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US Market Entry by Spanish Pharmaceutical Firms*

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Abstract

This work explores the factors that spur firms' propensity to enter in international markets. Among the whole population of Spanish firms active in the pharmaceutical sector (over the period 1995-2004), we identify those firms that have entered the US market by assessing whether they have filed at least a trademark in the US Patents and Trademarks Office. By means of a hazard model, we empirically estimate which firm's characteristics affect the probability of entry in the US market in a given year. Results show that technological capabilities (breadth and depth of firms' patent base), and the firm's cost structure explain the entry in the US market with a branded product. Moreover, our evidence shows that entry strategies based on differentiation advantage (technological diversification) and strategies based on cost advantage (scale economies) are exclusive and do not mix well each other.

Keywords: *Foreign market entry; Internationalization strategies; Firm-Specific Advantages; Competitive Advantage; Innovation and R&D; Patents; Trademarks.*
JEL Classification: F23

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1. Introduction

Firms that are able to access international markets not only are in the position of gaining higher profits but they also have the chance to reduce the firm's market risk by averaging complementary economic trends in different countries. Moreover, imitation of international leaders and the participation into a global network of knowledge creation allow the firm to increase its knowledge base with beneficial increasing returns in learning. Especially in knowledge based industries, the firm internationalization propensity is pivotal.

Nevertheless, not all the firms succeed in entering foreign markets. This work investigates which firms' characteristics increase the internationalization propensity in a global high-tech market such as the pharmaceuticals. The choice of the pharmaceutical industry represents a natural test bed for our hypotheses. Not only the pharmaceutical industry is a very internationalized, global industry, but it also shows a higher propensity than other industries to disperse innovative activity across borders (Pearce, 1989; McKelvey et al., 2004). Furthermore, the features of the industry structure – characterized by few very large global companies, and a myriad of SMEs often acting as licensees of major leaders – reveals that cost factors and the possibility to exploit economies of scale determine the distribution of the competitive advantage across firms. Therefore, it is exactly in contexts like that of the pharmaceutical industry that the role of firms' technological capabilities and cost structure can be analyzed.

We focus on the whole population of Spanish firms active in the pharmaceutical sector, and we identify those that have entered the US market with a branded product. More specifically, for each firm we test the significance of factors like breadth and depth of firms' technological base (patent portfolio), and firms' cost structure. Our evidence shows that firms with higher diversified patent portfolios and that benefit of more intense cost efficiency show a higher probability of entry in a foreign market. Interestingly, we also analyze how the interaction between the two factors affects firms' entry decision, and we show that firms facing strong cost disadvantages can still increase their probability of entry by opting for a patent concentration strategy.

Our work proposes these claims on novelty. We propose a novel measure of internationalization, which is derived the analysis of trademarks filed at the US Patent and Trademark Office. For several reasons, this proxy is more flexible than traditional internationalization measures. It allows us to track not only internationalization strategies

based on the classical opening of a foreign subsidiary, but also lighter forms of international strategies based only on market penetration. In turn, our internationalization measure does not depend on the organizational form adopted to achieve such a goal.

Furthermore, we confirm that strategies pursuing technological diversification and cost advantage are basic to understand the international propensity in high tech markets. Moreover, we study the not linear relationship existing between the two.

The remaining of the paper is organized as follows. The next section focuses on the review of previous literature and formulates our main hypotheses. In Section 3 we describe the database used for the analysis and introduce the empirical methodology. In Section 4 we introduce the empirical analysis and present our main econometric results. Finally, Section 5 concludes.

2. Literature review and hypotheses

In studying firms' foreign market entry decisions, the economic and managerial literature has traditionally paid attention to two broad, interdependent issues. The first one concerns the means by which firms choose to operate in a particular market – that is the mode of entry (Woodcock et al., 1994; Madhok, 1997; Mascarenhas, 1997). The second relevant issue is the analysis of motivations that induce firms to enter a foreign market. According to this stream of literature, firms decide to enter a particular market either to exploit or to strengthen an advantage they already possess, or to create and develop a new one. The eclectic paradigm of international production sustains this approach (Dunning, 1993, 1997, 2000).

As stated by the eclectic paradigm, the propensity of a firm to engage in international expansion is strictly linked to the possession of one or more types of advantages, namely ownership, internalization, and localization advantages. We focus our attention on the ownership advantage (Lieberman and Montgomery, 1998; Narula, 1996; Narula and Dunning, 2000). Empirical evidence supports this view (Agarwal and Ramaswami, 1992; Makino et al., 2002).

Therefore, the ability to internationalize and succeed in foreign markets is a function of the internal capabilities of the firm (Autio et al., 2000; Zahra et al., 2000). Under this perspective, firms with superior capabilities create new knowledge that leads to the development of critical organizational capabilities and embedded routines. These

organizational capabilities could refer to the ability of achieving a production function of greater efficiency or to improved technological capabilities. Both could provide superior performance in the entry into foreign markets.

Thus, among internal capabilities that shape a firm's ownership advantage, we draw upon existing literature to identify three types of factors that have been shown to have effects on firms' internationalization decisions: innovative capabilities, scope economies, and cost efficiency. Below, we develop a set of hypotheses that link these factors to the probability of entry into foreign markets.

