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International Integration and Mandates of Innovative Subsidiaries in Spain

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Abstract: In this paper, we develop a general framework that integrates diverse driving mechanisms of subsidiaries evolving towards competence creating mandates. The relevant process is the mutual relationship between innovation scope and the internationalization of the market as the primary channel for learning in subsidiaries, and how the opportunity for units to gain competence creating mandates is notably influenced by their embeddedness in export networks. This has direct implications for increasing the international channels for learning and indirectly in terms of the effectiveness of host country development. The framework is applied to a sample of firms in the Spanish economy, a country that does not hold a leading position economically and technologically inside the EU bloc, which suggests that the evidence may be suitable for generalizing the organization and network embeddedness of other catching-up economies.

Keywords: innovation, mandates, MNC, networks, subsidiaries

JEL classifications: D85, F23, O19, O23

1. Introduction

There is a growing branch of the literature that pays special attention to the strategies of multinational companies (MNCs) and, in particular, to the role of subsidiaries in building corporate competitive advantages on an international basis. In recent decades, research results in the field have permitted us to improve our understanding of subsidiary strategies and their mandates, moving forward the traditional basic foundations of internationalized companies. Accordingly, the international operations of foreign subsidiaries can be well understood as the action of specific units that integrate a global corporative network (Bartlett and Ghoshal, 1986) and beyond the traditional role of a subsidiary as a miniature-replica of its parent company abroad, subsidiaries can obtain differentiated mandates within the MNC (Jarillo and Martinez, 1990; Roth and Morrison, 1992; Birkinshaw, 1996). Some

subsidiaries acquire higher levels of autonomy from their parent company, and such greater independence helps to identify a kind of world mandate on behalf of their group, while others may become a more local implementer or local adaptor or a specialized contributor (Birkinshaw and Morrison, 1995; Birkinshaw, 1997; Nobel and Birkinshaw, 1998).

The construction of typologies and the definition of subsidiary categories have led to growing attention to knowledge sourcing, and the search for factors explaining how subsidiaries are assigned with R&D activities inside the entire corporation in a related literature (Gupta and Govindarajan, 1991; Feinberg and Gupta, 2004; Phene and Almeida, 2008). Focusing on the relationship between locations and the potential knowledge creation function of the subsidiary, some contributions have revealed that product development and the international strategic orientation of the units are some significant identifiers of the assignment of competence creating mandates (Cantwell, 1989, 1995; Cantwell and Mudambi, 2005; Cantwell and Piscitello, 2002, 2007).

The current conception of an MNC as an organization and its internationalization highlights the relevance of subsidiary technology-seeking strategies in foreign contexts. It is then plausible to accept that subsidiaries also have the function of knowledge searching abroad, it being expected that networking ability and knowledge flows would benefit not only themselves but also the entire corporation in the end (Cantwell, 1995; Barkema and Vermeulen, 1998; Frost, 2001; Piscitello, 2004; McCann and Mudambi, 2005; Singh, 2007; Mudambi, 2008). The generation of such effects can be conditioned by the features of the local contexts in host economies as well as by the level of subsidiary embeddedness within such contexts.

These arguments can be easily combined with a related line of economics literature that explores the more general basis for the impact of foreign firms on productivity and their role in the generation of spillovers to indigenous firms. Some important effects of MNCs in a host country, beyond those on employment and value added creation, are those linked to the possibilities of knowledge transfer to and from host economies, via the technological diffusion generated through supply chain relationships and the embodiment of technology in goods and services. Other effects are noticeable in terms of increases in competition due to the presence of foreign-owned firms and in particular, to their superior technological capabilities, the role of demonstration effects, the enhancement of productive and technical practices through vertical linkages, as well as the transmission of managerial practices facilitated by the greater mobility of highly skilled labour (Rugman and Doh, 2008). Various contributions further agree that these effects tend to be geographically localized and bounded by the conditions and the level of absorptive capabilities in host productive systems.

However, such external effects and subsidiary impacts in host locations are still a controversial topic and the empirical evidence on their determinants show inconclusive results, revealing notable differences among countries (Kokko, 1992; Blomström and Kokko, 1998; Perez, 1998; Aitken and Harrison, 1999; Damijan *et al*., 2003; Meyer, 2004; Álvarez and Molero, 2005; Girma, 2005; Driffield and Love, 2007). In addition, only some recent contributions incorporate the heterogeneity of subsidiaries in the study of knowledge spillovers generation (Marin and Bell, 2006; Marin and Costa, 2009; Smeets, 2008; Cantwell and Smeets, 2009). Hence, there are some opportunity windows for new research about the role of subsidiary mandates in specific national contexts such as those of catching-up economies – in particular, taking into account the relevance of subsidiaries' innovation scope and their international integration in both senses, corporate and geographical.

Here we try to develop a general framework departing from an evolutionary conception of subsidiary-mandates that combines the innovation and internationalization drivers of such mandates with their effects on firm performance. This is achieved by delving deeply into the distinction between *competence creating* (CC) and *competence exploiting* (CE) categorization of subsidiaries through the analysis of the extent of their product development for both host and international markets. We show that as subsidiaries evolve towards CC mandates, there is a shift in their primary channel of learning from the domestic host economy to wider international markets. Under the assumption of the role of national boundaries and local specificities, which arguments are supported by the evidence on the importance of national contexts in the literature on MNCs and innovation (Cantwell and Piscitello, 2002; Cantwell and Molero, 2003), domestic embeddedness can be expected to be dominant at first glance, but the engagement of subsidiaries in the international network coordinated by their parent company in the home country is also increasingly important as subsidiaries gain world market responsibilities, although these two processes are not necessarily mutually exclusive. In other words, the international involvement of the subsidiary and how its own network becomes more internationalized will broaden the learning channels for the subsidiary. We apply this general framework to firm level data in Spain, trying to provide some fresh empirical evidence about the specialization of subsidiaries and the development of their capabilities in particular contexts characterized by non-large markets and non-highly advanced innovation systems. Subsidiaries that build capabilities within such environments can become centres of excellence located in national economies that do not belong to the technological frontier, but which countries are still involved in international integration processes. This is the case of Spain in the European Union (EU) regional bloc.

The inferences that can be drawn from our paper may have some more general theoretical and empirical implications. Our contribution to previous literature addresses the potential relationship between innovation scope and the primary channel of learning, this channel being in the case of CE subsidiaries the host country and in the case of CC subsidiaries the home country and other foreign economies. In each of the two processes, the relevant idea is that subsidiaries are giving and taking network contributions because of their interactions with other entities. For CC units, larger contributions can be expected from the subsidiary to the international corporate group and also to other parts of the company network. This implies a two-way process of engagement that provides benefits to the subsidiaries from the network and from the subsidiary as an active participant to other actors in the relevant network as well. In this way, the implication of such two-way relationships is network embeddedness, which structure of embeddedness defines the different potential channels for learning for any subsidiary as well as for the corporate group.

