FDI projects in Spain and Ireland (see Annex 2) shows that the R&D centers of foreign multinationals are normally small units within existing subsidiaries, typically employing from 20 to 70 researchers, and rarely more than 200. With regard to the entry mode, it appears that the expansion of existing investors is the most common pathway, as agreed by all our interviewees. In effect, R&D-intensive FDI rarely emerges overnight but rather through an evolutionary process whereby the manufacturing or marketing units already located in the country get engaged in R&D after some time. Those initial, small scale, R&D activities are then further expanded with time if they meet expectations and demonstrate future potential. Greenfield R&D-intensive FDI only occurs occasionally, and in the case of transnational M&As promotion policies may not be justified, as argued in Section 2. In this sense, inward investment agencies are recommended to dedicate more resources to supporting the transition of existing foreign investors (after-care services) than to attracting greenfield R&D projects (pre-investment services).

In Spain, after-care services are provided at the regional level, although they have also become a priority for the national agency INTERES. According to Antonio Hernandez, a manager of INTERES, their priority now is “*to establish a unique and complete database of foreign subsidiaries operating in Spain and to establish policy analysis forums on different sectors and*

topics, in partnership with other government bodies, business associations and corporations” (interview by author, October 2006). In contrast, IDA Ireland has a long history of providing after-care services and went through those first phases over 30 years ago. Every foreign subsidiary has one direct project manager and close links have been forged with the managers of the subsidiaries in order to facilitate their expansion and upgrading in the country. As part of its after-care activities, IDA Ireland is making constant efforts to encourage existing foreign investors to get involved in R&D and to participate in national funding programs such as CSETS, as described earlier. In addition, IDA established in the 1980s the “National Linkage Program” to foster links between inward investors and the domestic industry, covering market research, monitoring and troubleshooting, business and organization development, etc. Moreover, in the early 2000s, IDA created a “Strategic Competitiveness Grant”, which comprises a small grant (up to 25,000 euro) to assist local managers of the multinational subsidiary to consider their strategic position in the corporation and what they might be able to offer the corporation in terms of moving to a higher value-added position and in particular to R&D. However, according to Sean Dorgan, CEO of IDA Ireland, this tool is not very significant and has only been used by a few companies.

It needs to be acknowledged that after-care services are costly and their efficiency is hard to measure, so it remains uncertain how to provide value-added services that justify their high cost. Services offered in the pre-investment phase (such as providing information and local contacts) are easier to standardize and become less costly to provide, while after-care services are tailored and require the involvement of highly qualified professionals whose work is hard to evaluate. This analysis of after-care leads to the following proposition which is extensible to other countries targeting R&D-intensive FDI:

Proposition 3: Since R&D-intensive FDI is normally an evolutionary process, it is advisable for inward investment agencies to emphasize after-care services. The drawback is that they are costly and their efficiency is hard to measure.

As argued in Section 3.2. another key role of IIAs is to provide policy advice to the government bodies responsible for formulating and

implementing innovation policy based the needs of R&D investors. IDA Ireland has a strong voice within the Irish public administration system which has been critical in guiding Ireland's institutional reforms towards the needs of multinational enterprises. Thanks to IDA Ireland, the country has become an institutional system configured to react rapidly to new trends in the global FDI landscape (Barry, 2006). In the words of Ned Costello, the responsible for science and technology within the Department of Enterprise, Trade and Employment: "*foreign investors in Ireland very often praise the responsiveness of our administrative system and the fact that it is relatively easy to get to the people who matter within the administrative structure. Right now, another strength is that we are very explicit about our interest to develop the R&D activities of foreign investors in Ireland*" (Interview by author, November 2006). Among IDA Ireland's most renowned success stories in its policy advocacy role are the modernization of the country's telecommunications infrastructure in the late 1970s and the improvement of the education system, for example through the establishment of the 'Manpower Consultative Committee' in the early 1980s, and of the 'Future Skills Needs' initiative during the 1990s (Barry, 2006).

In Spain, the new national investment promotion agency INTERES launched in March 2007 its "Plan to Optimize the Business Environment in Spain", intended to ascertain measures required to increase the attractiveness of the country for foreign investment. The plan entails close collaboration with the Economic Office of the President, the Ministry of Economy and Inland Revenue, the regional governments and other government departments such as the Foreign Trade and Investment Directorate. The compilation and analysis of information to identify Spain's strengths and weaknesses as an investment destination is complemented with a program of discussion forums comprising different policy areas and industries. Foreign companies set up in the country are heard, as are internationally successful Spanish companies and specialists in the field. During its first year of activity, INTERES has already played a policy advocacy role in some critical issues. For example, it has stressed to the government the need to reduce the waiting time to obtain a visa for foreign managers and to improve visa procedures for qualified workers. INTERES has also fought

against the government plans of eliminating the fiscal incentives to R&D described above.