2.1 Innovative capabilities

Technological resources play a double role in driving a firm's multinational expansion (Tseng et al., 2007). On the one hand, firms move abroad to better exploit technologies developed in the home country. Indeed, technological resources can be replicated among several geographical markets without incurring the full costs of their development. In so doing, the firm gains the so-called "location specific advantage" (Dunning, 1993). Given the high fixed costs in R&D, international expansion increases the size of the final market of a R&D investment, fostering efficiency. On the other hand, firms involved in new foreign markets have to learn and adapt their product according to different customers' tastes. In this respect, a firm with stronger technological resources acquires a higher absorptive capacity of local knowledge (Cohen and Levinthal, 1990), and is placed in a better position to quickly respond to local feedbacks.

In one of the first studies that analyzed the relation between exports and innovation, Hirsch and Bijaoui (1985) considered the relationship between R&D expenditures and export behaviour for Israeli firms. They found that innovation confers some monopoly power to the owner of the innovation. As a result, the firm discriminates between the domestic and foreign markets. This is not true for non-innovating firms that are assumed to be price takers and, hence, have less incentive to export. In their empirical study, they found that innovating firms in a sector have a higher propensity to export than the sector average, and that lagged R&D expenditure is significant in explaining the rate of change of exports in a cross-section analysis.

Several papers have followed this line of research confirming the relation between innovation and export. Sterlacchini (1999) argues that a broader definition of innovation is

necessary to capture the full effect on exports. Even in non-R&D intensive industries innovation is an important determinant of small firm's export performance. Including the acquisition of innovative capital goods and design, engineering and pre-production development has been found to be relatively more important for these firms. Lefebvre et al. (1998), and Becchetti and Rossi (2000) both found that R&D intensity has no impact on the export propensity, but that other innovation indicators such as the percentage of employees with technical and scientific backgrounds and the presence of R&D collaborations with external partners have positive effects. Furthermore, Brouwer and Kleinknecht (1993) found a positive effect of R&D on export activity, but they emphasized that it is product – as opposed to total – R&D that is relevant for this effect. Similarly, Bernard and Jensen (1999, 2004) found that, for a large sample of American manufacturing plants, the introduction of new products significantly enhances the probability of exporting. In sum, we hypothesize:

Hypothesis 1. *The stronger a firm's innovative capabilities, the higher the likelihood of entry in foreign markets with branded products.*

2.2 Scope economies

Scope economies have been already recognized to be a determinant of early entry in foreign markets (Gaba et al., 2002). Indeed, firms with a broader product portfolio can profit from potential synergies among market segments and benefit of a wider possibility of choosing the most appropriate combination for the host country. Thus, scope economies allow firms to gain a differentiation competitive advantage (Porter, 1985), and to exploit that advantage in the foreign market (Kimura, 1989).

In innovation-based markets, in order to implement a differentiation strategy, firms need to possess superior competencies on a broader range of technological fields such to develop products better suited to the characteristics of the (new) market, thus reducing the risk of entering into it and increasing the ability to learn from it. Consequently, the breadth of a firm's product line is often associated to the breadth of the firm's technological portfolio. Therefore, technological diversification can be leveraged in the international arena in order to effectively exploit the firm's scope economies. The extension of activities into new fields of production and across a variety of geographical sites allows the firm to take advantage of and consolidate existing technological capabilities (Cantwell, 1995). In turn,

corporate internationalization and the diversification of technological activities are both ways of spreading the competence base of the firm and of acquiring new technological assets or sources of competitive advantage (Cantwell and Janne, 1999; Cantwell and Piscitello, 2000, 2002).

In a recent paper, Quintana-García and Benavides-Velasco (2008) show that, in a sample of US biotechnology firms, the magnitude of technological diversification is directly and positively associated to both exploitative and explorative innovative competences of firms. According to the authors, this empirical evidence suggests that a broader technological base helps firms in overcoming potential core rigidities and path dependencies, thus enhancing their capability to develop innovative solutions, especially towards directions unrelated to the firms' past activities. We argue that this greater innovative capability in diversified technological areas also helps firms in overcoming the difficulties related to processes of international expansion. Technologically diversified companies have more strategic options needed to face more complex international scenarios that, in different sectors and places, can offer different opportunities and limitations. They can benefit of a larger portfolio of technological competences that permit an effective utilization of new knowledge and a prompt commercial exploitation of technological opportunities in the moment and in the place in which such opportunities arise. Thus, we hypothesize:

Hypothesis 2. *The higher the diversification of a firm's technological portfolio (scope economies), the higher the likelihood of entry in foreign markets with branded products.*

2.3 Cost efficiency

Apart from leveraging economies of scope in order to create a differentiation advantage, firms may pursue the alternative competitive strategy of cost efficiency (Porter, 1985). By using a cost efficiency strategy, companies compete with a standard, low cost product, since they maintain the cost structure to a certain threshold acceptable to cover the level of variable costs.

