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Technological Capabilities and Cost Efficiency as Antecedents of Foreign Market Entry*

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Abstract

This work explores which factors increase firms' propensity to enter into international markets. The study draws on the resource-based view and assesses the effect played by firms' technological capabilities and cost structures on entry. While many research papers consider those two factors to be independent one from the other, this study focuses on their interactive effect. Empirical analysis covers the whole population of Spanish pharmaceutical firms over the period 1995-2004. By using data on trademarks filed at the United States Patent and Trademark Office (USPTO), the study identifies those firms that have entered the US market with branded products. Then, the study uses a hazard model to empirically estimate which firms' resources and capabilities affect the probability of entry. Results show that firms can maximize the likelihood of entry in foreign markets by pursuing hybrid competitive strategies that combine together scope economies and cost efficiency.

Keywords: Innovation and R&D; Patents; Trademarks; Competitive Advantage; Firm-Specific Advantages; Foreign Market Entry.

JEL Classification: F2, M16, O30

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1. Introduction

International expansion is a strategic decision for firms, whose success has consequences on their ability to develop and deploy resources and capabilities, to create and sustain a competitive advantage, and, eventually, to enhance performance. Internationalization implies costs and risks (Contractor, 2007; Chen, 2006), and not all firms succeed in entering and operating in foreign markets (Bianchi and Ostale, 2006; Nadkarni, Pérez and Morganstein, 2006). This work investigates how technological and operational resources and capabilities influence the foreign market entry decisions.

Although the idea that technological capabilities – R&D expenditure, technical and scientific employees, product and process innovation – foster internationalization is not new (Hirsch and Bijaoui, 1985; Sterlacchini, 1999; Tseng, Tansuhaj, Hallagan and McCullough, 2007), there is still room to investigate the underlying mechanisms that facilitate internationalization. In this respect, a challenging issue is whether hybrid competitive strategies (Porter, 1985) resulting from the combination of technological capabilities with operational efficiency provide a competitive advantage in the international arena and enhance the success of foreign market entry decisions.

A few papers have discussed and identified a negative relationship between hybrid competitive strategies and firms' product entry (Aulakh, Kotabe and Teegen, 2000; Namiki, 1988; Salavou and Halikias, 2009). By contrast, this study builds on the resource-based view (Barney, 1991, 2001a, 2001b) and investigates whether firms that simultaneously pursue cost leadership and differentiation advantages achieve a higher likelihood of entering foreign markets, thanks to their ability to take advantage of ambidexterity (Tushman and O'Reilly, 1996) – that is, the ability to integrate within the same organizational unit both explorative (i.e., the search for variety and new solutions) and exploitative (i.e., the search for greater efficiency) activities (Andriopoulos and Lewis, 2009; Raisch, Birkinshaw, Probst and

Tushman, 2009). The integration of these different activities might result in increased complexity for organizations (Gibson and Birkinshaw, 2001). In turn, this study assesses which conditions concerning firms' endowment of resources and capabilities maximize the positive relationship between hybrid strategies and product market entry.

The empirical test uses data from pharmaceuticals. The pharmaceutical industry has long been an internationalized, global industry (Taggart, 1993), which shows a higher propensity than other industries to disperse innovative activity across borders (McKelvey, Orsenigo and Pammolli, 2004). Furthermore, the specific features of this industry's structure – characterized by few very large global companies and a myriad of SMEs often acting as licensees of major leaders – reveal that, apart from firms' innovative effort, cost-related factors and the possibility to exploit economies of scale determine the distribution of the competitive advantage across firms. Therefore, in contexts like the pharmaceutical industry the role of both firms' technological capabilities and operational efficiency become critical.

The empirical analysis embraces the whole population of Spanish firms active in the pharmaceutical sector, over a ten years period, and identifies those firms that have entered the US market with a product protected by a trademark filed at the US Patent and Trademark Office. This indicator represents a rather novel measure of foreign market entry, which objectively reveals the date by which a firm started operating in the US market. Furthermore, this indicator is more flexible than traditional measures and not constrained by any specific mode of entry (i.e. export, FDIs, alliances, M&As). The use of this novel indicator allows exploring the antecedents of foreign market entry and the effectiveness of hybrid competitive strategies irrespective of the mode of entry chosen by firms. This paper thus contributes to the literature by exploring which firm's resources maximize the probability of entry in foreign markets without imposing any condition on specific modes of entry or any combination of modes of entry.

More specifically, this study explores the relevance of factors like breadth and depth of firms' technological base (patent portfolio) and cost structure in explaining the likelihood of success in foreign market entry. The empirical analysis tests whether firms with more diversified patent portfolios and superior cost efficiency show a higher probability of entry in the US market, or whether the exploitation of such a hybrid strategy is negatively related to the probability of entry. This study also investigates how firms can overcome a disadvantage in either cost structure or technological diversification and still increase their probability of entry.