The paper is structured as follows. In the next section, we present the theoretical framework that embraces the development of our research questions. Section 3 is devoted to the data source and its description. In section 4, we present the research method and the empirical models. Section 5 is devoted to the discussion of results and section 6 contains some concluding remarks and basic implications.

2. Theory and Research Questions

One of the general premises found in the related theoretical background is the unique role that subsidiaries may have for the development of MNC competitive advantages and how their strategies respond to the features of local environments (Bartlett and Ghoshal, 1998). An important conceptual development in the MNC literature of recent decades has been the generalized agreement on the relevance of subsidiary level capabilities in several activities of the value chain, such as exports and innovation functions, and how subsidiaries may acquire various mandates (Birkinshaw, 1996, 1997). This aspect brings us to the continuing discussion about the dichotomy of subsidiary centralization and autonomy (Young and Tavares, 2004) and to the current understanding of the strategy and structure of the MNC linked to the emergence of a hierarchical organizational form that claims a network approach beyond the traditional hierarchical conception (Hedlund, 1986; Anderson and Forsgren, 1996; Birkinshaw and Hood, 1998; Cantwell, 2009).

In a diverse range of subsidiary typologies, it is possible to identify in the literature, differences between local and international adaptors as

well as international creator, the latter demarcated by higher levels of embeddedness and stronger internally and externally oriented networks of relationships (Birkinshaw and Morrison, 1995; Nobel and Birkinshaw, 1998; Andersson *et al*., 2002). In addition, the analysis of subsidiary strategies inside corporate groups has shown that their decision to internationalize is generally conditioned by the level of integration with their parent companies (Jarillo and Martínez, 1990). These authors observed, in their study of Spanish subsidiaries, the reinforcement of the international strategies of those firms that are becoming more "integrated" within the corporation. In a related vain, Gupta and Govindarajan (1991) provided a model in which subsidiaries were categorized on the basis of knowledge flows to and from the rest of the corporation. In a sense, embeddedness and integration become two key concepts for a better understanding of subsidiaries. Then, the implications of subsidiaries' roles and strategies have become a complex research topic and besides the prolific notion of mandate, a tractable definition is provided by Birkinshaw (1996) as the subsidiary responsibilities for businesses or elements of businesses that extend beyond its own national market. This offers a conception of "subsidiary mandates as a broadly defined form of specialization" (Birkinshaw, 1996: 471).

Regarding the relationship with innovation, empirical evidence on the impact of R&D independence has not yet confirmed the existence of a clear influence of such R&D autonomy on subsidiary mandates (Roth and Morrison, 1992). Findings from the study of external and internal factors explaining the assignment of R&D responsibilities to foreign subsidiaries show that the assigned role enables them to transfer technology from the home country to foreign units and also to become a new source of knowledge for the entire corporation (Feinberg and Gupta, 2004). Moreover, subsidiaries could generate some kind of specific capabilities that make them better able to absorb knowledge abroad and to translate it into innovation results at home (Phene and Almeida, 2008), and this would make more plausible the resemblance between competence creating and technology-seeking strategies.

Subsidiary innovation builds upon ideas taken from both home and host countries and this would define a relevant interplay between innovation strategy, technical capabilities and its "membership" in the local knowledge sharing community (Frost, 2001). Therefore, the technical embeddedness of subsidiaries refers to the interdependences of firms in terms of their product and process development and the different sources of scientific and technological knowledge (Von Hippel, 1988; Andersson *et al*., 2002) since the features of host economies may affect the scale and complexity of the competence development. In fact, the internationalization of R&D in those MNCs performing technologically creative activities outside their home country would respond at least partially to their capacity to access scientific

and technical knowledge in host locations (Nobel and Birkinshaw, 1998). In particular, foreign firms are keen to become centres of excellence in those host environments where they benefit from a high level of local science and technology (S&T), as was demonstrated in an analysis based on patents by Cantwell and Piscitello (2007) for the European context, such subsidiary development being more likely in those regions which are more advanced in S&T, with better and more consolidated infrastructures.

Overall, subsidiaries are parts of an international network and their global nature can be conditioned by various factors identified in the literature: first, by the acquisition of competences from the MNC (Young and Tavares, 2004); second, by the access to R&D in the global network that constitutes a stimulating source of knowledge for overseas firms (Jarrillo and Martinez, 1990; Nobel and Birkinshaw, 1998); and third, by the evolution of subsidiaries towards their own greater international orientation through the role of exports from their host country (Roth and Morrison, 1992; Birkinshaw and Morrison, 1995; Cantwell and Mudambi, 2005; Filatotchev *et al*., 2008). These premises are not mutually exclusive means by which subsidiary competences can evolve, taking it beyond a high level of unidirectional dependence on the rest of the corporate group to which it belongs. Moreover, subsidiary market orientation and embeddedness in host environments permits a new consideration of the geographical context, including not only the recipient national territory but also the broader regional blocs, especially in those small countries – most of the European – in the EU, consistent with Rugman's argument that MNCs are regional in character (Rugman and Doh, 2008).

In accordance with the suggestions of Cantwell and Mudambi (2005), two dimensions can be seriously considered in the analysis of the competence-creating status of subsidiaries that we utilize in this paper – the extent of the innovation scope (knowledge creation and diffusion) and the internationalization of subsidiaries. We are assuming that subsidiary types (CC and CE) are closely related to both the configuration of internal and external networks (the dependence on the relationships inside the MNC group and the level of embeddedness), the extent of knowledge flows and their channels for learning. Then, the presence of a CC mandate can be defined by the combination of some conditions that are subsidiary-specific: one is related to the existence of new product development in a subsidiary (the fact that firms carry out innovation in products) and the other relates to the international market orientation of the subsidiary (which is reflected in its level of export intensity). It can be thought that the latter is conditioned not only by market relationships but also by the wider set of relationships with other actors that units have in the home country and in other foreign countries as well.

In this paper we look at the continuum of innovation as a response to problem solving, exploring the evolutionary path of subsidiaries acquiring