The cost structure also influences firms' internationalization decisions and possibilities. A firm deciding to enter into a new international market by means of a cost efficiency strategy should constrain its average cost of production in order to be competitive and thus gaining competitive advantage in the new market. Economies of scale are seen as one of the

fastest avenues to build a competitive advantage. Cost advantage could be used to increase the flexibility in implementing a price strategy, by reducing and augmenting price margins according to the level of competition. This could substantially help firms that aim to penetrate international markets: the higher the flexibility in moving the product price, the higher the bargaining power with local distributors and the lower the perceived risk.

The empirical evidence supports the existing relationship between a firm's cost structure and internationalization. For instance, Wakelin (1998) finds that cost considerations play some role in the firms' export performance, especially for the non-innovating firms. Indeed, higher cost firms show a lower propensity of engaging in exporting activity. Similarly, Basile (2001) empirically demonstrate that the level of unit labor cost represents a measure of a firm's cost/price competitiveness, which negatively affects exports in cost sensitive export markets. Thus, in his sample of Italian manufacturing firms, firms with higher labor costs per unit of product are less likely to enter foreign markets.

Based on these considerations, we hypothesize:

Hypothesis 3. *The higher the level of a firm's cost efficiency, the higher the likelihood of entry in foreign markets with branded products.*

2.4 Interaction between cost efficiency and scope economies

It is worth noting that the traditional theoretical approach on competitive strategies suggests that the intrinsic nature of cost leadership and differentiation strategies is such that the two alternatives cannot be pursued and implemented simultaneously (Porter, 1985). In the case of firms involved in exporting, the empirical evidence seems to suggest that, under certain circumstances, a pure competitive strategy is preferred over other strategic alternatives. For example, Namiki (1988) finds that among firms competing in export markets those following a single strategy – i.e., either differentiation focus or innovative differentiation – show the higher performance. Aulakh et al. (2000) posit that the simultaneous use of both cost leadership and differentiation strategies is negatively related to their export performance. Similarly, Salavou and Halikias (2009) show that the hybrid form of competitive advantage pursued by exporting firms, although dominant, does not offer the most profitable strategic choice.

The issue of whether a pure competitive strategy yields to a higher performance with respect to a hybrid strategy has been debated for long, often with contrasting results (among others, see Dess and Davis, 1984; Nayyar, 1993; Spanos et al., 2004; Wu et al., 2007).

Similarly to situations in which firms need to combine both explorative and exploitative innovative activities, hybrid strategies can be pursued by ambidextrous organizations (Tushman and O'Reilly, 1996), which are able to join together the search for greater efficiency – typical of exploitation – with the search for variation and new solutions – typical of exploration. If these apparently irreconcilable activities can be effectively integrated by firms within the same organizational unit, a higher performance is expected (Raisch et al., 2009; Andriopoulos and Lewis, 2009)..

Thus, ambidextrous organizations – which are capable of simultaneous exploitation of current competencies and exploration of new domains – are expected to be better able to pursue hybrid competitive strategies based on the simultaneous deployment of both cost leadership and differentiation advantages. In turn, this organizational capability is expected to bring a higher internationalization performance. Nevertheless, the integration of exploration and exploitation activities is a complex task for organizations that demands managerial experience and effort. Such integrative efforts may strain firms and reduce the performance potential (Gibson and Birkinshaw, 2004). As a consequence, we hypothesize:

Hypothesis 4. *The simultaneous exploitation of cost efficiency (cost advantage) and of scope economies (differentiation advantage) increases the likelihood of entry in foreign markets*.

3. Empirical strategy

3.1 Sample

This study is based on a database that has been built by the match between several sources of information. First, we selected from the SABI dataset the sample of Spanish firms classified under the industrial activity "Manufacturing of Pharmaceutical Products".[1] We focused on the period 1995-2004, and we ended up with 507 firms. We used the SABI

[1] The SABI database (Bureau van Dijk Electronic Publishing) reports financial information on more than one million Spanish firms and more than 300.000 Portuguese firms. Firms are classified according to the Spanish National Classification of Economic Activities (CNAE). The "Manufacturing of Pharmaceutical Products" class corresponds to CNAE code n. 244.

dataset to draw information on the financial (e.g., sales, costs, profits, fixed assets, profitability) and structural characteristics (age, size, legal type) of our sample companies.

Second, we matched this list of Spanish pharmaceutical firms with the list of owners of patents registered at the European Patent Office, in order to collect information on the patent portfolio of our sample companies. We found 40 firms having filed at least one patent in the European Patent Office.

Third, we verified whether our sample firms are independent legal entities or whether they belong to industrial groups, by using the 1998 version the of Who Owns Whom database.[2] We were able to identify 139 firms being not independent in 1998. Furthermore, we identified those firms having at least a subsidiary in the US (only two firms), and those whose parent company is a firm located in the US (18 cases in total).

Finally, we searched the trademark database of the US Patent and Trademark Office (www.uspto.gov) for trademarks registered by our sample companies. We discovered 21 firms having filed at least one trademark during the same time period (see Table 1). As explained below, we use such information to determine the time of entry of our sample companies into the US market. Given that our main purpose is to study the determinants of entry into that foreign market, we are only interested in analyzing the characteristics and behavior of our firms *before* the entry. Therefore, we did not take into account neither the total number of trademarks owned by a company, nor the characteristics of the same company *after* the year of entry into the US market.

