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Entrepreneur's Resources, Technology Strategy, and New Technology–Based Firms' Performance

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This study is based on the configuration approach and argues that the new technology-based venture's performance depends on how well the entrepreneur's resources allow the chosen technology strategy to be executed, in other words, the fit between the resources and the strategy. The authors study this idea by using a sample of 175 Spanish new technology-based ventures. The results indicate that the fit between the chosen technology strategy and the entrepreneur's resources explain the firm's performance, when this is measured through Foreign market performance. That fit is also related to the technology-based firm's financial results and generic and domestic performance.

Código JEL: F23 (Multinational Firms; International Business); L25 (Firm Performance); L26 (Entrepreneurship).
Keywords: Technology-based firms (TBFs), new venture strategy, technology strategy, pioneer strategy, new venture performance, financial performance, strategic performance.

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ENTREPRENEURS' RESOURCES, TECHNOLOGY STRATEGY, AND NEW TECHNOLOGY–BASED FIRMS' PERFORMANCE

Introduction

Although literature on new technology-based firms (NTBFs) states that entrepreneurs' human and social resources endowments are critical for NTBFs (Cooper, Gimeno-Gascon, and Woo 1994; Elfring and Hulsink 2002), as they provide these firms with distinctive capabilities (Feeser and Willard 1990) that are needed for good performance (Colombo and Grilli 2005, 2010; Park and Bae 2004), studies empirically identifying the factors that explain the performance of these new ventures have obtained divergent results. For example, previous works show that some of the entrepreneurs' resources – e.g., heterogeneity of experience in technical and managerial areas, size of venture team – have a positive influence (e.g., Aspelund, Berg-Utby, and Skjevdal 2005). However, other studies show that they have a negative effect (e.g., Newbert, Kirchhoff, and Walsh 2007), and yet others show no effect at all (e.g., Kakati 2003). So, it should be asked, *what is the effect of entrepreneurs' human and social resources endowments on a NTBF's performance?*

In addition, as NTBFs are '[…]new start-up businesses formed individually or by a group of founding entrepreneurs' (Aaboen, von Koch, and Löfsten 2006: 955), which are independent, owner-managed, small or medium-sized enterprises (SME), and with the characteristic of operating in a high-tech industry (Storey and Tether 1998), the technology strategy is one of the most important factors in their performance (Oh, Cho, and Kim 2015; van de Vrande, Vanhaverbeke, and Duysters 2011; Zahra 1996; Zahra, Nash, and Bickford 1995). However, empirical studies have found divergent results with respect to the influence of this strategy on performance. For example, indicators of the strategy, such as the use of radical technology and innovation or the search for first-mover advantages, have shown positive effects on the performance (e.g., Aspelund, Berg-Utby, and Skjevdal 2005), but also negative effects

(Oh, Cho, and Kim 2015), as well as no effect at all (Kakati 2003). Therefore, a new question arises: *what is the effect of the technology strategy on a NTBF's performance?*

Answering these research questions requires new research. To fill this research gap, we propose that two issues must be considered, as they can enhance our comprehension of the effect of human and social resources and the technology strategy on the performance of NTBFs: (1) the consequence of selecting strategies without having the required resources to implement them and, accordingly, *the need to incorporate the fit approach into the research*; and (2) the ways of measuring the performance of NTBFs, and particularly *the need for using strategic and financial indicators of performance*.

Firstly, entrepreneurs usually pursue opportunities without regard for the resources under their control (Stevenson and Jarillo 1990), so they might face strong challenges in keeping their ventures profitable after choosing a given strategy (Ndofor and Priem 2011; Shrader and Siegel 2007). As a gap between resources and strategy may exist, a different approach to studying resource-performance and strategy-performance relationships is necessary. The fit approach offers a useful alternative because it proposes that the better the alignment between a firm's given strategy and some of its resources, the better the firm's performance will be (Edelman, Brush, and Manolova 2005). In addition, as the lack of any relevant resource may negatively affect the implementation of the strategy (Finney, Lueg, and Campbell 2008), and different perspectives for studying fit exist (Venkatraman 1989), research into fit should benefit from the use of comprehensive approaches. In this respect, the configuration perspective of fit is useful for studying the multiple resources that must fit the chosen strategy (Venkatraman 1989), but this approach of fit has still not been used for studying NTBFs. A configuration is a "multidimensional constellation of conceptually distinct characteristics that commonly occur together" within the firm (Meyer, Tsui, and Hinings 1993: 1175) and that combine the chosen strategy and those resources needed for its implementation,

leading to better-performing organisations that resemble the ideal combinations proposed by theory (Doty, Glick, and Huber 1993).

