

Government strategies to attract R&D-intensive FDI

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Published online: 24 April 2008
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Abstract Competition among countries to attract the research and development (R&D) activities of multinational enterprises has increased substantially during the last years, but the strategies used by governments in this competition still remain largely unexplored. This paper addresses that gap by proposing a taxonomy of the policy instruments available to stimulate inward R&D-intensive foreign direct investment (FDI) and presenting the results of a comparative case study of two EU countries: Spain and Ireland. The main conclusion is that an efficient promotion of R&D-intensive FDI calls for a closer connection between innovation policy and inward investment promotion, which are two policy areas that have traditionally operated rather separately. In addition, investment promotion 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 purely greenfield.

Keywords R&D · FDI · Multinational enterprises

JEL Classifications F23 · O33

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 (UNCTAD 2005). In addition, the existing literature supports the view that inward R&D-intensive FDI constitutes a powerful mechanism of international technology transfer and can enable host locations to integrate more advantageously in global value chains (Carlsson 2006).

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Hence, foreign-controlled subsidiaries are now seen by most governments as a central actor of national innovation systems, and the competition among regions and countries for internationally-mobile R&D has grown accordingly (Mudambi and Mudambi 2005; Zanatta et al. 2006). But while the existing literature is rich in discussing policies in an abstract level, it is weak at offering practical guidance regarding the strategic choices for policy makers and the implementation challenges (Borrás et al. 2007).

In response to this gap, the aim of this paper is twofold: (1) to identify the main policy instruments to stimulate inward R&D-intensive FDI, and (2) to explore how those policies are designed and implemented in practice. The first objective is addressed in Sects. 2 and 3, building on a literature review. Section 2 describes how multinational enterprises choose where to locate their offshore R&D, while Sect. 3 proposes a taxonomy of the main policy instruments available. The second objective is addressed in Sect. 4 through a comparative case study of two European Union (EU) countries: Spain and Ireland. These two countries make particularly interesting case studies for analyzing policies to attract R&D-intensive FDI.

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 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 was 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. This makes them especially relevant for the purposes of this research, since technological leaders 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 the economic agenda of low cost competitors often concentrates on other policy objectives such as reducing unemployment.

2 The location of R&D-intensive FDI

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 is a multi-faceted and heterogeneous process that depends on the nature of the R&D activities being 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). Unfortunately, existing statistics do not provide the breakdown of R&D-intensive FDI by mode of entry, but previous research suggests that R&D-intensive FDI occurs mainly through the expansion of existing subsidiaries rather than through greenfield investments, at least in developed countries (e.g. Erken et al. 2005; Mudambi and Mudambi 2005; UNCTAD 2005). In this case R&D-intensive FDI emerges from an evolutionary process whereby the manufacturing or marketing units already located in the country get engaged in R&D after some time, and later may increase the quality and scope of their R&D. R&D-intensive FDI may also occur through transnational M&As, but in this case the only short term effect for the host country is a change of ownership, and the potential benefits 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. Normally

governments are not interested in promoting this kind of FDI in R&D but, rather, may want to protect their “national champions” from foreign acquirers (Archibugi and Iammarino 1999).

The location of R&D-intensive FDI is driven by the interplay of a wide array of factors which may be classified into three groups: parent company strategies, subsidiary potential and host country characteristics (Birkinshaw 2003). Governments that aim at attracting R&D-intensive FDI may act upon each of those three groups of factors. Firstly, regarding the parent company strategies, although the technological strategies of foreign multinational enterprises are largely outside the scope of influence of national policies, governments should aim at understanding and monitoring them in order to evaluate how the country may fit into those strategies and to assess the impact of incoming FDI. Secondly, the factors related to the capabilities of subsidiaries are critical since R&D mandates are often assigned through a competitive bidding process involving several potentially-capable subsidiaries of the multinational firm already present in different countries. To succeed, multinational 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 in order to attain a sustainable competitiveness (Porter 1985; Teece 2000). Success is also driven by the upward influence of subsidiary managers and their capacity to “sell issues” to headquarters (Ling et al. 2005).