According to the sampling procedure that we adopted, our final sample consists of an unbalanced panel of 507 firms over a period of 10 years (4,961 observations in total).

TABLE 1 ABOUT HERE

3.2 Measurement of variables

Dependent variable.

Internationalization strategies can be pursued through two (not necessarily alternative) entry modes: exporting and foreign production. Then, each of them can be implemented by means of several forms that go from the use of international trading companies, to the

settlement of product licensing contracts with local manufacturers, to direct investments. Each entry mode affects the amount of investments required, and therefore the associated level or risk – indirect exporting can be viewed as the most conservative and least risky entry mode, while Foreign Direct Investments require the highest level of investments and imply the highest risk for firms. Figure 1 offers a representation of such alternatives.

FIGURE 1 ABOUT HERE

According to the distinction between exporting and foreign production as potential entry modes, previous studies on firms' internationalization processes have used as outcome measure either a firm's level of export (mainly in terms of export intensity, i.e. exports as a share of total firm's sales), or the amount of a firm's investments in production facilities located abroad. In this study, we follow an alternative, innovative approach and we make use of trademarks as an objective indicator of entry into the foreign market with a branded product.

As Mendonça et. al (2004) argued, trademarks play a crucial role in marketing innovations, being instrumental in differentiating the attributes of goods and services in the marketplace. In turn, our internationalization strategy does not depend on the organizational form adopted to achieve such a goal. This entry mode, however, requires the firm to possess some absorptive capacity to diffuse its knowledge to other foreign markets and to be cost efficient.

Trademarks can be considered as an objective measure of active presence of a firm in a market because, i) "a trademark includes any word, name, symbol, or device, or any combination, used, or intended to be used, in commerce to identify and distinguish the goods of one manufacturer or seller from goods manufactured or sold by others, and to indicate the source of the goods",[3] and ii) that a requirement for a trademark property right to emerge is that the mark must be actively used in the market otherwise is cancelled[4]. That

[2] Who Owns Whom (published by Dun & Bradstreet, Inc.) is a worldwide directory that links a company to its corporate family. The dataset reports information concerning the corporate structure, family hierarchy, and few information on the parent company, headquarters, branches, and subsidiaries worldwide.

[3] From the USPTO web page: http://www.uspto.gov/web/offices/tac/tmfaq.htm#DefineTrademark. Last assessed: July 15th, 2009.

[4] Failure to actively use a trademark for a certain period of time (five years in the US) will result in abandonment of the mark, which will then be part of the public domain. Abandonment of the mark determines cessation of the trademark property right.

is, if a firm owns any trademark in a specific market – the US market, in the specific context of this study – it means that that firm has entered the market at least with the weakest form. Obviously, because a trademark only signals the active presence of a firm in a market, it does not provide any information on the details of the firm's presence.

Trademarks are important to protect the firm brand from imitation. Brand names reduce search costs for buyers who cannot observe ex-ante the quality of the product or service and therefore serve the function of identifying the provider of a good by making a name visible in the marketplace (Schmoch, 2003). This suggests that the date of the first trademark registered by a foreign firm in the trademark office signals the first step of its entry process with a branded product or service.

It is worth noting that trademarks imply direct monetary and indirect administrative costs – the owner must file a trademark application for each class of goods/services, pay application fees and renewal fees, file a statement of use, demonstrate that it uses the mark in commerce and file requests for time extension. At regular intervals, the owner has to demonstrate that it has used the mark in commerce for five consecutive years and pay extension fees. Maintenance costs include attorney fees.

In order to collect information on trademarks, we searched in the US trademark database at USPTO (www.uspto.gov) for trademarks registered by our sample companies. Then, we considered the year when the firm filed its first trademark as the year of entry in the US market. So, we were able to construct a dependent variable (ENTRY) that takes the value 1 if the firm has entered the US market in a specific year and 0 otherwise. During the period under study (1995-2004), 21 sample firms entered the US market with a branded product.

Core variables of theoretical interest

We built two patent-based variables. The first, TECH_CAPABILITIES, is the time-variant stock of firm patents filed at the European Patent Office during the sample period, divided by the sales of the company during the same period of time. This measure can be considered a proxy for the overall innovative capabilities of the company, given its size.

The second, SCOPE_ECONOMIES, has been built by computing the Herfindhal index of the different technological patent classes in which the sample firms own patents. The first two digits of the main IPC technological class have been used. Provided that the Herfindhal index

is a measure of concentration, the higher the value of the index, the higher the degree of concentration of the company's patent portfolio, that is, the lower the firm's degree of technological diversification.

It is worth noting that the use of patents as an indicator of advanced technological capacity and ability to develop innovations is one of the most established and reliable methods of estimating the patterns of innovative activities. The advantages and disadvantages of using patent statistics are well known in the literature (Schmookler, 1966; Pavitt, 1985; Griliches, 1990).