Secondly, and with respect to how the performance of NTBFs must be measured, there is no consensus among scholars (Murphy, Trailer, and Hill 1996). While studying TBFs and NTBFs, previous studies have tried to explain the firms' financial performances (e.g., Shrader and Siegel 2007). These measures may be important for NTBFs, but they are not necessarily sufficient, as these firms display great heterogeneity in the time required for technology development (Aspelund, Berg-Utby, and Skjevdal 2005). The financial results could be initially poor for a NTBF that makes a large investment in R&D (Zahra, Nash, and Bickford 1995) and offers an innovative product, with sales that are initially low (Walsh, Kirchhoff, and Newber 2002). In the case of NTBFs, and because they operate in high-tech entrepreneurial environments with frequent ground-breaking changes (Chorev and Anderson 2006), strategic performance measures become relevant (Fernhaber, McDougall-Covin, and Shepherd 2009). Particularly important is the geographic scope of activity. If geographic scope is achieved only locally, the high investment in R&D that the chosen technology strategy entails could be difficult to recover (e.g., Crick and Spence 2005; Spence and Crick 2006), and so negatively affect the financial performance. However, it is also true that in cases where international scope is successfully reached, profits associated with this overseas expansion may be negative for a time as the initial investment needed to enter foreign markets may entail high costs for a new, internationalising firm (Lu and Beamish 2004). These circumstances might confound research conclusions on the fit effect and authors suggest that, whenever possible, performance should be measured across several dimensions (Durand and Coeurderoy 2001; Murphy, Trailer, and Hill 1996).

On the basis of the above, we *explore whether the NTBF's financial and strategic performance is determined by the degree of fit between entrepreneurs' resource endowments*

and the needs of the chosen technology strategy. We provide empirical evidence from 175 NTBFs in Spain to test these ideas. Spain is a suitable setting for this research since many NTBFs based there are successfully competing and have international scope. Our research work offers the following, principal contributions: (1) it provides a first step in the study of fit from a configuration approach for the setting of NTBFs; and (2) it allows us to understand not only the relationships between entrepreneurs' resources and the technology strategy (as a configuration) with financial results, but also with strategic performance.

Theoretical foundations

The technology strategy of NTBFs and venture performance

Strategies are the ways in which firms relate to their environment (Porter 1985). There are different strategic decisions that an entrepreneur must make in order to guide the NTBF's actions, among which the technology strategy is particularly important because it displays the most significant differences across NTBFs (Aspelund, Berg-Utby, and Skjevdal 2005). Since new ventures often face resource constraints (Atuahene-Gima, Li, and De Luca 2006), they must seek advantages by embracing emerging technologies as the core component of their competitive strategies (Walsh, Kirchhoff, and Newber 2002). They must be able to find or create a market for innovative products that satisfy unmet needs; in this market there will be no incumbent firms offering direct competition (Atuahene-Gima, Li, and De Luca 2006). They can also enter existing markets with innovations based on disruptive technologies (Walsh, Kirchhoff, and Newber 2002).

According to Zahra (1996), the technology strategy clarifies, among other things, the company's choices on: being a technological pioneer or a follower, amounts of investment in internal R&D, and the degree of emphasis on incremental and radical R&D. Specifically, entrepreneurs that choose to be pioneers develop a technology that is innovative in the market and used by their firm, while followers adopt standards and improve products initiated by

pioneers (Utterback 1994). According to Zahra, Nash, and Bickford (1995), the 'technology pioneer' strategy is the creation, use, and successful commercialisation of technology through innovative products/services. This conceptualisation combines developing the technology with commercialising it in the market, as other authors suggest (e.g., Park and Bae 2004; Zahra 1996).