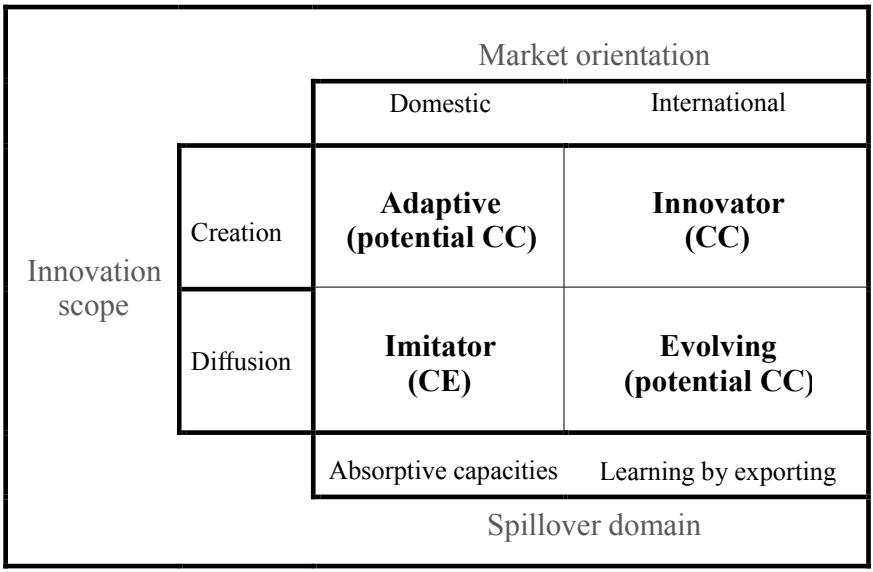
CC mandates, a process that can be captured through the combination of the innovation and imitation features of subsidiaries. This can contribute to establishing the differential aspects of subsidiaries which evolve towards competence creating mandates, it being possible to approach this qualitative aspect according to the degree of novelty and the scope of new product development achieved by a subsidiary, that is to say, whether it introduces novelty only in the sense of being new to the firm (imitation) or at the level of the global market (radical innovation). On the other hand, we consider the subsidiary network engagement by the range of R&D sourcing that can be found within the MNC group, through the formal acquisition of external R&D from local and international actors (other firms, universities, government institutions) but also through more informal relationships of cooperation inside the national system of innovation.

Therefore, the relevant process can be defined by a mutual relationship between innovation scope and the internationalization of the primary channel for learning in subsidiaries. We would expect a positive evolution of the subsidiary along these two dimensions together because if it is to become an active member of a network that is becoming more internationalized, its innovation scope must broaden. International business connections become even more crucial in the case of catching-up economies, since they facilitate their integration into larger and more global networks, with more important actors. It means that subsidiaries can play a critical role in making these international connections and by doing so subsidiaries evolve themselves. It is possible to observe the existence of at least four possible combinations in Figure 1, where these basic relationships can be seen in its simplest and intuitive version.

Beginning with the lower-left hand side of the figure, the cell corresponding to *Imitator* designates those subsidiaries mainly oriented to the domestic market and in which innovation consists of the introduction of products new for the firm, generating incremental positive effects at the firm level, but not in the general state of business in the market. This combination can be readily associated with subsidiaries with competence exploiting (CE) assignments. In this case, it can be expected that positive external effects in terms of performance would be linked to absorptive capacities. On the other side of the diagonal in the upper-right hand side is the cell of *Innovator* subsidiaries which introduce products radically new for the market, this denoting CC mandates also because the orientation of these subsidiaries to international markets tends to broaden their channel for learning to export networks beyond its international connections in its MNC group.

The possibilities illustrated in Figure 1 are not necessarily just black or white. There are also two kinds of hybrid positions. The cell *Evolving* corresponds to subsidiaries which are more likely to develop new products only

Figure 1: Types of Subsidiaries



Source: Authors.

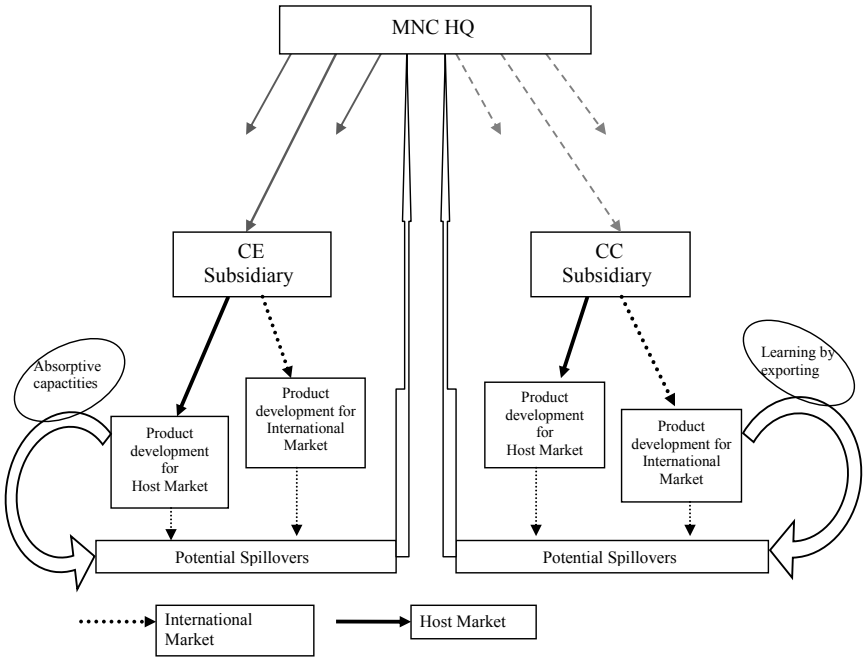
for the firm, but which market strategies already have a clear international orientation. However due to their limited current innovation status, these subsidiaries can be considered as potentially CC. In this case, international markets serve as an important potential channel for learning, not only due to sales to a greater diversity of customers, but also because of other relationships and interactions that subsidiaries entail with agents, partners and other entities in foreign countries. Finally, the cell *Adaptive* corresponds to those subsidiaries which are innovative in a more radical fashion. That is to say, they become potentially CC because they are able to introduce new products for the global market and not only new for the firm. While these subsidiaries have not yet developed an international orientation and so have not yet gained a CC mandate recognition within their MNC group, they may evolve towards this through the learning possibilities offered by their interactions with other key actors in the host economy. This process may evoke some sort of potential industry-wide benefits depending upon the general absorptive capacities of competitors in the host country.

This typology follows an evolutionary conception of subsidiaries that integrates both innovation and internationalization elements and which may be generalized to various local contexts. It may be that the transition from one type to another closer to competence creating mandates is not necessarily linear and there need be no supposition that one element of the process is

always likely to precede the other in some established sequential path. The achievement of a competence creating mandate can be influenced by both its own innovation experience and its scope for learning through external channels, depending on the relative importance of such channels for learning. That is to say, there is likely to be some form of co-evolution of increasing local innovation scope and the internationalization of subsidiary learning channels.

Then, considering this broader view of subsidiary dynamics that is inclusive of the potential learning channels, Figure 2 complements the general framework within which we develop our research questions. One important assumption is the prevalence of a combination of an international market orientation and autonomy in its own product development as characterising CC subsidiaries (Cantwell and Mudambi, 2005). It must be clarified that the discontinuous arrow in Figure 2 from the parent company towards CC subsidiaries is intended to represent the higher level of independence of the latter. On the other hand, technology-seeking strategies abroad need not always imply positive effects on subsidiary performance (Girma *et al*., 2008), but it is more plausible in those national contexts that are favourable for

Figure 2: Productivity Effects and Subsidiaries Mandate



Source: Authors.

reverse spillover effects (positive effects that run to subsidiaries from other actors in host locations).