As far as firm's cost efficiency measure is concerned, we built the variable INV_EFFICIENCY by dividing the yearly amount of a firm's production costs (variable costs) plus investments in long-term tangible assets (fixed costs), by the firm's volume of sales. This measure represents an approximation of a firm's average cost in a given year, and therefore it is inversely related to the firm's level of production efficiency. Notice that, the lower the level of INV_EFFICIENCY, the lower the firm's average cost, the higher the firm's cost efficiency.

Control variables

We included several controls in our analysis. As a control for firm size we used the firm's amount of fixed assets (FIXED_ASSET). Then, we introduced the firm's age, calculated as the difference between the year of firm foundation and each year of the sample period (AGE). We also took into account the firm's profitability by including the level of Return on Assets (ROA), which assesses the firm's ability to generate financial resources that might be used for the firm's plans of multinational expansion (Tseng et al., 2007).

Moreover, in order to take into account the influence of the legal form on the firm's policies and actions (e.g., the possibility to raise additional financial resources in the stock market), we included the dummy time invariant variable CORPORATION, which takes the value 1 in the case the firm opted for a "Sociedad Anonima" legal form.

Similarly, we included few variables related to the firm's group structure. GROUP_98 is a dummy variable that takes the value 1 if the firm was part of an industrial group in 1998, and 0 otherwise. PARENT_US is a dummy variable that takes the value 1 if the firm's parent company has its headquarter in the US, and 0 otherwise. SUBSIDIARY_US is a dummy variable that takes the value 1 if the firm has at least a subsidiary whose headquarter is located in the

US, and 0 otherwise. Finally, we included the yearly values of Dollar / Spanish "Peseta" exchange rates to take into account time effects.

Table 2 reports the variables' descriptive statistics, and it shows the correlation matrix among variables.

TABLE 2 ABOUT HERE

4. Results

4.1 Descriptive analysis

Before discussing the results of the main econometric estimations, we present some descriptive statistics highlighting the different behavior and characteristics of firms that have entered the US market and those firms that have not. Table 3 compares firms in terms of patents and trademarks. Provided that trademarks signal an active commercial activity of the firms in the US market, one might hypothesize that those firms which have filed a trademark also show a higher innovative profile. Indeed, it seems reasonable to suppose that each trademark refers to a branded product, which is the outcome of an innovative activity whose results have been legally protected with a bundle of patents. However, Table 3 seems to reveal that this line of reasoning is incorrect. Among those firms having filed a trademark, only one third owns at least one patent. Notice that we are comparing trademarks filed by Spanish companies in the US with patents filed by the same companies in the European Patent Office. If entering a foreign market may be considered an "exceptional" event, protecting innovations with patents filed in the "local" patent office should not be an "exceptional" activity, especially for Pharmaceutical firms whose innovative propensity is, on average, higher than that of firms belonging to different sectors. Nevertheless, in relative terms, Table 3 also shows that the patenting activity of firms with trademarks is higher than patenting activity of firms without trademarks (33.3% of firms with trademarks vs. 2.7% of firms without trademarks).

TABLE 3 ABOUT HERE

This evidence is similarly reported in Table 4, which compares the behavior of firms along several dimensions, and which illustrates how the two groups of firms do possess different

characteristics. Firms having entered the US market have patented more and have patented in a higher number of technological classes (i.e., they show a slightly higher degree of technological diversification – lower SCOPE_ECONOMIES). Furthermore, they seem to possess a cost advantage with respect to the other group (lower INV_EFFICIENCY), a higher profitability, and a slightly smaller size (even though the differences along these three dimensions are not significant from the statistical point of view). Finally, they are older (age, in this respect, might signal higher accumulated experience that turns out to be useful to enter a foreign market), belong to a group (similarly to age, this variable might account for accumulated corporate experience and complexity which might facilitate internationalization – though this variable is not significant), and have mainly chosen the public corporation legal form. In sum, it appears from Table 4 that firms that have entered the US market possess superior technological capabilities, a cost advantage, and higher accumulated experience.

TABLE 4 ABOUT HERE

4.2 Econometric analysis

To test our hypotheses we have used a hazard model that estimates the hazard rate, namely the probability of entry into a market in year t, conditional on not being in the market at time t–1. Hazard models draw on hazard functions, which are distribution functions of the duration or spell length for a firm $F(t) = Pr(T<t)$, where T is the duration. Hazard rates are estimated from hazard functions. They are the rates at which spells are completed at duration t, given that they have lasted until t,

$$\lambda(t) = f(t)/S(t)$$

where

$$f(t) = dF(t)/dt$$

is the number of firms that have entered the market at time t, while

$$S(t) = 1-F(t) = Pr(T \geq t)$$

the set of firms whose duration is at least t, is the number of firms still at risk at time t, i.e. the risk set (Blossfeld and Rohwer, 2002).