The remaining of the paper is organized as follows. The next section reviews previous literature and formulates the main hypotheses. Section 3 describes the database used for the analysis and introduces the empirical methodology. Section 4 presents the empirical analysis and econometric results. Finally, Section 5 concludes and discusses the main findings.

2. Literature review and hypotheses

The academic literature on firms' internationalization processes and strategies has largely analyzed aspects like the modes of entry into foreign markets (Agarwal and Ramaswami, 1992; Dunning, 1980; Madhok, 1997; Mascarenhas, 1997; Woodcock, Beamish and Makino, 1994), the motivations that drive firms' internationalization decisions (Buckley and Casson, 1998; Dunning, 1993; Hymer, 1976; Woodcock et al., 1994), and the internal and external conditions that enhance the likelihood of success in internationalization (Chetty and Hamilton, 1993; Kogut and Zander, 2003; Kuemmerle, 1999). Yet, several questions are still open to debate. For example, researchers have not yet fully discussed whether some differences exist in the drivers of success (or failure) of international entry in the case of emerging vis-à-vis developed markets (Hennart, 2009; Johnson and Tellis, 2008; Lin, 2010). Moreover researchers show interest in disentangling how firms can exploit specific corporate

resources to implement international strategies (Pehrsson, 2008). This paper focuses on the latter aspect and explores firms' internal determinants of foreign market entry.

In general terms, internationalization strategies can be pursued through different (not necessarily alternative) entry modes that go from the use of international trading companies, to the settlement of product licensing contracts with local manufacturers, to direct investments in subsidiaries or in the acquisition of local firms (Figure 1). Each entry mode affects the amount of investments required, the associated level of risk, and the amount of resources and capabilities needed to succeed.

Figure 1 here.

According to the eclectic paradigm of international production (Dunning, 1988, 2000), 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. Empirical evidence supports this view and shows, among other results, that the ability to internationalize and succeed in foreign markets is a function of a firm's internal capabilities (Agarwal and Ramaswami, 1992; Autio, Sapienza and Almeida, 2000; Makino, Lau and Yeh, 2002; Zahra, Ireland and Hitt, 2000). Firms with superior capabilities create new knowledge that leads to the development of critical organizational capabilities and embedded routines. These organizational capabilities might refer to the ability of achieving a production structure of greater efficiency or to the ability to develop improved technologies. Both provide superior performance in the entry into foreign markets.

Among internal capabilities that shape a firm's ownership advantage (Lieberman and Montgomery, 1998; Narula, 1996), this study considers three factors that affect firms' internationalization decisions: innovative capabilities, scope economies, and cost efficiency.

Furthermore, by building upon the stream of literature that focuses on hybrid competitive strategies (Porter, 1985) and ambidexterity (Tushman and O'Reilly, 1996), this study explores the issue of whether such factors complement or substitute each other.

2.1 Technological capabilities

The resource-based view theory (Barney, 1991, 2001a, 2001b) commands that the exploitation of rare, non-imitable and non-substitutable resources could confer to firm an advantage in entering in a new foreign market.

Technological resources and capabilities 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. 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, fostering efficiency. On the other hand, firms involved in new foreign markets have to learn and adapt their products according to local customers' characteristics. 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.

Hirsch and Bijaoui (1985) consider the relationship between R&D expenditures and export behaviour. They find that innovation confers some monopoly power to the innovating firm. Innovative firms in a sector have a higher propensity to export than the sector average, and lagged R&D expenditure explains the rate of change of exports in a cross-section analysis. Several studies follow this line of research confirming the relation between innovation and export. Sterlacchini (1999) argues that even in non-R&D intensive industries

innovation is an important determinant of small firms' export performance. Lefebvre, Lefebvre and Bourgault (1998), and Becchetti and Rossi (2000) both find 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. Brouwer and Kleinknecht (1993) report that R&D positively affects export activity, but they emphasize that product R&D is especially relevant for this effect. Similarly, Bernard and Jensen (1999, 2004) find that the introduction of new products significantly enhances the probability of exporting**.**

> **Hypothesis 1.**The stronger a firm's technological capabilities, the higher the likelihood of product market entry in foreign markets**.**

2.2Cost efficiency and Scope economies

As Porter (1985) proposed in its canonical work, firms face to two types of advantages: cost and differentiation. By using a cost efficiency strategy, companies use price as the most important "weapon" to compete in a market. When firms decide to enter into a new market with a cost advantage they usually have sunk investment targeted to constrain its average cost of production. In turn, firms benefiting from a cost advantage may implement a flexible pricing strategy, modulating price margins according to the level of competition. This higher flexibility in moving the product price helps firms to penetrate international markets. In this line, economies of scale are one of the fastest avenues to build a cost advantage.