In order to be able to provide specific advise to respond to the needs of R&D investors, IIAs need to develop a deep knowledge of their country's national innovation system, its strengths and weaknesses and the policies in place to improve it. For this reason, they need to increase their collaboration and cooperation with ministries of science and technology, with R&D state funding agencies and with other relevant actors of the national innovation system such as universities and public research centers. This applies to their policy advocacy role but also to investment services, including after-care. Targeting also requires a strong coordination between IIAs and other government agencies, since the goal is to prioritize projects which offer the greatest economic impact and which match the factor conditions within the region (Young et al., 1994).

In addition, as shown above, beyond dialogue and policy advocacy IIAs may also become directly involved in the implementation of innovation policy. For example, IDA Ireland has the capacity to negotiate directly R&D grants with foreign investors and, moreover, it has recently financed the creation of new research infrastructure in the country (see Box 2). In Spain the connection between inward FDI promotion and innovation policy is not as close as in Ireland, but the trend is also towards a higher involvement of IIAs in innovation policy. As an example, starting in 2007 INTERES will have funds available to provide grants directly to R&D-intensive FDI. Our last proposition serves to summarize these arguments:

Proposition 4: The connection between inward investment promotion and innovation policy that results from targeting R&D-intensive FDI requires closer dialogue and coordination mechanisms between the two policy areas.

As inward investment promotion becomes more connected with innovation policy, IIAs need to develop internally new skill-sets and capabilities, not only to understand the changing technological strategies of multinational enterprises but also to be able to evaluate the interest of incoming R&D-intensive FDI projects. In particular, the skill-sets of the employees of Ireland's and Spain's IIAs are changing to reflect the agencies' new focus in R&D.

Existing employees are being trained on innovation and R&D and, at the same time, new employees with a technological background are being hired¹².

Since the early 2000s IDA Ireland has taken important steps in this direction, like the setting up of a new department called the 'Education, Skills and Research Group' whose job is to understand and help to develop the Irish capabilities and expertise in R&D. IDA Ireland has also established a new Research Collaboration and Commercialization Group, focusing on ICT, biology, life sciences and medical technology. According to Sean Dorgan, CEO of IDA Ireland: "*in the last 2 or 3 years we have hired 4 technologists that have a good understanding and expertise in particular technologies but who also have an understanding of business needs and can talk knowledgably to our own staff and to companies. Four people cannot talk to all of our foreign companies; rather, their role is to provide support to our client-facing executives. Separately, the client-facing executives need to be more skilled in technology areas, and that is the reason why in recent years we have changed the job specifications for the standard project executive. With these changes we expect to hire a high level of expertise, but in general we do not hire a huge number of specialists, because specialists can be too narrowly focused*" (interview by author, January 2007).

5. Conclusion

Due to the increased internationalization of corporate R&D, foreign-controlled subsidiaries are now seen by most governments as a central actor of national innovation systems and as a catalyst for upgrading in global value chains. To benefit from the internationalization of corporate R&D as a host country, this paper has called for a closer connection between innovation policy and inward investment promotion. On the one hand, we recommend that innovation policy becomes more sensitive to the importance of foreign-controlled firms in national innovation systems. On the other hand, we advise inward investment agencies to get more involved in innovation policy and to develop the skills to evaluate R&D projects. In

addition, we have suggested that inward investment agencies targeting R&D-intensive FDI are to change the scope of the services they provide and to place more emphasis on after-care. A key challenge for governments is to set in place efficient coordination mechanisms between these two policy areas and to determine the right division of competences among the different actors involved, avoiding inefficient duplicities and overlaps. Another major challenge is to allocate efficiently their budgets across alternative policy instruments whose efficiency is highly uncertain ex ante and hard to evaluate ex post.

¹² In my visits to investment promotion agencies around Spain and Ireland, I have met some recently hired project managers with PhDs in biology or chemistry.