At the same time, the existence of two-way spillovers between subsidiaries and indigenous firms would allow us to identify not only impacts of subsidiary presence on domestic firms, but also those created by the flows going back from the subsidiary to its entire corporation, due to bilateral flows from domestic units to foreign firms and vice versa (Sanna-Randaccio and Veuglers, 2007; Yang *et al*., 2008). CC mandates are generally associated with the function of knowledge sourcing abroad that is conditioned by both the S&T capabilities of the host country and domestic firm-specific capabilities, since these elements enhance the potential for valuable feedbacks to the parent company. In this line of thinking, the differences across countries (Singh, 2007) allow us to highlight the role of national systems of innovation in host economies for a better understanding of the nation-specific systematic differences on subsidiary practices and effects. Based on recent empirical evidence (Girma *et al*., 2008; Cantwell and Smeets, 2009), we study whether evolving subsidiaries with a clear international orientation are also likely to generate positive effects in subsidiary performance. We then adopt an analysis that integrates the evolution and effects of foreign firms depending upon the positioning of their local units in terms of the different subsidiary categories. Our contribution adds to approaches based on subsidiary-centred models (Marin and Bell, 2006; Marin and Costa, 2009) by including the specific role of subsidiaries still in a process of evolution towards competence creating mandates, and drawing attention to the importance of international channels of learning for these units.

Our empirical analysis is shaped by three research questions that are tested in specific empirical models as presented and discussed in the following sections.

The first research question relates to the importance for CC units of specific abilities in value-chain activities, such as R&D, accepting that these are not strictly independent of the activities carried out by the entire corporation. In particular, what is the relative importance of local R&D autonomy in subsidiary knowledge sourcing? (Q1). It can be expected that more R&D autonomous subsidiaries should be able to attain a higher level of innovation and they are more likely to achieve a leading position in their global network since their international orientation would reinforce their capacity to channel sources of new knowledge to others in the group.

The second question relates to the idea of learning through host countries. Which flows or local interactions are most effective for subsidiaries as a channel for learning? (Q2). The relationships that subsidiaries develop with local entities can be more or less formalized and may affect their innovation scope, the crucial issue being the degree of embeddedness in local networks.

It can be expected that more creative subsidiaries would show a higher level of integration within networks of the host system of innovation, possibly also in the innovation system of the wider regional bloc, which in the Spanish case refers to the broader EU context.

Finally, the third question is what are the main factors explaining the improvement of subsidiary performance when considering both their innovation scope and their international orientation? (Q3). It is expected that a higher international orientation of CC subsidiaries implies more complex relationships abroad and this would enlarge international channels of learning for these units. The justification is based on the ability of those subsidiaries to give and take from international networks, which differentiates the learning channels of these units from those of both other subsidiaries and domestic companies.

3. Data Source Description

The data set used in the empirical analysis comes from a survey of innovation in Spain, called the *Panel de Innovación Tecnológica* (PITEC) which is the result of merging two different ongoing Statistics, the Technological Innovation Survey and the Statistics about R&D Activities. This is a project that began in 2004, coordinated by the Spanish National Institute of Statistics (INE) with the final aim of improving the statistical information available on firms' innovation activities and making it more valuable for academic research. Nonetheless, this source of information has some limitations for the analysis of mandates, which we describe further in this section.

This secondary source of information provides data at the firm level, including some general economic data such as sales, number of employees and exports (among others), as well as some specific data referred to their innovation activities.[1] The sample was composed initially by two samples of firms which were included in the survey of year 2004, according to two census criteria: first, it included all firms with 200 or more employees and, second, it also included those firms that performed internal R&D expenditures in year 2003. These criteria were further enlarged, including also firms with less than 200 employees and also non-innovative firms in the sample. Although the project intends to build a balanced panel in coming years, in this paper we only use data corresponding to year 2005 to avoid comparability problems with the data published in the first year and also because at the time we started this empirical analysis more updated data were not yet complete, not available.

Regarding the definition of foreign firms in our dataset, the cutting off point is delimitated by the level of 50 per cent of foreign ownership in the firm. The set of foreign firms in the database is composed of 1,271

firms, although this number should be restricted according to the available information of the required variables of our interest in the empirical models, as we will discuss later on. Among the subsample of foreign subsidiaries, the majority are European firms while those from outside the European region are mainly concentrated in three main home countries: the USA, Japan and Canada. These non-European subsidiaries sum to a total of 235 firms.

Following existing knowledge about this topic that lends support to our assumptions, two of the critical aspects that serve to characterize subsidiaries which achieve a CC mandate are their competences in product development and their international orientation. As has been largely confirmed in the literature, the assignment of competence creating mandates is associated with high levels of subsidiary autonomy in international markets and with a greater capacity to export even to the home market. Therefore, we assume that the subsidiary export variable is especially relevant for the purpose of our empirical analysis. When measuring exports we are assuming the involvement of subsidiaries not only in sales abroad, but also in wider connections with other actors that engage with the export network, and that an increasing internationalization of units enhances their capabilities for learning. In relation to this, there is an important data limitation due to the methodology and definition of the *Exports* variable in PITEC, as follows. In the original questionnaire, exports are defined as the sales that firms perform outside the European market. Hence, the variable "domestic sales" refers to both firms' sales in the Spanish market as well as in the entire European one. For this reason and in order to explore the characteristics of CC subsidiaries by assuming the importance of their international market orientation, our sample is restricted to a target group of foreign firms that consists only of non-European subsidiaries, that is, 235 firms originating from the US, Japan and Canada.

The existence of relevant differences between domestic firms and foreign subsidiaries and also within the latter group in the Spanish context can be noticed in basic data description. In particular, according to some descriptive statistics for productivity and export intensity,[2] foreign firms show higher levels of productivity than do domestic firms[3] – as in Table A1 in the Appendix. Moreover, non-European subsidiaries (the group defined by subsidiaries from the US, Japan and Canada) show a slightly higher level of productivity on average, in terms of a higher median as well as a higher mean value, while this is the least dispersed group of firms – according to the value of the standard deviation across firms. Another feature that illustrates the differences of non-European subsidiaries is their export superiority. This set of firms shows also higher mean and median values of exports than do domestic firms or European subsidiaries, and this further helps us to justify the target group in the exploratory analysis that follows.

The notion of CC subsidiaries that we adopt here is defined by the export intensity of non-European subsidiaries[4] (measured as the weight of exports as the share of total sales in firm *i*) and their product innovation performance in the last two years (the introduction of a new product between *t-2* and *t*). Thus, CC is defined as a 0-1 binary variable that takes a value of 1 in the case of positive values of export intensity and product innovation for firm *i*. We are considering innovation in a broad sense, taking into account those subsidiaries introducing new products into the market (radical innovation) and those developing products that are new to the firm (imitation of other firms), as we explain in the next section.