The empirical evidence supports this view. Wakelin (1998) finds that cost considerations play pivotal 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 demonstrates that the level of unit labour cost

represents a measure of a firm's cost/price competitiveness, which negatively affects exports in cost sensitive export markets. In his sample of Italian manufacturing firms, firms with higher labour costs per unit of product are less likely to enter foreign markets.

On the other hand, product differentiation strategy consists in targeting particular market niches, creating a special relationship with customers who become more loyal and attached to the product. The use of technological diversification could allow firms to increase the ability to learn from the new market, spotting favourable market niches and thus reducing the risk of entry.

Since scope economies allow firms to gain a differentiation competitive advantage that could be exploited in foreign markets (Kimura, 1989), scope economies can therefore be considered an antecedent of early entry in foreign markets (Gaba, Pan and Ungson, 2002). Firms with a broader product portfolio can profit from potential synergies among market segments, especially in the case of related diversification in which products share some commercial and/or technological common features.

In innovation-based markets, the breadth of a firm's product portfolio is often associated to the breadth of the firm's technological portfolio(Cantwell, Gambardella and Granstrand, 2004).Firms thus need to possess superior competencies on a broader range of technological fields in order to implement a differentiation strategy, albeit a certain degree of technological relatedness is often required. In turn, technological diversification can be leveraged in the international arena. 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). Therefore, 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).

In a sample of US biotechnology firms, Quintana-García and Benavides-Velasco (2008) show that the magnitude of technological diversification is directly and positively associated to both exploitative and explorative innovative competences. 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. 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 dissimilar 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.

Overall, the discussion so far suggests that both a cost advantage (through economies of scale and cost efficiency) and a differentiation advantage (through scope economies and technological diversification) can facilitate internationalization decisions. However, 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 simultaneously (Porter, 1985). The empirical analysis of whether a pure competitive strategy yields to higher performance with respect to a hybrid strategy offers contrasting results (among others, see Dess and Davis, 1984; Nayyar, 1993; Spanos, Zaralis and Lioukas, 2004; Wu, Lin and Chen, 2007).

Under certain circumstances, firms involved in exporting seem to prefer a pure competitive strategy over other strategic alternatives. For example, Namiki (1988) finds that among firms competing in export markets those following a single strategy – that is, either

differentiation focus or innovative differentiation – show higher performance. Aulakh, Kotabe and Teegen (2000) posit that the simultaneous use of both cost leadership and differentiation strategies is negatively related to 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.

Nevertheless, a hybrid strategy can prove to be superior to a pure strategy if the firm's organizational setting is such to allow a balance between the search for greater efficiency and the search for variation and new solutions. Ambidextrous organizations can successfully implement such organizational configurations (Tushman and O'Reilly, 1996). For example, the use of ambidexterity teams produces higher performance in the business unit, since it includes more differentiated personnel, diversity, higher skilled workers with higher autonomy (Haas, 2010). Moreover, the inclusion of networks structures with alliances facilitates the fit with the environment (Lechner, Frankenberger and Floyd, 2010). Thus, even though the managerial experience and effort required to perform the task may strain firms (Gibson and Birkinshaw, 2001), the effective integration of explorative and exploitative activities within the same organizational unit helps firms in developing different forms of innovation (Andriopoulos and Lewis, 2009) and yields higher performance (Raisch et al., 2009).

Furthermore, in the case of emerging economies, emerging market multinational enterprises have often the ability to leverage ambidexterity in order to offset their late-mover disadvantages and succeed in international expansion (Luo and Rui, 2009). Similar considerations can be extended to internationalization in general. If firms adjust their organizational structures to meet the requirements of ambidexterity and thus pursue hybrid competitive strategies, the decision to enter into a foreign market can be successfully

enhanced. Firms with superior resources and capabilities will be better able to pursue hybrid strategies and thus to enter into foreign product markets.

Hypothesis 2. The simultaneous exploitation of cost efficiency (cost advantage) and of scope economies (differentiation advantage) increases the likelihood of product market entry in foreign markets.

3. Empirical methodology

3.1 Sample

This study is based on a database that has been built by matching several sources of information. First, Spanish firms classified under the industrial activity "Manufacturing of Pharmaceutical Products" have been selected from the SABI dataset (Bureau van Dijk Electronic Publishing), over the period 1995-2004. The SABI dataset also provided information on firms' financial (e.g., sales, costs, profits, fixed assets) and structural characteristics (age, size, legal type). Second, sample firms' patent portfolios have been built by retrieving patents registered at the European Patent Office (EPO). Forty firms have filed at least one EPO patent over the sample period. Third, the 1998 version the of Who Owns Whom database revealed whether sample firms were independent legal entities or rather were belonging to business groups.[1] In 1998, 139 sample firms were not independent. Furthermore, firms having at least a subsidiary in the US (only two firms), or whose parent company was a firm located in the US (18 cases in total) were identified. To complement information on nationality of firms' parent companies, individual firms' web sites have been analysed. All firms that over the sample period were belonging to non-Spanish business groups (54 firms in total) were discharged and excluded from the final sample.