Following earlier works (Sorenson, 2000; Dobrev et al., 2002; Giarratana and Fosfuri, 2007) on firm survival in industry population, we opted for a piecewise exponential model

specification that does not make any strong assumption on time dependence. Given the time periods, this model could be expressed as:

$$\Lambda_{jt} = \exp(\alpha + X_{jt}\beta_j)$$

where X is the covariate vector, β is the vector of coefficients assumed not to vary across time and α is a constant coefficient associated with the t time period (see Blossfeld and Rohwer 2002: 120).

Results

Table 5 reports the results of our estimations. While Model 1 only contains control variables, from Model 2 to Model 6 we gradually include the core explanatory variables. In Model 7 we add an interactive term (SCOPE_ECONOMIES * INV_EFFICIENCY) between our measures of scope economies and cost efficiency, in order to assess how the interaction between the two dimensions affects firms' behavior.

Overall, our estimations provide support to most of our hypotheses. Indeed, as predicted by Hypothesis 1, TECH_CAPABILITIES is always positive and significant in all the specifications and, as predicted by Hypotheses 2 and 3, SCOPE_ECONOMIES and INV_EFFICIENCY are always negative. Note that both variables result significant only in Model 7, when including the multiplicative effect. This means that to fully capture the effect of different strategies, we need to consider their jointly effects. Therefore, it emerges that firms with stronger innovative capabilities, with a broader diversification of technological competences, and with a higher efficiency in manufacturing (i.e., firms that are able to reduce the average cost of production) show a higher probability of entering the US market.

TABLE 5 ABOUT HERE

Moreover, Model 7 reveals a counter-intuitive joint effect of scope economies and cost efficiency. Indeed, the interaction variable, which defines how one dimension attenuates or strengthens the effects of the other, has a significant positive impact on the entry probability.

To interpret our findings better, we report in Table 6 the estimates of the multiplier rate of entry, conditional on different values of INV_EFFICIENCY and SCOPE_ECONOMIES. A multiplier rate of 1 means that a variable has no effect on the entry rate. A multiplier rate higher than

1 implies that a particular level of a variable increases the chances of entry. Table 6 explores the change in entry rate due to a more diversified patent portfolio for given levels of cost efficiency, and vice versa. Multiplier rates are computed with a baseline model of a firm with a median value of INV_EFFICIENCY (1.143) and of SCOPE_ECONOMIES (0.5): M = exp (– 10.621 * INV_EFFICIENCY – 14.125 * SCOPE_ECONOMIES + 10.451 * INV_EFFICIENCY * SCOPE_ECONOMIES) / exp (– 14.125 * 0.5 – 10.621 * 1.143 + 10.451 * 1.143 * 0.5). First, note that for all the levels of INV_EFFICIENCY except the one corresponding to the 90% of the distribution, increases in the value of SCOPE_ECONOMIES (i.e., decreasing the degree of patent diversification) decrease the hazard of entry. This finding confirms our second hypothesis. Similarly, for any value of SCOPE_ECONOMIES, increases in the value of INV_EFFICIENCY decrease the entry probability, which confirms our third hypothesis.

Only for firms that have a worst performance in terms of cost efficiency (high levels of INV_EFFICIENCY), an increase in patent concentration increases the probability of entry. Therefore, this result captures the entry of firms with a high degree of technological specialization and with the lowest cost performance. This could be explained by a typical feature of the pharma industry in which some firms could attempt the entry with breakthrough innovative drugs or compounds that are the results of costly radical and specialized research (Gans and Stern, 2003). Figure 2 presents a graphical representation of this effect.

TABLE 6 ABOUT HERE

FIGURE 2 ABOUT HERE

On the whole, Table 6 and Figure 2 seem to suggest that entry strategies based on the simultaneous exploitation of cost and technological diversification advantages are successful. Thus, hybrid strategies seem to prevail over pure competitive strategies. However, this effect is not linear. If a firm faces high production costs, to concentrate the innovative activity on a narrow technological field is the only possibility to slightly enhance the entry probability. Notice, however, that the effect of SCOPE_ECONOMIES is definitely smaller than that of cost efficiency. Therefore, for very high levels of cost inefficiency, no patent concentration can completely compensate a cost disadvantage (the level of the multiplier remains below 1). Our conclusion is that the ambidexterity is a workable

hypothesis, except for firms with the worst cost efficiency that seems to lack this competency.

As a robustness check, we replicate the same regression excluding from the sample those firms belonging to business groups having a US parent company and/or controlling a US subsidiary. Indeed, having a US subsidiary or being part of a US-based business group could be organizational substitutes for direct entry in the US market with branded products. Obtained results, available on request, are perfectly in line with those obtained in Model 7.

5. Conclusions

This study analyzes how the patenting and cost efficiency of a sample of Spanish pharmaceutical firms affect their internationalization process. We find that patent intensity, technological diversification and the level of a firm's cost efficiency explain the entry in the US market with a branded product. Moreover, results show that below a certain threshold of productivity, a patent concentration strategy slightly compensates an inefficient cost strategy in the probability of entry. Nevertheless, the multiplier effect remains monotonic decreasing.