The literature discusses the possible advantages and disadvantages of the pioneer strategy in terms of demand and cost implications (Boulding and Christen 2008) with respect to the follower one. Among others, one of the main advantages is that disruptive ideas usually provide differentiated and technologically superior products (Utterback 1994) and a reputation as a leader (Zahra, Nash, and Bickford 1995). Cost-side advantages include pre-emption of factor inputs as the NTBF is often able to close early negotiations with suppliers more favourably than later entrants can (Boulding and Christen 2008). Thus, new ventures can use first-mover advantages to outperform incumbents (Park and Bae 2004; van de Vrande, Vanhaverbeke, and Duysters 2011). The disadvantages of pioneering include a higher risk in terms of the functionality of the resultant product or timely acceptance because of customer resistance (Zahra, Nash, and Bickford 1995). Thus, they embrace the challenge of demonstrating market potential and providing evidence for forecasted profits (Walsh, Kirchhoff, and Newber 2002), which are necessary if financing for the new entrepreneurial project is to be obtained. On the other hand, followers can sometimes quickly imitate the main characteristics of products and exploit them much more cheaply than the pioneers, and hence the NTBF's first-mover advantages may not be sustainable (Ruiz-Ortega and García-Villaverde 2010). Accordingly, Bantel (1998) states that the choice of a suitable technology strategy, either pioneer or follower, is critical for the viability of the new venture.

It should be noted that the pioneer strategy may create or destroy value (Zahra, Nash, and Bickford 1995: 20). Although general strategic thinking seems to support the idea that being

the first in the market leads to competitive advantages, Boulding and Christen's (2003) evidence shows that, on average, it leads to profit disadvantage. For example, Oh, Cho, and Kim (2015) found that 'first-mover' high-tech firms had negative correlations with sales and profits, whereas Kakati's (2003) study showed that relevant aspects related to the pioneer strategy did not differentiate between successful and unsuccessful NTBFs – e.g., the fact that the products were in the early stage of development; the creation of a new market/segment. However, Aspelund, Berg-Utby, and Skjevdal (2005) found that in cases where NTBFs developed a somewhat pioneering technology, firm failure was diminished. In comparison, and referring the follower strategy, some works show that followers might reach a higher level of performance as they enter after the initial market has been created by pioneers, and so technological and commercial uncertainties have been solved (García-Villaverde and Ruiz-Ortega 2006), whereas others found that later entrants achieve a lower level of performance (see summary of empirical papers on first- late-movers advantages in Lieberman and Montgomery 1998).

These conflicting results may be related to the resources NTBFs can marshal in order to implement the chosen strategy (Park and Bae 2004). In the case of pioneers, to sustain the advantage generated by a pioneer strategy (Boulding and Christen 2003); in the case of followers, to identify unsatisfied market needs and the way to meet these needs through making improvements in incumbents' products with attributes that allow the consumer to compare them directly with those already existing (García-Villaverde and Ruiz-Ortega 2006). Hence, although some previous works study direct strategy-performance relationships, a more suitable procedure for understanding the implications of the chosen technology strategy is to assume that it is likely that no direct strategy-performance link exists and that the technology strategy will only contribute to the NTBF's performance in cases where the firm has the requisite resources to implement the chosen strategy (Boulding and Christen 2003). Therefore, the identification of the endowment of entrepreneurs' resources that enable the successful

implementation of the technology strategy, either pioneer or follower, is critical in order to orientate NTBFs' decisions.

Entrepreneurs' resource endowments and venture performance

Resources encompass all assets, capabilities, processes, and knowledge controlled by firms (Barney 1986; Edelman, Brush, and Manolova 2005). In the case of NTBFs, the competence-based view (e.g., Prahalad and Hamel 1990), frequently described from a resource perspective (Schriber and Löwstedt 2015; Walsh and Linton 2001), argues that the distinctive capabilities of these ventures are closely associated with the knowledge and skills of their founders (Colombo and Grilli 2005, 2010; Feeser and Willard 1990): the entrepreneurs' technological competencies and managerial capabilities – to expand upon this distinction see Marino (1996) and Newbert, Kirchhoff, and Walsh (2007). Specifically, technological competencies refer to the ability to apply scientific and technical knowledge in order to develop products and processes (Schriber and Löwstedt 2015); managerial capabilities refer to the skills, knowledge, and experience required to manage the complexities of the NTBF (Eisenhardt and Schoonhoven 1990). Therefore, educational specialty, level of education, and professional background are relevant characteristics of the collective human capital of a management team and condition the successful implementation of the decisions made by them (Zarutskie 2010). In particular, the fact that the entrepreneurial team is better qualified in technology-related areas (Colombo and Grilli 2005, 2010; Shrader and Siegel 2007; West III 2007) is said to be critical to the NTBF's implementation of the technology strategy (Lee, Lee, and Pennings 2001). The entrepreneurs' managerial capabilities are also determining qualities (Colombo and Grilli 2005, 2010; Kakati 2003; Shrader and Siegel 2007) because they have to be able to position the products offered by the NTBF in domestic and/or foreign markets. However, the direct and positive effect of these resources on the venture's performance has not always been empirically found. For example, Newbert, Kirchhoff, and Walsh (2007) found that NTBFs founded upon

technological competencies tend to perform better than firms founded on managerial capabilities.