Thirdly, 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) as well as the dynamism of the national innovation system, that is, the degree of interaction and collaboration among firms, universities, research centers and industrial associations (Chaminade and Vang 2006). The size of the market is also a relevant attraction factor, especially for market-seeking (or asset-exploiting) R&D-intensive FDI, which aims at adapting the product or the production process to the local context (Mansfield et al. 1979). However, it is not so important 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). The cost of labor may also be a relevant location driver, especially for routine R&D activities. Other location factors suggested in the existing literature are the presence of 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 associated with creating and functioning an R&D enterprise.

3 A taxonomy of policy instruments

The attraction of R&D-intensive FDI can be conceptualized as a horizontal policy which stands in the intersection between innovation policy and inward investment promotion. 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 while 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 (see Table 1).

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

Policy area	Key policies
Innovation policy	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	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

3.1 Innovation policy to attract R&D-intensive FDI

The most straight-forward policy instrument is to provide public incentives to business R&D, which may be both fiscal and financial.¹ 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 tends to support that incentives are not a significant driver 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; Edler 2007; UNCTAD 2005; Cantwell and Mudambi 2000). In any case, there appears to be a widespread increase in the use by governments of incentives to corporate R&D, resulting in a “bidding contest” among competing locations (Mudambi 1999; OECD 2007).

Beyond incentives, the availability of world-class researchers is arguably 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 choose 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 also entails attracting and retaining talent. Thus the inflow of highly-skilled researchers from abroad should be facilitated, not only to enlarge the home talent base but also 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 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. Another advisable policy is to provide incentives for the return of national researchers located abroad, with the aim of transforming the original *brain drain* into *brain circulation* with benefits for the national innovation system.

¹ Fiscal incentives consist in a favourable tax treatment to R&D expenditure and may take the form of accelerated depreciation, tax credits, tax holidays or import tariff exemptions. 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 (Mudambi 1999; IBFD 2004).

In some cases, R&D-intensive FDI is 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 1997). A recent example in Spain is the case of Yahoo!, which opened an R&D center in Barcelona in 2006 thanks to the initiative of Professor Baeza-Yates, a renowned expert in search technology. Yahoo! was looking into opening an R&D unit in Europe, and Baeza-Yates approached the company and offered to lead the project in Barcelona. As explained by Baeza-Yates, in the end “*the most important factor behind location decisions are always people and networks of people*” (interview by author, April 2006). Thus, governments are advised 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, technology parks and scientific platforms in key technology areas. In particular, technology parks are attractive 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 their 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. In addition, governments should aim at promoting interaction and collaboration in the national innovation system. In particular, a key role for policies is to stimulate linkages of foreign subsidiaries with local firms, universities and research centers. A high degree of embeddedness in the national innovation system is required in order to maximize technology transfer (Rama 2007) and may also be critical for the sustainability and upgrading of foreign R&D investors already located in the country (Helmut and Nones 2007).

Another key role of policies is to develop a transparent and enforceable intellectual property (IP) rights regime, since from a headquarters 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). In order to stimulate the patenting activity of firms, an instrument used by several 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 should also 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 could be contacted by foreign investors.

3.2 Inward investment promotion

The previous section has highlighted some key instruments of innovation policy which are critical for attracting R&D-intensive FDI, but as argued earlier innovation policy should be complemented with a targeted promotion of R&D-intensive FDI by investment promotion agencies (IPA).² IPAs are usually part of, and financed by, the ministries of trade, economy

² Creating a specific agency to promote and facilitate inward FDI has become a standard practice worldwide, but some governments (especially at the regional or local level) do not establish an independent agency but rather a department or directorate within the existing bureaucracy (OECD 2006).

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

Country or region	Slogans used by IPAs
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	Technology for life
Catalonia (Spain)	Look at innovation. Look at Catalonia
Lower-Austria	Enjoy high performance in the high-tech business
Wallonia (Belgium)	The pursuit of technological excellence
Portugal	Technology from the heart
Czech Republic	The Skills Hub of Central Europe

Source: Websites of IPAs and advertisements published in various international business magazines and newspapers

or industry, and often have offices abroad and strong links to the ministries of foreign affairs to facilitate overseas investment promotion. Their aim is to increase the international visibility of the country through marketing campaigns and to facilitate the investment process by offering tailored services to foreign-owned multinational enterprises.