4. Method and Empirical Models

In a first step, we try to disentangle the factors that would be associated with the probability of being a competence creating subsidiary in Spain. Then, our dependent variable PROB-CC_{it} is the probability that a non-European subsidiary has a CC mandate. This is a 0-1 variable, which equals 1 if subsidiary *i* exports at time *t* and has introduced new products either for the firm (*evolving CC*) or for the market (*innovator CC*) between *t-2* and *t*. The definition of the dependent variable and the factors included in the estimation are defined according to the theory and the evidence reviewed in Section 2 of this paper.

We adopt a general model in which the binary variable y_j (CC) can have only two possible outcomes (1 and 0) and there is a vector of regressors X that can influence the outcome y_j, of the following form:

$$P\,[y_j = 1 \mid x_j] = \Phi\,(x_j\,\beta)$$

where P is the probability and Φ is the probit function – the standard cumulative normal distribution while the parameters β are estimated by maximum likelihood.

The vector X of regressors is composed by three main blocks of variables that represent subsidiary autonomy, embeddedness and other conditioning factors. The first block includes R&D level of subsidiary autonomy as well as the subsidiary dependence on the corporation, including internal R&D, patents and the acquisition of R&D from the corporative group. The second block captures the importance of the subsidiary embeddedness in the innovation system, according to the acquisition of external R&D, the cooperation for innovation that subsidiary keeps with other entities of the system and the access to EU public funds for R&D projects. Finally, other factors are incorporated taking the form of several control variables revealing structural features, such as the subsidiary sales in the domestic market, the size of

the subsidiaries and the industry to which they belong, and their degree of technological complexity constituting an additional control included in the estimation.[5]

Then, the general specification of the model that we wish to fit would adopt the following form:

$$\text{PR (CC subsidiary} = 1) = \Phi\,(\beta_0 + \beta_1\, Sub\_autonomy + \beta_2\, Sub\_embeddedness + \beta_3\, Sub\_others)$$

The details about the variables included in each regressor block as well as the estimation results are presented in subsection 5.1.

The second step of our empirical analysis consists of an estimation of productivity effects and the aim is to establish whether potentially differential impacts on firm performance exist – in particular, whether there are performance differences between domestic units, EU and non-European subsidiaries. In line with the related literature, our point of departure is the regression of the level of productivity (TFP) on various measures of R&D, innovation activities and exports, controlling for a number of other covariates. To do so, we proceed in two steps.

First, we estimate a Cobb-Douglas production function that adopts the following general form:

$$\ln y_{it} = \beta_0 + \beta_l \ln l_{it} + \beta_k \ln k_{it} + \ln TFP_{it} \qquad (1)$$

where y is output and l, k, are labour and capital inputs to obtain total factor productivity (TFP) estimates as residual for firm i in time t.

The next stage involves regressing (log) TFP on productivity effects among firms, to explore the existence of differences between firms. With this TFP analysis we try to capture the impact that absorptive capacities and other knowledge sourcing have on firm performance as well as the impact of other influential factors related to learning. An additional dimension included in the analysis is that related to export intensity, in order to examine whether the potential "learning by exporting" effect may differ between domestic and foreign units.

This specification allows us to observe whether firm performance may vary according to the level of absorptive capacities (ABSORCAP). Our expectation is that those units with higher levels of ABSORCAP are better able to capture external effects that affect positively their performance. This aspect is largely grounded in the literature and adopted from the micro concept formulated by Cohen and Levinthal (1989) where absorptive capacities can be understood as the possibilities of organizations to benefit from those innovations carried out externally to the firms that would define a second phase of learning. We also expect that those firms with a clearer international

orientation may benefit from international channels for learning and these are related to their export intensity (EXP). Such subsidiaries also have the necessary technological ability to assimilate new knowledge from their global corporate network as well as from different foreign markets, and this may be disseminated into the host country from foreign subsidiaries (Andersson *et al*., 2002; Cantwell and Mudambi, 2005; Cantwell and Smeets, 2009). For this reason, we include as additional controls the access to external R&D, the human qualification efforts of firms, the effects of innovation and imitation effects as well as patents and EU R&D funding in order to capture other variables that may be correlated with TFP.

The fully specified equation is the following:

$$\ln (\mathrm{TFP}_{it}) = \gamma_0 \, ABSORCAP_{it} + \gamma_1 \, EXP_{it} + \gamma_2 \, X_{it} + \varepsilon_{it} \qquad (2)$$

where *ABSORCAP* is the measure of absorptive capacity of firm *i*, *EXP* is the measure of the export variable and *X* is the vector of control variables.

We follow Girma (2005) and Girma *et al*. (2008) using relative measures of the absorptive capacity concept and defining it as the relative position of a firm's R&D effort in relation to the maximum value in the industry *j* – a high level of absorptive capacities could indicate technological proximity with industry leaders and a higher potential for capturing the benefits from the generation of external effects in performance. We compute them as follows:

$$ABSORCAP_{ij} = \ln (RD_i / RD\mathrm{max}_j) \qquad (3)$$

where $RD\mathrm{max}j$ is the maximum RD level (a kind of so-called technological frontier) in the industry of firm *i*.

Regarding the factors integrating the vector *X*, the independent variables are: first, the R&D acquired by firms externally to their boundaries, an aspect that is complementary to internal R&D. Second, the training efforts of firms which provide higher levels of qualification for their employees, and so improve human capital that could serve as a conduit to productivity increases. Third, one important question is to capture innovation and imitation as two sides of a continuing process of problem solving in firms. Hence, the degree of novelty of innovation of products may be "new for the market" that can be thought of as radical innovation while imitation is supposed to exist when the introduction of an innovation is merely "new for the firm". Moreover, patents capture the appropriation of knowledge generated by the firm and can also be understood as an indicator of technological performance as well. Fourth, in the context of supranational integration such as in the case of the EU, the support provided by public funds to R&D is also included as a potential source for productivity effects. The results of the estimation are discussed in subsection 5.2.[6]

5. Discussion of the Results

In this section, we discuss the results of the *probit* model estimations to analyze the factors affecting the subisidiaries mandates as well as the results from the productivity estimations.

5.1 Analysis of CC Subsidiaries

According to the different types of subsidiaries outlined in Figure 1, we proceed with the analysis of the most influential factors in two models: one refers to the *Evolving* type and the other to the *Innovator* type. The general specification of the probit model was presented in section 4 of this paper and it has been applied to the sample of non-European subsidiaries. The definition of variables introduced in the model can be found in Table 1 and estimation results in Table 2.

Table 1: Variables Definition Used in the Probit Analysis

Variable	Definition
INTRD	Intensity of internal R&D: R&D expenditures as share of total sales
PAT	Patent applicant (0-1 variable which equals 1 if a subsidiary does obtain at least one patent between time (t-2) and t)
RDGROUP	R&D acquired to the Corporation: R&D expenditures acquired to the corporation group as share of total firm R&D expenditures
EXTRD	External R&D. Intensity of external R&D: external R&D services as share of total sales
COOPERA	Cooperation with other agents for innovation (0-1 variable which equals 1 if a subsidiary does cooperate with other agents of the national system to innovate between time (t-2) and t)
RDEU	R&D Funded by EU: R&D expenditures funded by the EU funds, as share of total firm R&D expenditures
MKSHARE	Market share: firm sales in the domestic and EU markets as share of the sales in the industry
SIZE	Number of employees (0-1 variable which equals 1 if the firm have 200 employees or higher)
HIGHTECH	High Technology firm (0-1 variable which equals 1 if a subsidiary belongs to high-tech industries)

Note: Non-dichotomic variables were introduced in *log* in the estimation.
Source: Authors.