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Annex 1

List of interviewees

1. Policy-makers responsible for innovation policy and R&D funding agencies		
Salvador Barberá	Spain	Secretary of State for Scientific and Technology Policy, Ministry of Education and Science (2004-6).
Juan Carlos Fernández	Spain	Director of Promotion, Studies and Corporate Services, Center for Technological and Industrial Development (CDTI)
Ned Costello	Ireland	Assistant Secretary; Science, Technology and IP; Department of Enterprise, Trade and Employment
Mark Keane	Ireland	Director General (acting), Science Foundation Ireland (SFI)
Carol Gibbons	Ireland	Deputy to the Chief Science Adviser to the Government (currently in IDA Ireland)
Séamus Bannon	Ireland	Forfás, Manager of the Trade & Innovation Department
2. Managers of investment promotion agencies		
Sean Dorgan	Ireland	IDA Ireland, Chief Executive Officer
Eamonn Sheehy	Ireland	IDA Ireland, Business Development Manager
Antonio Hernandez	Spain	INTERES Invest in Spain, Chief Strategy Manager
Jesús Rubiera	Spain	INTERES Invest in Spain, Operations Directorate
Susana Tintoré	Spain	CIDEM, Catalonia Investment Agency, General Director
Vicente Orts	Spain	Promomadrid, Director of Investment Promotion
Irene Herrera	Spain	Promomadrid, Project Manager
3. Managers of multinational subsidiaries		
Mike Devane	Ireland	Managing Director of Alcatel-Lucent Ireland & Chair of the R&D group of the American Chamber of Commerce in Ireland
Una Halligan	Ireland	HP Ireland, Director for institutional relations
Ricardo Baeza-Yates	Spain	Yahoo!, Research Director for Spain and Chile
José María de la Sota	Spain	PwC Spain, Partner
4. Others		
Jonathan Young	Ireland	Political/Economic Section Chief, US Embassy
Mitchel Auerbach	Ireland	Senior Commercial Officer, US Embassy
Carlos Pérez Minguez	Spain	Senior International Trade Specialist, US Embassy
Santiago Antón Zunzunegui	Spain	Consular Officer, Spanish Ministry of Foreign Affairs

Annex 2

Examples of R&D-intensive FDI in Spain and Ireland

Ten examples from Ireland

- In 2006 Cisco announced it is to establish an R&D center, initially with around 50 employees.
- In 2005 Microsoft marked their 20th anniversary in Ireland with the opening of a new R&D centre, creating positions for 100 researchers and developers.
- Bristol Myers Squibb has expanded its R&D function rapidly in recent years and now employs 110 people in R&D
- Intel employs around 150 researchers in its two R&D centers in Ireland
- Schering-Plough carries out two R&D activities employing around 70 researchers.
- Genzyme Corporation established its first R&D unit in 2002 and further expanded its R&D mandate in 2005. The R&D staff is around 25.
- IBM invested an additional €22 million in 2004 to further develop its Irish R&D facility.
- In 2005 Xilinx announced it is to establish a Xilinx Research Labs at its European Headquarters in Ireland, the first of its kind outside the US.
- In 2005 Wyeth announced the creation of a Bio-therapeutic Drug Discovery Research Facility in University College Dublin, comprising 12 research scientists
- In 2006 GlaxoSmithKline created a new R&D unit in Ireland to research into gastrointestinal diseases, with a planned investment of almost 14 million euro.

SOURCES: IDA website (www.idaireland.com); IDA Annual Report 2005; Business Ireland (various numbers).

Ten examples from Spain

- Yahoo! opened its first R&D center outside the US in Spain in 2006, employing around 20 researchers.
- In 2006 Vodafone announced it will create a development centre for new services, with 25 professionals. This will be one of 6 centers of excellence that the multinational plans to establish in Europe.
- Merck, Sharpe & Dohm has a basic research center which invested over 20 million euro in R&D in 2004 and employed around 50 researchers.
- In 2006 Siemens announced the creation of an “R&D and Innovation Center” employing around 30 researchers, and of a new “Services and Technology Center”, employing 500 workers (not exclusively in R&D).
- Eli Lilly opened a new R&D center in 2003 dedicated to basic research on therapeutic molecules and employing 50 researchers.
- In 2007 Atos Origin created an R&D center for the development of telecommunications convergence services which will employ around 100 engineers
- In 2007 Sony announced an investment of almost 24 million euros in R&D at its Spanish Technology Center.
- In 2005 Microsoft announced it would create a new Technological Center to cover the Southern Europe region (the fourth Center of its kind in Europe)
- Intel created an R&D lab in 2002, in collaboration with the Polytechnic University of Catalonia, employing around 25 engineers.
- In February 2007 Sanofi-Aventis announced a 7 million Euros investment in a new basic R&D centre adjacent to its manufacturing plant.

SOURCES: INTERES website (www.investinspain.org); Cinco Días (various numbers); Expansión (various numbers)

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- WP 05/05 Leyra, Begoña: *Trabajo infantil femenino: Las niñas en las calles de la Ciudad de México.*
- WP 04/05 Álvarez, Isabel; Fonfría, Antonio; Marín Raquel: *The role of networking in the competitiveness profile of Spanish firms.*
- WP 03/05 Kausch, Kristina; Barreñada, Isaías: *Alliance of Civilizations. International Security and Cosmopolitan Democracy.*
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