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

Finally, the trademark database of the US Patent and Trademark Office provided information on trademarks registered by sample firms. During the sample period, 18 firms have filed at least one trademark. Such information was used to determine the time of entry of sample companies into the US market. Given that the main purpose of this study is to determine antecedents of entry into the US market, the empirical analysis only focuses on characteristics and behaviour of sample firms *before* the entry. Therefore, neither the total number of trademarks, nor the characteristics of firms *after* the year of entry into the US market have been considered.

According to the sampling procedure, the final sample consists of an unbalanced panel of 454 firms over a period of 10 years (4,263 observations in total).

3.2 Measurement of variables

Dependent variable. Most studies on international business use as internationalization measure either a firm's level of export (mainly in terms of export intensity), or the amount of a firm's investments in production facilities located abroad. The study here follows an alternative, innovative approach and uses trademarks as an indicator of entry into the foreign market with a branded product. In this respect, such an indicator does not depend on the organizational form adopted to achieve internationalization.

Trademarks are instrumental in differentiating the attributes of goods and services in the marketplace (Mendonça, Pereira and Godinho, 2004) and in identifying the provider of a good by making a name visible (Schmoch, 2003).As a consequence, trademarks play a crucial role in marketing innovations and can be considered reliable measures of a firm's active presence in a market. According to the definition provided by the USPTO, "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" (www.uspto.gov/web/offices/tac/tmfaq.htm#DefineTrademark). Furthermore, a requirement to grant a trademark property right is that the mark must be actively used in the market, otherwise the trademark is cancelled. Thus, if a firm owns any trademark in a specific market, that firm has entered the market at least with the weakest entry mode. Obviously, a trademark does not provide any information on the details of the firm's presence and only signals the active presence of a firm in a market.

Note 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, and file requests for time extension. At regular intervals, the owner has to demonstrate that the trademark has used in commerce for five consecutive years and pay extension fees. Maintenance costs include attorney fees.

The dependent variable of this study is a dummy variable (ENTRY) that takes the value 1 if the firm has filed its first trademark at the USPTO (i.e., has entered the US market) in a specific year and 0 otherwise. During the period under study (1995-2004), 18 sample firms entered the US market with a product protected by trademarks (Table 1).

Table 1 here.

Core variables of theoretical interest. A first patent-based variable (TECH_CAPABILITIES) is the time-variant stock of a firm's EPO patents filed during the sample period, divided by the sales of the company during the same period of time. This measure represents a proxy of the company's overall innovative capabilities, given its size.[2]

[2]The use of patents as indicators of technological capabilities 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 (Griliches, 1990; Henderson and Cockburn, 1994; Pavitt, 1985).

A second variable (SCOPE_ECONOMIES) has been built by computing the Herfindhal index of the different technological patent classes in which the sample firms own patents (Ndofor, Sirmon and He, 2011). 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.

With regard to the cost efficiency measure, the variable INV_EFFICIENCY has been obtained 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 approximates a firm's average cost in a given year and 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. The analysis includes several controls. The firm's amount of fixed assets (FIXED_ASSET) represents a control for firm size. Firm's age (AGE) has been calculated as the difference between the year of foundation and each year of the sample period. Firm's profitability (Return on Assets – ROA) assesses the firm's ability to generate financial resources that might be used for plans of multinational expansion (Tseng et al., 2007).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), the analysis also includes a dummy time invariant variable (CORPORATION). The variable takes the value 1 in the case the firm opted for a *SociedadAnonima* legal form. Similarly, the variableGROUP_98accounts for the firm's group structure and takes the value 1 if the firm was part of a business group in 1998. In order to capture the effect of firms' experience in

commercializing trademark-protected products,[3] we create the variable CTM that measures the number of European Community Trade Marks registered in Europe by a firm in a given year. The CTM-ONLINE database (http://oami.europa.eu) revealed the number of Community Trade Marks registered by sample firms at the European Office for Harmonization in the Internal Market (OHIM) over the sample period. In total, 121 firms obtained at least one Community Trade Mark in 1995-2004, with a few companies filing more than one hundred trademarks. This also represents a proxy of the internationalization propensity of Spanish companies inside the European Union. Finally, the variable EXCHANGE_RATE measures the yearly values of Dollar / Spanish *Peseta* exchange rates and takes into account time effects.

Table 2 reports the variables' descriptive statistics and correlation matrix.

Table 2 here.