Table 2: Probit Results

	Evolving CC		Innovator CC	
	(1)	(2)	(3)	(4)
INTRD Intensity of internal R&D	-0.0081 (0.0093)	-0.0080 (0.0087)	0.0086** (0.0040)	0.0091** (0.0041)
PAT Patents application	0.1415* (0.0787)	0.1125 (0.0888)	0.061 (0.105)	0.026 (0.107)
RDGROUP R&D acquired to the Corporation	0.0063*** (0.0033)	0.0063*** (0.0030)	0.0070** (0.0040)	0.0079** (0.0043)
EXTRD Intensity of external R&D	-0.0387 (0.0332)	-0.0339 (0.0322)	-0.3460 (0.0331)	-0.0330 (0.0345)
COOPERA Cooperation with other agents	0.0491 (0.0835)	0.0663 (0.0843)	0.1513*** (0.0751)	0.1738** (0.0896)
RDEU R&D Funded by the EU	-0.0014 (0.0020)	-0.0083 (0.0020)	0.0031 (0.0026)	0.0024 (0.0026)
MKSHARE Domestic market share	0.0099 (0.0097)	0.0068 (0.0098)	-0.0147 (0.0133)	-0.0190* (0.0116)
SIZE Number of employees 200 or more	-0.2271*** (0.0996)	-0.2079*** (0.0973)	0.0130 (0.1101)	0.0445 (0.1115)
INDUST Industrial sector	0.1388 (0.1458)	0.0935 (0.1420)	0.2901* (0.1553)	0.2524* (0.1555)
HIGHTECH High tech industries		0.1362* (0.0808)		0.1852** (0.0984)
Wald chi²	22.04	24.58	20.24	23.75
Prob > chi²	0.008	0.006	0.007	0.008
Log pseudo-likelihood	-75.43	-74.16	-77.83	-76.07
Pseudo R²	0.13	0.14	0.12	0.14
N	128	128	128	128
Obs. P	0.59	0.59	0.45	0.45
Pred. P	0.74	0.75	0.60	0.61

Notes: – Marginal effects dF/dx are reported for discrete change of being a CC subsidiary $P(y_i = 1)$.
– St. Error in parentheses. Significance levels at 1%***; 5%**; 10%*.
Source: Authors.

The estimated coefficients reveal that the integration of units in the MNC is important for *Evolving* CC subsidiaries that show R&D dependence on the corporation group (column 1, Table 2). Technological performance – by patents as the proxy – is also a factor associated with the probability of being an *Evolving* CC while internal R&D is not significant. The second block of variables reveals that embeddeness in the host system does not seem to be a feature characterizing these subsidiaries in the Spanish context, nor the involvement in the regional block. Regarding structural factors, we can see that a large size is not a factor enhancing the evolution of subsidiaries towards CC. On the contrary the sign of this coefficient is negative, while it is likely to find this type of subsidiary in those industries with a higher technological complexity, as revealed in the estimated coefficients of the model after controlling for high-tech industries. We found essentially the same pattern after introducing this control, although patents lose their significance (column 2, Table 2). These results suggest that the probability of being an evolving CC will be more associated with units belonging to industries with higher technological complexity, although it is likely that they do not develop new knowledge suitable for applying for patents.

On the other hand, it is observable in column 3 of Table 2 that the probability of being an *Innovator* CC subsidiary is positively related to internal R&D performance and to the international integration in the corporate group for R&D sourcing. It is also confirmed that the cooperation with other agents for innovation is a factor enhancing the probability of being a specialized subsidiary in Spain while external R&D and the participation of subsidiaries in R&D funding programmes of the EU do not seem to be important for them. With regard to the control variables, industry gets a significant coefficient and the international orientation of the CC subsidiaries is especially revealing after controlling for high-tech industries (column 4, Table 2), there being a negative relationship with the orientation of these subsidiaries to the domestic (regional) market – measured as the sales of the firms in both national and European markets. In fact, the role of the domestic market negatively affects the probability of getting such a mandate, an observation that is consistent with other findings in the related literature on competence creating subsidiaries reviewed in section 2 of this paper.

Overall, these results allow us to answer our research question Q1. R&D dependence on the parent company is important for both CE and CC types of subsidiaries, indicating the role of the international integration of subsidiaries in their corporate network. On the other hand, the innovation strategies of those subsidiaries with creative mandates are more linked to higher levels of R&D autonomy. Internal R&D matters for the evolution of subsidiaries since the ability to develop knowledge and carry out core activities internally

– such as R&D – is a differentiated aspect of CC subsidiaries, while patents are not revealed as a significant aspect for CC subsidiaries in this catching-up economy.

As long as the integration in the corporate group is a common aspect for both *Evolving* and *Innovator* CC, embeddedness seems to be a differential factor that is more linked to those subsidiaries with higher capabilities in product development, allowing them to be an innovator in a more radical fashion. The participation of *Innovator* CC subsidiaries in networks of cooperation with other actors inside the local system of innovation is an aspect that clearly enhances the specialization of non-European subsidiaries. Their strategies are also conditioned by the industrial specialization of locations since the results are affected by the technological complexity of industries, an aspect that is confirmed by the significant and positive sign of the high-tech control variable. An answer to our research question Q2 according to our estimations has implications related to the importance of cooperation with other actors in the national innovation system as a domestic channel for learning. This is a clear differential aspect that especially matters for CC subsidiaries while the acquisition of external R&D and the EU policy of R&D finding are not significant aspects.

5.2 Effects on Firms' Performance

A first test of productivity effects has been performed for the total sample of firms in Spain – the definition of the variables can be found in Table 3 while the results are reported in Table 4, column (1). The estimated coefficients give support to the positive impact of ABSORCAP in firms' performance. The sign and significance of the coefficients for innovation variables allow us to affirm the relevance of both the ability of firms to introduce new products for the market, adopting a radical innovation perspective, but also considering imitation that implies the introduction of new products only for the firm spectrum. Although to a lesser extent, the European public support for R&D seems to be another element that could positively affect firms' performance. However, external R&D, efforts in human capital and patents are not significant factors.

The results of the estimation only for the set of European subsidiaries are reported in column (2) of Table 4, revealing that ABSORCAP loses its significance for this subsample of firms. Nonetheless, the two variables related to both innovation and imitation behaviours are revealed to be positive and significant and also the support to R&D provided by the EU funds. These results denote the existence of differentiated aspects affecting TFP in European subsidiaries in Spain and the relevance that being innovative has for improving their performance.