These findings may help managers identify the key factors needed to elaborate effective international growth strategies. In an innovation-based sector like pharmaceuticals, strong technological capabilities are needed to structure the internationalization strategy as a long-term success. A competitive strategy focused on scope economies, however, cannot be pursued at the expenses of the firm's costs. The highest probability of entry a foreign market lies in the simultaneous exploitation of a benefit and a cost advantage. Thus, a hybrid strategy appears superior to a pure competitive strategy. But, hybrid strategies can effectively be pursued only by ambidextrous organizations that are able to mitigate the tensions of exploitation of current capabilities with exploration of new domains. Nevertheless, this result is not always confirmed. Very cost inefficient firms might result better off by concentrating their innovative activity on a limited technological area, maybe because this choice allows firms to invest their limited resources on just one activity (technology development), thus avoiding the risk of resources' dispersion.

Such results are specific to the sphere of the study (Spanish pharmaceutical firms entering the US market with branded products), and might differ if the industry or the home

country or the host country were to change. Yet, we partly confirm the results obtained by a previous study on the localization choices of Spanish MNEs (Galan et al., 2007), which shows that Spanish firms decide to enter into advanced countries both to exploit their firm-specific advantages, and to benefit of technologies, knowledge and capabilities that are not available in Spain.

As far as empirical methodology is concerned, a related contribution of this study is about measurement. We explore the usefulness of a novel measure of foreign activity that is represented by trademarks. Being representative of entry in a foreign country with branded products, trademarks cover different entry modes, from export to FDIs. We believe that future research on small-to-medium sized international firms can then benefit from the use of this variable to overcome the lack of data on sales in foreign markets and related investments.

Moving this research a step further, we are now in the process of understanding firm's performances and trying to see if internationalization produces a positive effect on firms' sales and profits. This raises both econometric complications and interesting strategic concerns that we will try and tackle in future research.

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Table 1. Time distribution of entry

Year	# firms that not entered	# firms that entered	Total
1995	503	4	507
1996	500	3	503
1997	498	2	500
1998	497	1	498
1999	494	3	497
2000	492	2	494
2001	492	0	492
2002	489	3	492
2003	489	0	489
2004	486	3	489
Total	4,940	21	4,961

Table 2. Variables' descriptive statistics and correlation matrix

	Mean	Std. Dev.	1	2	3	4	5	6	7	8	9	10	11	12
1. ENTRY	0.00	0.06	1.00											
2. TECH_CAPABILITIES	0.00	0.00	0.00	1.00										
3. SCOPE_ECONOMIES	0.99	0.07	-0.04	0.00	1.00									
4. INV_EFFICIENCY	2.05	9.13	-0.01	0.00	0.01	1.00								
5. FIXED_ASSET	5404.77	16986.92	0.01	-0.01	-0.29	-0.01	1.00							
6. ROA	4.87	31.16	0.01	-0.01	-0.02	-0.06	0.02	1.00						
7. AGE	19.64	16.82	0.03	-0.01	-0.15	-0.04	0.24	0.06	1.00					
8. CORPORATION	0.59	0.49	0.04	0.01	-0.08	0.01	0.14	0.09	0.31	1.00				
9. GROUP_98	0.26	0.44	0.01	-0.01	-0.16	0.00	0.26	0.12	0.14	0.21	1.00			
10. PARENT_US	0.00	0.06	-0.01	0.00	-0.17	-0.01	0.35	-0.01	-0.04	0.05	0.11	1.00		
11. SUBSIDIARY_US	0.03	0.18	-0.01	0.00	-0.07	0.05	0.13	0.00	0.06	-0.02	0.30	-0.01	1.00	
12. EXCHANGE_RATE	152.78	20.99	-0.02	-0.01	0.00	0.02	0.02	0.02	0.00	-0.08	-0.04	0.00	0.00	1.00

Table 3. Comparison of patent and trademark activities among firms/years

US	**EP Patents**		
Trademarks	**No**	**Yes**	**Total**
No	4,665	275	4,940
Yes	11	10	21
Total	4,676	285	4,961

Table 4. Mean comparison of firms' characteristics among firms/years

	Entry			
Variable	**No**	**Yes**	**Difference**	
DUMMY_PATENT	0.056 (0.003)	0.476 (0.112)	-0.421 (0.051)	***
# OF PATENTS	0.192 (0.018)	2.762 (1.259)	-2.570 (0.289)	***
SCOPE_ECONOMIES	0.990 (0.001)	0.917 (0.039)	0.073 (0.015)	***
INV_EFFICIENCY	2.055 (0.157)	1.218 (0.069)	0.837 (2.221)	
FIXED_ASSET	5394.00 (286.93)	7632.17 (2408.69)	-2238.17 (4130.29)	
ROA	4.842 (0.531)	9.880 (2.075)	-5.038 (7.577)	
AGE	19.611 (0.239)	27.429 (3.951)	-7.818 (3.677)	**
GROUP_98	0.261 (0.006)	0.381 (0.108)	-0.120 (0.096)	
CORPORATION	0.590 (0.007)	0.905 (0.066)	-0.315 (0.107)	***

Table 5. Hazard Rates for Piecewise Exponential Model for Market Entry, 1995-2004