Several international organizations have developed guidelines to assist IPAs in developing successful FDI promotion strategies based on accumulated knowledge and international best practices,³ but the specific promotion strategies for R&D-related FDI remain still largely uncovered. In a survey conducted by UNCTAD (2005) comprising 84 national IPAs, 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 those promotion policies. Indeed, 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.

Beyond advertisement, a further step is to select prospective companies for tailored presentations, seminars and meetings. The identification of prospective 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 next step for IPAs 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 IPAs to have a short report or fact-sheet explaining the strengths of the country as a location for R&D, tailored to specific sectors or technologies, and which may be distributed through different

³ For example, the Policy Framework for Investment of the OECD, the Investment Promotion Toolkit of the World Bank/MIGA, or the Guidelines for Investment Promotion Agencies of UNIDO.

Table 3 Distribution of interviews by country and type of respondent

Type	Ireland	Spain
Policy-makers responsible for innovation policy and R&D funding agencies	4	2
Managers of investment promotion agencies	2	5
Managers of multinational subsidiaries	2	2
Embassy/Foreign Ministry officers	2	2
Total	10	11

channels. IPAs also prepare visits of potential investors to the country, including visits to R&D centers, universities, technology parks, and meetings with government officers and potential suppliers or partners.

In addition, IPAs may also deliver “after-care” services customized to the specific needs of foreign investors already present in the country. As argued in Sect. 2, the expansion of existing investors seems to be the most common entry mode of R&D-intensive FDI. If that is the case, then after-care services should be emphasized by IPAs, with the objective of assisting the existing stock of foreign-owned companies in their efforts to attract new R&D mandates. Another key role of IPAs is to provide policy advice to the government bodies responsible for formulating and implementing innovation policy based on the needs of R&D investors.

4 The cases of Spain and Ireland

This section analyzes the cases 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 21 senior executives from government ministries and agencies and from the subsidiaries of multinational enterprises.⁴ The interviews were conducted between July 2006 and March 2007, lasted 1 h on average, and comprised a balanced mix of representatives from Spain and Ireland from the different types of institutions addressed (see Table 3).

A major policy 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 for both governments, 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, shortly 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 markedly different.

⁴ The complete list of interviewees is available from the author upon request.

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. 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.

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 2007). Spain, in contrast, was a very closed economy until the late nineteen sixties as a consequence of 40 years of Franco’s dictatorship, although during the last two decades the country has integrated fully into the world economy and its FDI stock stands today close to the EU average. In any case, 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 IPA, the Industrial Development Agency (IDA), was created in 1949 and today is recognized internationally as one of the most efficient IPAs 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 IPA called INTERES was created in 2005. But the joint budget of all IPAs in Spain is lower than Ireland’s IDA despite Spain’s larger size.⁵

The higher importance of inward FDI in Ireland also translates into its national innovation system (see Table 4). More than two thirds of total business R&D 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 firms have a dominant role in both the inputs and 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. Although both are intermediate EU countries, it becomes apparent that there is not a unique strategy towards R&D-intensive FDI. This leads to the first proposition:

⁵ IDA Ireland has around 280 employees 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 IPAs in Spain, Madrid and Catalonia, have 13 and 20 employees, respectively (and refused to disclose their annual budget during our interview).

Table 4 Relevance of foreign subsidiaries in national innovation systems

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

^a Source: OECD-AFA Database

^b Source: Own calculations through patent counts in the US Patent and Trademark Office (<http://www.uspto.gov>), following the methodology proposed by Guellec and van Pottelsberghe de la Potterie (2001)

^c 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

Proposition 1 Government strategies to attract inward R&D-intensive FDI differ across countries depending on their size, institutional profile, level of technological development, 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. According to Séamus Bannon, a manager of Forfás: “Ireland has a different approach than 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). Financial incentives to R&D in Ireland are targeted, tailored to specific circumstances, and proactively aimed at “picking-up winners” in relevant technologies.