On the other hand, in column (3) of the same Table, we find the results of the estimation for the sample of non-European subsidiaries. The results in the case of these subsidiaries show that the possibilities for productivity changes are notably concentrated in two main regressors, the absorptive capacities and the ability to imitate. Then, the positive indirect effects in performance for those subsidiaries evolving towards CC mandates in catching-up economies come to underline the relative importance of their capabilities for knowledge absorption and the relevance of the innovation scope that may differ according to subsidiaries' types.

To expand on this issue, we proceed to control for the international orientation of the companies, taking export intensity of firms as a way to approach their specialization. After controlling for firms export intensity, in column (4) of Table 4 it can be seen that for the complete sample, effects on performance seem to be conditioned again by the relevance of the role of both innovation effects and the higher proximity to the technological frontier of firms (ABSORCAP variable). The estimation results from the subsample of European companies (in column 5) reveal an even clearer pattern that is

Table 3: Variables Definition, Used in the TFP Estimation

Variables	Definition
TFP	Total factor productivity
ABSORCAP	Absorptive capacities. Ratio of internal R&D expenditures of firm i /max R&D in the industry j
EXTRD	External R&D. Intensity of external R&D: external R&D services as share of total sales
HUMANK	Human capital effort: Intensity of training expenditures (as share of sales)
INNOVA	Innovation effect. % of sales modified by the introduction of innovations new to the market between time (t-2) and t
IMITA	Imitation effect. % of sales modified by the introduction of innovations new to the firm between time (t-2) and t
PATNUM	Number of patent applications between time (t-2) and t
RDEU	R&D Funded by EU: R&D expenditures funded by the EU funds, as share of total firm R&D expenditures
EXPROP	Export intensity. Exports as share of sales

Note: The variables were introduced in *log* in the estimation.
Source: Authors.

Table 4: Productivity Effects (TFP Regressions)

	Total Sample	European Subsidiaries	Non European Subsidiaries	Total Sample	European Subsidiaries	Non European Subsidiaries
	(1)	(2)	(3)	(4)	(5)	(6)
Const.	-.041**	0.036	-0.101	-0.044**	0.042	-0.039**
	(0.01)	(0.745)	(0.541)	(0.01)	(0.179)	(0.081)
ABSORCAP	0.070***	0.010	0.187**	0.071***	-0.016	0.220**
	(0.000)	(0.704)	(0.033)	(0.000)	(0.541)	(0.013)
EXTRD	-0.044	-0.023	0.006	-0.004	-0.023	-0.003
	(0.729)	(0.362)	(0.937)	(0.729)	(0.360)	(0.973)
HUMANK	-0.001	-0.003	-0.012	-0.001	-0.003	-0.022
	(0.931)	(0.892)	(0.879)	(0.927)	(0.907)	(0.772)
INNOVA	0.078***	0.475***	0.119	0.078***	0.474***	0.136
	(0.000)	(0.000)	(0.166)	(0.000)	(0.000)	(0.113)
IMITA	0.283***	0.510***	0.459***	0.283	0.510***	0.455***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
PATNUM	0.011	0.029	-0.091	0.011	0.036	-0.107
	(0.331)	(0.250)	(0.284)	(0.328)	(0.157)	(0.206)
RDEU	0.055***	0.082***	0.113	0.055	0.083***	0.095
	(0.00)	(0.001)	(0.152)	(0.000)	(0.001)	(0.228)
EXPROP				-0.002	-0.053**	0.149***
				(0.890)	(0.036)	(0.040)
Adj. R^2	0.120	0.649	0.292	0.119	0.651	0.353
Model stability, *F p-value*	134.939**	149.395***	81.950***	118.058***	132.079***	77.870***
Num. observations	6942	564	123	6942	564	123
DW	1.870	1.865	1.975	1.808	1.873	2.063

Note: *** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$.
Source: Authors.

defined by innovation in a broad sense (including also imitative behaviour) as well as, to a lesser extent, by the participation of these companies in R&D funding programmes of the EU. The export intensity is significant and shows a negative sign. This result may be related to the higher importance of subsidiaries' interactions with home countries with regard to other foreign markets and it would be supported by the orientation of European subsidiaries toward the host market and the regional EU bloc.

Finally, the estimation for non-European subsidiaries – column (6) in Table 4 – reveals a different configuration of TFP determinants. The effects on performance for these firms seem to be driven by both the absorptive capacities and the ability to innovate in these subsidiaries, being observable the potential for learning by exporting effect. Export intensity shows a significant coefficient that would denote the possible positive impact that international markets may have in the performance of these units. The latter results allow us to answer our research question Q3 as follows. First, subsidiary performance benefits from the combination of both high absorptive capacities and higher capacities for imitation. It is precisely that combination which can be more relevant for catching-up contexts since R&D is associated with positive impacts on productivity. Second, the international market orientation of CC subsidiaries has a positive effect on subsidiary performance through the internationalization of primary learning channels. It can be said that for this channel to be effective it must incorporate the home country – of the parent company – because those interactions would mean integration within the international network while if this does not happen the network will be more peripheral and the reverse effects on host contexts diminished. Finally, although we do not know about the impact on other agents outside the host country – since we could not specifically test this – we can speculate that some positive effects may even transcend to the general corporate network.

6. Concluding Remarks

Our analysis has focused on the role of innovation and internationalization in MNC subsidiaries with mandates. To affirm that innovation is a significant factor enhancing the possibilities of a location to become a centre of excellence is not a new idea. On the contrary, this premise finds broad support in the related literature. Nonetheless, the inclusion of a broader conception of innovation and the consideration of international channels of learning in the path of evolving subsidiary towards CC mandates in catching-up economies may open new opportunities to get some inferences with theoretical and empirical implications. It also provides a useful framework to proceed with further research. Our contribution addresses the importance

of the relationship between innovation and subsidiaries network involvement as a mechanism enhancing learning. The key idea is that the interaction of the innovation scope and the internationalization of the primary channel for learning co-evolve with one another and the path toward competence creating mandates is affected by the interplay of the effects derived from absorptive capacities in domestic channels for learning and integration in broader international networks.

According to our findings, subsidiaries with mandates in the Spanish context show a higher international integration and a positive relationship with embeddedness, this being more likely for high-tech firms. In a positive direction, there is a co-evolution of the innovation scope and the interactions of subsidiaries within the national system of innovation in host economies. The evidence confirms the role of R&D autonomy and the scarce relevance of public R&D programmes, such as the actions of European R&D funding. Our results appear to pinpoint the importance of developing R&D internal capabilities as well as the links with the broad local context. We can satisfactorily affirm the arguments found in the literature about the international integration of subsidiaries and MNC assignments. Therefore, the specificity of locations as well as the level of technological development in host economies must be seen as influential factors in the trade-off between location specificities, the subsidiary evolving path towards becoming a CC unit and the impacts in internal and external networks. This would allow us to extend this framework to the definition of potential implications for the capacity building process in catching-up economies to narrow the gap with the technological frontier.