4. Results

4.1 Descriptive analysis

Before discussing the results of the main econometric estimations, some descriptive statistics highlight the different behaviour and characteristics of firms that have entered the US market and those firms that have not. Table 3 illustrates how the two groups of firms do possess different characteristics. Firms having entered the US market possess more patents and present a cost advantage with respect to the other group of firms (lower INV_EFFICIENCY). Furthermore, such firms have patented in a wider number of technological classes (i.e., they show a slightly higher degree of technological diversification

[3] The authors thank an anonymous referee for her suggestion to include in the analysis a measure of firms' propensity to register trademarks in countries different from the United States. Given that the sample consists of Spanish firms, trademarks registered in Europe (Community Trade Marks) represent a control of firm's propensity to make use of trademarks at home.

– lower SCOPE_ECONOMIES),are larger in size, and engage in more trademarks in Europe(even though the differences along the latter three dimensions are not statistically significant). Sample firms are older: age, in this respect, might signal higher accumulated experience that turns out to be useful to enter a foreign market. They also show a higher profitability and they belong to a business group with higher probability. Their main legal form is public corporation. In sum, Table 3 suggests that firms that have entered the US market possess superior technological capabilities, a cost advantage, and higher accumulated experience.

Table 3 here.

4.2 Econometric analysis

The empirical estimation employs a hazard model that estimates the hazard rate, namely the probability of market entry 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 and represent 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, that is the risk set (Blossfeld and Rohwer, 2002).

Following earlier works on firm survival in industry population (Dobrev, Kim and Carroll, 2002; Giarratana and Fosfuri, 2007; Lin, 2010; Sorenson, 2000), this study adopts a

piecewise exponential model specification that does not make any strong assumption on time dependence. Given the time periods, this model is 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).

Table 4 reports the results of the estimations. While Model 1 only contains control variables, the other models gradually include core explanatory variables. In order to assess how the interaction between scope economies and cost efficiency affects firms' behaviour, Model 7 adds the interactive term SCOPE_ECONOMIES * INV_EFFICIENCY.

Overall, estimation outcomes provide support to the hypotheses. As predicted by Hypothesis 1, TECH_CAPABILITIES is always positive and significant in all the specifications. SCOPE_ECONOMIES and INV_EFFICIENCY are always negative, even though both variables are significant only in Model 7, when including the multiplicative effect. This result confirms hypothesis 2 and denotes that a requirement for the model is to include the joint effect of the two strategies. Therefore, 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 4 here.

Model 7 reveals a counter-intuitive joint effect of scope economies and cost efficiency. Contrarily to expectations, 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 findings better, Table 5 reports the estimates of the multiplier rate of entry, conditional on different values of INV_EFFICIENCY and SCOPE_ECONOMIES. A multiplier rate of 1 suggests that a variable has no effect on the entry rate, while a multiplier rate higher than 1 implies that a particular level of a variable increases the chances of entry. Table 5 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(1.134) and of SCOPE_ECONOMIES (0.500): M = exp (– 9.637 * INV_EFFICIENCY – 13.174 * SCOPE_ECONOMIES + 9.502 * INV_EFFICIENCY * SCOPE_ECONOMIES) / exp (– 13.174*0.500– 9.637*1.134 + 9.502 * 1.134*0.500). First, note that for all the levels of INV_EFFICIENCY except the one corresponding to the 90% of the distribution, an increase in the value of SCOPE_ECONOMIES (i.e., a decrease in the degree of patent diversification) reduces the hazard of entry. Similarly, for any value of SCOPE_ECONOMIES, an increase in the value of INV_EFFICIENCY reduces the entry probability, Only for firms that have a bad performance in terms of cost efficiency (high levels of INV_EFFICIENCY), an increase in patent concentration raises the probability of entry. This result captures the entry of firms with a high degree of technological specialization and with the lowest cost performance, such as firms having developed breakthrough innovative drugs that are the results of costly radical and specialized research (Gans and Stern, 2003). Figure 2 represents this effect.

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Table 5 and Figure 2 here.

Table 5 and Figure 2 suggest that entry decisions based on the simultaneous exploitation of cost advantage and technological diversification 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. The effect of SCOPE_ECONOMIES is much smaller than that of cost efficiency. For very high levels of cost inefficiency, no patent concentration can completely compensate a cost disadvantage (the level of the multiplier remains below 1). Therefore, the ambidexterity is a workable hypothesis, except for firms with the worst cost efficiency.

5. Conclusions

This study analyses how technological capabilities and cost efficiency affect foreign market entry decisions of the population of Spanish pharmaceutical firms. Results show that patent intensity, technological diversification and the level of firms' cost efficiency explain entry in the US market with a branded product. Below a certain threshold of productivity, a patent concentration strategy slightly compensates an inefficient cost strategy. Nevertheless, the multiplier effect remains monotonic decreasing. Overall, the main contribution that this study offers to the internationalization literature is that, contrary to previous findings (Aulakh et al., 2000; Namiki, 1988; Salavou and Halikias, 2009), it shows that hybrid competitive strategies based on the simultaneous exploitation of cost efficiency and scope economies maximize the likelihood of entry into foreign markets. Thus, technological capabilities and cost efficiency represent key antecedents of successful internationalization decisions.