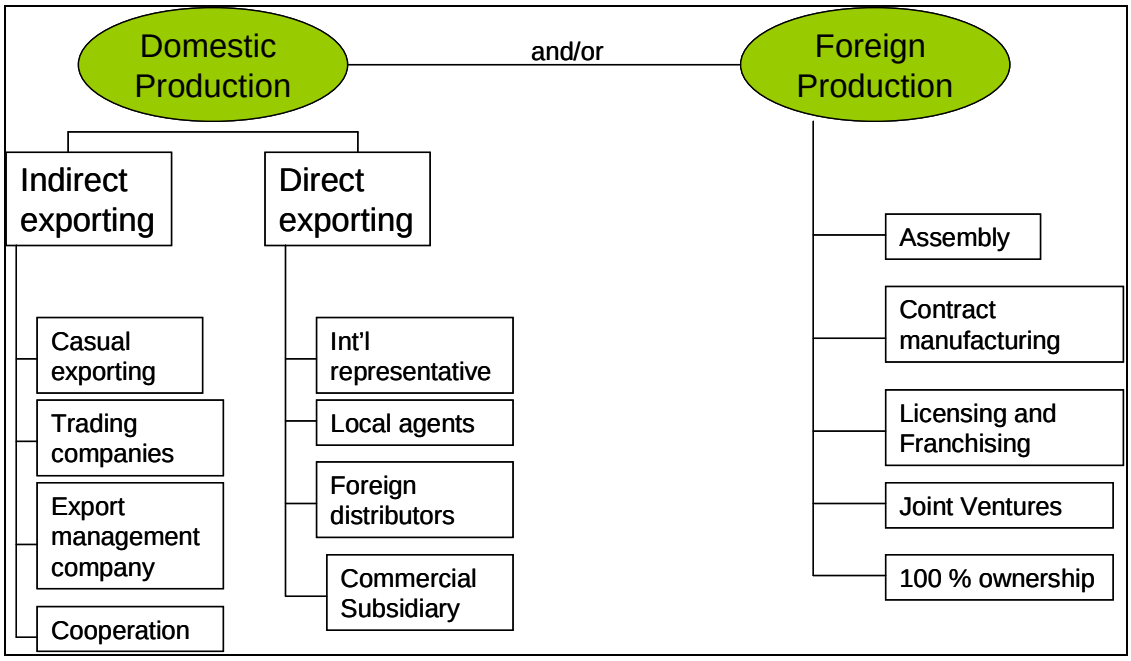
Independent variables	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
Control variables:							
FIXED_ASSET	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
ROA	0.008	0.007	0.009	0.009	0.009	0.009	0.007
	(0.008)	(0.010)	(0.008)	(0.008)	(0.009)	(0.010)	(0.010)
AGE	0.017	0.016	0.017	0.015	0.015	0.014	0.013
	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)	(0.014)
CORPORATION	1.804	1.794	1.876	1.803	1.866	1.873	1.923
	(6.983)	(6.911)	(8.002)	(7.081)	(7.960)	(8.083)	(8.719)
GROUP_98	-0.066	-0.081	-0.069	-0.188	-0.187	-0.190	-0.268
	(0.550)	(0.540)	(0.552)	(0.565)	(0.567)	(0.562)	
EXCHANGE_RATE	3.590 **	3.597 **	3.574 **	3.598 **	3.585 **	3.589 **	3.585 **
	(16.524)	(16.660)	(16.810)	(16.625)	(16.880)	(16.991)	(16.883)
YEAR DUMMIES	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Explanatory variables:							
INV_EFFICIENCY		-0.190				-0.199	-10.621 *
		(0.142)				(0.155)	(0.000)
TECH_CAPABILITIES			413.574 **		400.414 **	407.820 **	406.130 **
			(6.3E+181)		(1.2E+176)	(2.0E+179)	(3.7E+178)
SCOPE_ECONOMIES				-2.616	-2.501	-2.472	-14.125 *
				(0.165)	(0.184)	(0.189)	(0.000)
SCOPE_ECONOMIES * INV_EFFICIENCY							10.451 *
							(158461.0)
Number of observations	3477	3379	3370	3475	3368	3367	3367
Log pseudoLikelihood	10.537	11.108	11.279	11.301	11.985	12.227	12.699

†p<0.10, *p<0.05, **p<0.01. Heteroskedastic consistent standard errors in parentheses.

Table 6. Multiplier Rates for Entry

	INV_EFFICIENCY					
	Min	**10th cent**	**30th cent**	**50th cent**	**70th cent**	**90th cent**
SCOPE_ECONOMIES	*0.003*	*0.941*	*1.042*	*1.143*	*1.315*	*2.046*
0.50	471.152	2.984	1.729	1.000	0.397	0.008
0.60	115.045	1.942	1.251	0.805	0.382	0.016
0.75	13.881	1.020	0.770	0.581	0.361	0.047
0.90	1.675	0.536	0.474	0.419	0.340	0.140
1.00	0.409	0.349	0.343	0.337	0.327	0.289

Figure 1. Entry strategies in foreign markets



Source: adapted from Terpstra and Sarathy (2001).

Figure 2. Multiplier Rates for Entry