Finally, from the empirical results of this paper some implications – for practitioners and managers – may be derived concerning the role of creation and/or improvement of local capabilities that would make more attractive to firms the engagement in more intense collaboration with entities in the local host context. First, implications related to the role of internal R&D activities as a means of increasing the likelihood of achieving CC mandates that would increase the possibility of a location becoming a centre of excellence. Second, the opportunities that higher level of involvement in local networks of actors may have for subsidiaries to become creative units inside the entire corporation. The participation in such networks can be conceived as a facilitator of greater integration into the host system of innovation, an outcome that may be clearly broadening learning channels.

Appendix

Table A1: Data Description

		Log Productivity (sales by employee)	Log Export Intensity (export as share of total sales)
Spanish Firms	Mean	5.023	1.051
	Median	5.031	1.229
	St. Dev.	0.446	0.757
	N	10,242	4,823
EU Subsidiaries	Mean	5.302	1.209
	Median	5.286	1.453
	St. Dev.	0.421	0.802
	N	1,036	759
Non_EU Subsidiaries	Mean	5.398	1.302
	Median	5.359	1.463
	St. Dev.	0.387	0.657
	N	225	177
Total	Mean	5.055	1.080
	Median	5.062	1.256
	St. Dev.	0.452	0.763
	N	11,503	5,759

Source: Authors.

Table A2: High and Medium-high Technology Industries

NACE-Rev. 1	
	High and Med-high Technology Manuf. Industries
24	Chemicals and chemical products
29	Machinery and equipment n.e.c.
30	Office Machinery and computers
31	Electrical machinery and apparatus n.e.c.
32	Radio, television and communication equipment
33	Medical, precision and optical instruments
34	Motor vehicles, trailers and semi-trailers
35	Other transport equipment
	High Tech Services
64	Post and telecommunications
72	Computer and related activities

Source: Authors.

Table A3: Correlation Matrix (Probit Estimations)

	PAT	RDGROUP	EXTRD	COOPERA	RDEU	MKSHARE	SIZE	HIGTECH	EXPROP	INNOVA	IMITA
INTRD	-0.007	-0.042	0.498**	-0.064	0.036	-0.054	-0.198**	0.097	0.156*	-0.007	-0.037
Intensity of internal R&D	0.909	0.636	0.000	0.388	0.585	0.412	0.002	0.138	0.016	0.916	0.575
PAT	1.000	0.000	-0.014	0.151*	-0.013	0.098	0.071	0.140*	0.038	0.093	0.183**
Patents applications		0.997	0.834	0.042	0.840	0.212	0.275	0.032	0.566	0.153	0.005
RDGROUP		1.000	0.172	0.064	-0.019	0.122	0.115	0.018	0.042	0.266**	0.513**
Intensity R&D acquired to MNC group			0.053	0.473	0.833	0.169	0.196	0.840	0.636	0.002	0.000
EXTRD			1.000	0.049	0.051	-0.005	-0.133*	0.028	0.056	0.083	0.061
Intensity of external R&D				0.511	0.437	0.944	0.041	0.665	0.394	0.206	0.355
COOPERA				1.000	-0.041	-0.065	0.110	-0.026	0.091	0.226**	0.126
Cooperation with other agents for innovation					0.579	0.380	0.140	0.725	0.222	0.002	0.091
RDEU					1.000	0.074	0.078	0.092	0.001	0.057	-0.004
Intensity of R&D funded by EU						0.260	0.235	0.159	0.982	0.387	0.949
MKSHARE						1.000	0.292**	0.186**	-0.052	0.019	0.380**
Domestic market share							0.000	0.004	0.430	0.103	0.000
SIZE							1.000	-0.136*	-0.130*	0.155*	0.152*
Number of Employees 200 or higher								0.037	0.046	0.018	0.020
HIGHTECH								1.000	0.245**	0.091	0.135*
High and medium-high									0.000	0.165	0.039
EXPROP									1.000	-0.043	0.026
Export propensity										0.509	0.689
INNOVA										1.000	0.352**
Innovation, new for the market											0.000
IMITA											1.000
Innovation, new for the firm											

Note: ** 0.01; * 0.05.
Source: Authors.

Table A4: Correlation Matrix (TFP Estimations)

	EXTRD	HUMANK	INNOVA	IMITA	PATNUM	RDEU	EXPROP
ABSORCAP	0.011	-0.191**	0.113**	0.117**	0.127**	0.070**	0.150*
Absorptive capacities	0.256	0.000	0.000	0.000	0.000	0.000	0.000
EXTRD	1.000	-0.056*	-0.003	-0.003	-0.037**	0.025*	0.080
Intensity of external R&D		0.028	0.717	0.711	0.000	0.038	0.412
HUMANK		1.000	-0.062*	-0.078**	-0.150**	-0.064**	-0.220*
Human capital, training efforts			0.016	0.002	0.000	0.002	0.017
INNOVA			1.000	0.426**	0.052**	0.046**	0.200*
Innovation, new for the market				0.000	0.000	0.000	0.028
IMITA				1.000	0.016	0.009	0.022*
Innovation, new for the firm					0.080	0.465	0.017
PATNUM					1.000	0.005	0.074**
Number of patent applications						0.686	0.000
RDEU						1.000	0.136**
Intensity of R&D funded by EU (RD_EU)							0.000
EXPROP							1.000

Note: ** 0.01; * 0.05.
Source: Authors.

Notes

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1. The database is constructed based on the annual Spanish responses to the *Community Innovation Survey* (CIS), a survey that was specifically designed to analyze R&D and other innovating activities following the recommendations of the Oslo Manual (OECD, 2005). The survey is targeted to industrial companies whose main economic activity corresponds to sections C, D, and E of NACE 93, except non-industrial companies because of the imprecision of methodological marking in the international context by other branches of activity.
2. For description purposes, productivity is measured as the share of sales per employee and export intensity is the measure of foreign sales (exports) as share of total firm sales – the two variables are taken in log.
3. Results achieved by García-Vega and Huergo (2010) in the analysis of technology transfer by MNCs reveal also the superiority of foreign firms over domestic firms in labour productivity while the former do not seem to be more innovative.
4. To justify this choice, ANOVAs were performed to confirm that non-European subsidiaries and the other two groups of firms (domestic firms and European subsidiaries) were significantly different in their export intensity. *F*-values of 2.77 and 2.51, respectively, were attained, both significant at $p < 0.001$ confirming the validity of the choice.
5. The control has been made taking into account both high and medium-high technological activities according to OECD criteria of the technological content of industries. For precise details, see Table A2 in the Appendix.
6. The lack of data availability does not allow us to estimate panel data in order to capture the dynamic effect in TFP, an aspect that we will be covering in further analysis. As already indicated, data corresponding to year 2005 were used and the estimation method is OLS.

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