The Irish government created in 2002 a state agency to distribute R&D funding called Science Foundation Ireland (SFI). But, in addition, its IPA has wide powers to negotiate directly incentives with foreign investors even before they have committed to invest (Loewendahl 2001). Mark Keane, 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, 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 do not negotiate incentives directly, but rather inform of the different incentives available and of their application processes. 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 IPAs. CDTI makes no difference between indigenous firms and foreign controlled subsidiaries: foreign multinationals that aim at receiving incentives are subject to the same procedures that apply to local firms.

Table 5 Participation of foreign subsidiaries in CENIT and CSETS (2006)

	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: <http://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

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 “Centers 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 competitive bidding process, and only domestically-located firms can apply (they are open to foreign firms as long as they have a subsidiary in the country already). The Irish CSETS are managed by SFI, but IDA 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 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 subsidiaries, whereas in Spain only one out of the sixteen. Moreover, in Ireland 67% of all participant firms are foreign subsidiaries whereas in Spain just 6% (see Table 5).

With regard to fiscal incentives, Spain and Ireland are following markedly different paths: the Irish government did not previously provide fiscal incentives but started doing so just a few years ago, whereas the Spanish government provides generous fiscal incentives to R&D but has recently announced its plan to reduce them in a few years. Among developed countries, Spain has one of the most favorable tax regimes towards R&D expenditure in the world (OECD 2007), 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 35% to 30% over two years. In addition, it was decided to introduce a new incentive consisting in a 40% reduction of social security charges of research employees.⁶ Altogether, the generous tax incentives to R&D continue being an important advantage of Spain as an R&D location,

⁶ This incentive has the advantage of being easier to apply for and to control, and of being more focused on creating employment in R&D. In addition, it is attractive not only for firms that declare a profit but also for those with losses (which would not benefit from a tax deduction).

even though critics argue it is too complicated and should be simplified. Ireland, in contrast, offers below-average fiscal incentives to R&D (OECD 2007), although a 20% tax credit for incremental R&D was introduced in 2004. Still, critics claim that the tax credit should be more generous and that it should be on the full amount rather than incremental over a base.

This discussion about the use of incentives in Spain and Ireland has illustrated how governments with similar objectives may 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 IPAs.

But there are other ways of improving the attractiveness of the country as an R&D location besides providing incentives to business R&D, such as developing the human capital base, building the research infrastructure or improving the patent regime (see Sect. 3.1). The Spanish and Irish governments are taking big steps in those directions through their new national innovation strategies mentioned above, 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 IPA in building new research infrastructure in the country. This is a rare role for an IPA and a clear manifestation of how innovation policy and inward investment promotion are becoming more closely connected. For example, IDA approached Georgia Tech, a US university specialized in R&D and engineering, and offered it an incentive package which led to the creation in 2006 of a small R&D center in Ireland, the first R&D unit of Georgia Tech outside the US. The project of IDA was to attract a foreign institution 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 also approached other leading international R&D centers including Stanford Research and Fraunhofer.⁷

Another clear example is the case of the National Institute of Bioprocessing Research and Training (NIBRT), to which IDA dedicated 70 million euro; its most costly project in 2005. This is how the project was conceived, according to Sean Dorgan, the CEO of IDA: *“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.”* (interview by author, January 2007).

The reminder of this section focuses on the second arm of the policy framework described in Sect. 3.2: 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

⁷ Sources: interview with Sean Dorgan, CEO of IDA Ireland (January 2007) and Irish Ministry of Enterprise, Trade and Employment, Press Release (March 14, 2006).

of Spain was mostly targeted to tourism, but now INTERES emphasizes that “Spain is much more than sun and sand”. As of 2008, the central government’s main slogan in its international promotion efforts is “Spain: Technology for Life”, while the advertisements of the main regional investment promotion agencies now focus on R&D, innovation and the capacity to attract international talent.