In terms of managerial implications, these findings may help managers identify the key factors needed to elaborate effective internationalization. In innovation-based sectors like pharmaceuticals, strong technological capabilities allow firms to exploit scope economies and

eventually to engage in foreign market entry. Given the cumulative nature of technological development (Pavitt, 1990), long-term investments in R&D and innovative activity are often needed to guarantee the creation of a sufficiently broad and consistent technological base. 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 benefit and cost advantages. A hybrid strategy appears superior to a pure competitive strategy. But only ambidextrous organizations – those that are able to mitigate the tensions of exploitation of current capabilities with exploration of new domains – can effectively pursue hybrid strategies. Nevertheless, this result is not always confirmed. Very cost inefficient firms might result better off by concentrating their innovative activity on a limited technological field, maybe because this choice allows them 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, the study here partly confirms the results obtained by a previous work on the localization choices of Spanish MNEs (Galan, Gonzalez-Benito and Zuniga-Vincente, 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.

With regard to the empirical methodology, a related contribution of this study is about measurement. Trademarks filed in the Trademark Office of the host country represent a novel measure of foreign activity. Being representative of entry in a foreign country with branded products, trademarks cover different entry modes, from export to FDIs. In turn, the analysis of firms' entry decisions by means of this novel indicator is based on the underlying

assumption that each firm freely chooses the entry mode according to the level and complexity of its resources and capabilities, and according to the perception of the risks associated to the entry in a specific country. Future research on the internationalization of SMEs can then benefit from the use of this indicator to overcome the lack of data on sales in foreign markets and related investments.

This paper has clearly some limitations. First, our sample is derived from the Spanish pharmaceutical industry that has its particular characteristics in terms of size and specialization. Further works should check if results hold in different national contexts and industries. Second, this paper suggests that a meaningful explanation of why some firms are successful in simultaneously pursuing cost efficiency and differentiation lies in their ability to manage ambidextrous organizations. However this assumption is not empirically tested. An extension of this work would thus be to include specific moderators of ambidexterity in the empirical model. Finally, this study does not address how much firms' market entry was profitable. In most cases, entry in an international market could be easy but survival not. Matching entry data with performance data on foreign entry could be ideal to test if resources and capabilities that favour the international market penetration account also for the profitability and the success of the entry. Indeed, moving this research a step further requires studying antecedents of firms' performance and assessing whether internationalization decisions produce positive effects on firms' sales and profits. This goal raises interesting strategic concerns that future research will address.

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Table 1. Time distribution of entry

Year	# firms that not entered	# firms that entered	Total
1995	432	3	435
1996	430	2	432
1997	428	2	430
1998	427	1	428
1999	425	2	427
2000	423	2	425
2001	423	0	423
2002	420	3	423
2003	420	0	420
2004	417	3	420
Total	4,245	18	4,263

Table 2. Variables' descriptive statistics and correlation matrix

	Mean	Std. Dev.	1	2	3	4	5	6	7	8	9	10	11
1. ENTRY	0.00	0.06	1.00										
2. TECH_CAPABILITIES	0.00	0.00	0.02	1.00									
3. SCOPE_ECONOMIES	0.99	0.06	-0.04	-0.05	1.00								
4. INV_EFFICIENCY	2.07	9.63	-0.01	0.00	0.01	1.00							
5. FIXED_ASSET	4039.38	15929.95	0.02	0.00	-0.26	0.00	1.00						
6. ROA	4.52	29.25	0.01	-0.01	-0.02	-0.06	0.01	1.00					
7. AGE	19.12	16.38	0.05	-0.03	-0.12	-0.04	0.22	0.04	1.00				
8. CORPORATION	0.56	0.50	0.05	-0.01	-0.08	0.02	0.16	0.07	0.32	1.00			
9. GROUP_98	0.21	0.41	0.03	-0.01	-0.16	0.02	0.22	0.10	0.14	0.22	1.00		
10. EXCHANGE_RATE	152.79	20.99	-0.03	-0.03	-0.01	0.01	0.01	0.02	-0.01	-0.08	-0.04	1.00	
11. CTM	0.14	1.68	0.08	-0.01	-0.02	-0.01	0.22	0.01	0.06	0.06	0.08	0.01	1.00

Table 3. Mean comparison of firms' characteristics among firms/years

	Entry		
Variable	**No**	**Yes**	**Difference**
DUMMY_PATENTS	0.048	0.444	-0.396 **
	(0.00)	(0.12)	(0.12)
# OF PATENTS	0.175	2.833	-2.659 †
	(0.02)	(1.46)	(1.46)
SCOPE_ECONOMIES	0.991	0.928	0.063
	(0.00)	(0.04)	(0.04)
IIN_EFFICIENCY	2.071	1.209	0.861 **
	(0.18)	(0.07)	(0.19)
FIXED_ASSET	4018.602	7906.053	-3887.451
	(292.35)	(2547.61)	(2564.33)
ROA	4.486	10.192	-5.706 *
	(0.54)	(2.18)	(2.25)
AGE	19.069	31.611	-12.542 **
	(0.25)	(3.76)	(3.77)
CORPORATION	0.563	0.944	-0.381 **
	(0.01)	(0.06)	(0.06)
GROUP_98	0.209	0.389	-0.180
	(0.01)	(0.12)	(0.12)
CTM	0.135	2.167	-2.031
	(0.02)	(2.05)	(2.05)

†p<0.10, *p<0.05, **p<0.01.

Table 4. 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	-6.6E-06	-6.6E-06	-7.1E-06	-7.7E-06	-8.0E-06	-7.7E-06	-4.6E-06
	(9.2E-06)	(9.2E-06)	(9.3E-06)	(8.6E-06)	(8.8E-06)	(8.6E-06)	(9.7E-06)
ROA	0.012	0.011	0.014	0.013	0.015	0.012	0.012
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
AGE	0.023 †	0.022	0.023 †	0.020	0.020	0.020	0.019
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
CORPORATION	1.677	1.671	1.763	1.679	1.753	1.760	1.805
	(6.28)	(6.24)	(7.38)	(6.40)	(7.34)	(7.42)	(7.93)
GROUP_98	0.218	0.201	0.206	0.069	0.066	0.064	0.004
	(0.76)	(0.75)	(0.76)	(0.78)	(0.78)	(0.78)	(0.78)
EXCHANGE_RATE	3.593 **	3.602 **	3.578 **	3.601 **	3.590 **	3.593 **	3.593 **
	(16.53)	(16.68)	(16.84)	(16.63)	(16.90)	(17.01)	(16.94)
CTM	0.056 *	0.056 *	0.056 *	0.060 *	0.060 *	0.059 *	0.057 *

	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
YEAR DUMMIES	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Explanatory variables:							
INV_EFFICIENCY		-0.161				-0.167	-9.637 *
		(0.19)				(0.20)	(0.00)
TECH_CAPABILITIES			416.206 **		400.105 *	403.135 *	403.946 **
			(8.9E+182)		(9.0E+175)	(1.9E+177)	(4.2E+177)
SCOPE_ECONOMIES				-2.773	-2.625	-2.607	-13.174 *
				(0.14)	(0.17)	(0.17)	(0.00)
SCOPE_ECONOMIES *							
INV_EFFICIENCY							9.502 *
							(6.1E+04)
Number of observations	2940	2846	2838	2938	2836	2835	2835
Log pseudo Likelihood	12.807	13.284	13.584	13.658	14.355	14.483	14.837

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

Table 5. Multiplier rates for entry

	INV_EFFICIENCY					
	Min	**10th cent**	**30th cent**	**50th cent**	**70th cent**	**90th cent**
SCOPE_ECONOMIES	*0.00*	*0.93*	*1.03*	*1.13*	*1.30*	*1.97*
0.50	252.19	2.72	1.64	1.00	0.45	0.02
0.60	67.71	1.76	1.17	0.79	0.41	0.03
0.75	9.42	0.92	0.71	0.55	0.37	0.07
0.90	1.31	0.48	0.43	0.38	0.32	0.16
1.00	0.35	0.31	0.31	0.30	0.30	0.27