With regard to sectors, in the past years Ireland has mainly targeted the information and communication technologies (ICT), biotechnological and financial services sectors. 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 should shift from sector targeting towards targeting technology platforms and key disciplines. In the words of Eamonn Sheehy, a manager of IDA: “*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 their efforts to attract R&D-intensive FDI efficiently, the IPAs of Spain and Ireland have developed new tools to evaluate and screen potential investment projects. In Spain, INTERES has recently developed a customer relationships management (CRM) model which rates incoming projects 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 headquarters. 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, which implies that R&D-intensive projects are 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 is used to determine the level of support. IDA 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 performs a more detailed analysis of what could be done to enhance their R&D activities. 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 IPAs. The challenge of creating new assessment methods also applies to any other IPA targeting R&D-intensive FDI, which leads to the second 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 recent investments in Spain and Ireland shows that the R&D centers of foreign multinationals are normally small units within existing subsidiaries, typically employing from 20 to 100 researchers, and rarely more than 200. The sample analyzed comprises the R&D-related investment projects announced by Irish and Spanish IPAs through their websites between 2002 and 2007, a total of 30 and 27 projects, respectively (see Table 6).⁸ Further searches about those companies in their own websites and in local

⁸ The complete list is available from the author upon request.

Table 6 Distribution of the sample by country and entry mode

	Ireland	Spain
Expansions	25	28
Greenfield	2	1
M&As	0	1
Total	27	30

business newspapers helped to gather additional information. The sample is not exhaustive, as there are other foreign companies that increased their R&D activity in the countries during those years. It is not fully reliable either, since it sometimes refers to official announcements which may later not be fully executed. Probably many new R&D activities linked to manufacturing are not covered and, in addition, the sample may underestimate M&A projects, since these are less likely to be advertised by IPAs.

According to this sample, the most common entry mode is clearly the expansion of existing investors, which supports the argument made in Sect. 2. In particular, there are only two cases of greenfield investments in the Irish sample and just one in the Spanish sample. In addition, all of the interviewees agreed that expansions are the most frequent entry mode. With regard to M&As, we found just one case although as explained above the sample may underestimate this entry mode. The implication for policies is that IPAs should 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). Along these lines, in October 2007 INTERES launched a newsletter specifically targeted to multinational enterprises already present in the country.

IDA has a longer history of providing after-care services and went through those first steps long time ago. In the 1980s IDA established 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. 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 is now 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, 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 subsidiaries to facilitate their upgrading.

But 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:

Proposition 3 Since R&D-intensive FDI is normally an evolutionary process, after-care services should be emphasized by investment promotion agencies. The drawback is that they are costly and their efficiency is hard to measure.

Another key role of IPAs is to provide policy advice to the government bodies responsible for formulating and implementing innovation policy based the needs of R&D investors. IDA 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 (Barry 2006). In the words of Ned Costello, the main 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). 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 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.

To respond to the needs of R&D investors, IPAs should develop a deep knowledge of their country's national innovation system, its strengths and weaknesses and the policies in place to improve it. Therefore, they are advised 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. In addition, as shown above, IPAs may also become directly involved in the implementation of innovation policy. For example, IDA has the capacity to negotiate directly R&D grants with foreign investors and has recently financed the creation of new research infrastructure in the country. 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 IPAs in innovation policy. The following 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, IPAs need new 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 IPAs 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 hired.

5 Conclusions

The key challenge for governments targeting R&D-intensive FDI is to design a coherent and efficient strategy that encompasses the right set of policy instruments given the

country's circumstances. But determining the correct policy mix is an extremely difficult task because it involves different government departments and agencies and because the relative efficiency of the different policies is uncertain *ex ante* and hard to evaluate *ex post*. That said, this paper has argued that an efficient promotion of R&D-intensive FDI calls for a closer connection between innovation policy and inward investment promotion.

IPAs can become a critical interface agent in national innovation systems by promoting the R&D activities of foreign-owned firms located in the country and their collaboration with local institutions, both private (firms of national ownership) and public (universities and public research centers). In this endeavor, they may provide a wide array of tailored services and incentives to foreign investors in R&D, but this paper has argued that it may be more efficient to focus on supporting the transition of existing foreign investors rather than on attracting greenfield R&D projects.

Acknowledgments Thanks are due to the Institute of International Integration Studies (IIIS) of Trinity College Dublin for hosting me as a visiting researcher while developing this paper, and especially to Frances Ruane for her invaluable contribution.

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