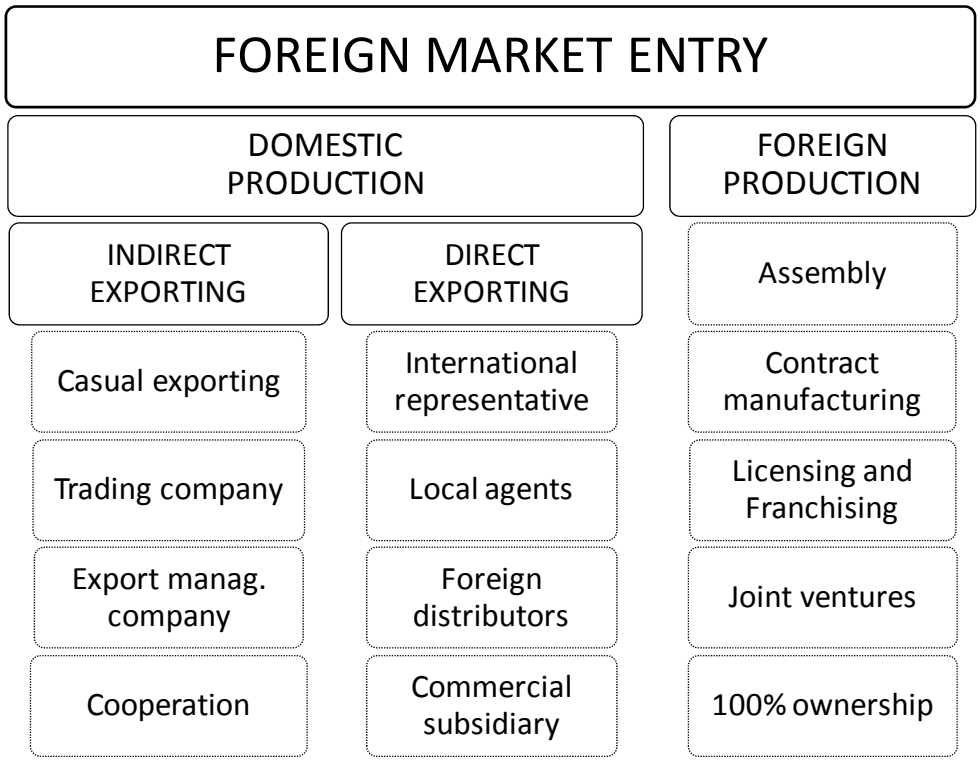

Figure 1. Modes of product entry market

Source: adapted from Terpstra and Sarathy(2001)

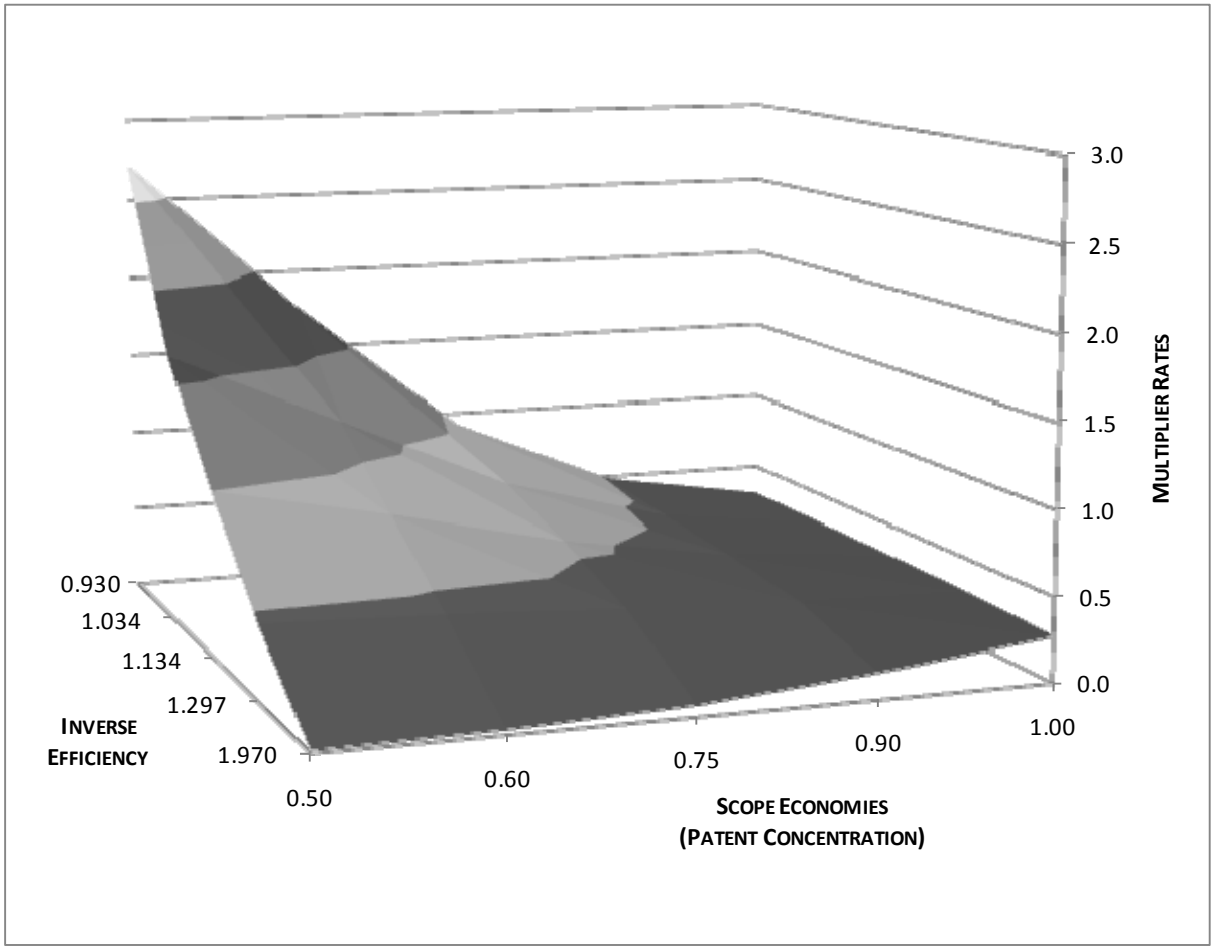

Figure 2. Multiplier rates for entry

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