In addition, Prahalad and Hamel (1990) consider that ventures can benefit from network ties, since they can use them to learn core competences from partners. In particular, social resources are embedded within personal and business networks (Seibert, Kraimer, and Liden 2001), which encompass members with different backgrounds and sets of experience (Stam, Arzlanian, and Elfring 2014), and hence can help entrepreneurs to locate much-needed resources (Birley 1985) and gain access to them (Florin, Lubatkin, and Schulze 2003). Of course, social resources may also have something to do with the entrepreneurs' managerial abilities to develop and maintain agreements and obtain valuable resources from their social networks – such as complementary technology, valued advisory and financial resources (Anderson, Dodd, and Jack 2010; Davidsson and Honig 2003). Indeed, partners contribute to the NTBF's performance by offering their resources and capabilities, but it will be dependent on the entrepreneurs' managerial abilities in resourcing (Lahiri and Kedia 2009). Given that NTBFs face resource constraints because of their liability of newness (Atuahene-Gima, Li, and De Luca 2006) and deal with the dynamic nature of the technological environment (Ruiz-Ortega and García-Villaverde 2010), entrepreneurs need to join social and business networks (Anderson, Dodd, and Jack 2010) from which they can obtain the help they need to successfully implement the technology strategy. Valued social resources provide NTBFs access to suitable partners so that critical resources can be reached. In particular, Elfring and Hulsink (2002) analyse NTBFs and identify investment and technology partners as critical assets that condition the venture's survival since these partners may offer the start-up further access to financial resources, advice, complementary technology, and production know-how, among other forms of support. However, the direct and positive effect of social resources on the NTBF's performance has not also always been found. For example, Lee, Lee, and Pennings (2001) found

that investment partners, such as venture capitalists, positively affected the technology-based start-up's performance while technology partners, such as universities or research institutes, were not significantly associated with such performance. Yet Arthurs and Busenitz (2006) found that venture capital backing has no significant effect on the NTBF's performance. Moreover, in this study, venture capitalists with greater experience in terms of the number of boards on which they serve negatively condition the NTBF's performance.

A potential reason of these conflicting results is that no direct resource-performance link exists and that a human and social resources endowment only has potential value in helping the firm to implement strategic actions as Ketchen, Hult, and Slater (2007) suggest.

The fit between entrepreneurs' resource endowments and the chosen strategy

Although, from resource-based view (Barney 1986), it would be expected that entrepreneurs should choose those strategies requiring resources they have to hand or to which they have access, Zahra, Korri, and Yu (2005) point out that entrepreneurs make their decisions based on both rational and non-rational elements. For this reason, entrepreneurs might choose strategies for which they lack critical resources and hence face strong challenges in keeping their ventures profitable (Ndofor and Priem 2011; Shrader and Siegel 2007). As the resulting gap between resources and strategy may condition the NTBF's performance, the fit approach must be considered as it offers the opportunity to introduce such a gap into the models that aim to understand the NTBF's performance.

Fit can be understood as the alignment between strategy and the internal elements of the firm (Venkatraman and Camillus 1984). Venkatraman (1989) identified three conceptual approaches to conceive of fit that may have an effect on a firm's performance: fit as moderation, fit as mediation, and fit as profile deviation. The first suggests that the impact that resources have on the firm's performance varies across strategies (e.g., the work of Shrader and Siegel

2007) and the second specifies the existence of an intervening mechanism (the strategy) between the resources and the performance (e.g., the work of Edelman, Brush, and Manolova 2005). These two approaches have conceptual limitations as they examine fit between strategy and a particular element of a firm (as a dyad), so omitting the nature of systemic interaction (Barth 2003; Venkatraman 1989). Accordingly, Venkatraman and Camillus (1984) warn about such studies, since effective implementation of strategy requires congruence among a range of internal elements and the strategy. Since the absence of any critical resource may harm the execution of a strategy (Finney, Lueg, and Campbell 2008), new research based on more complex approaches of fit is necessary.

The configuration approach of fit avoids these limitations. However, except for the work of Ndofor and Priem (2011), which analyses ventures started up by immigrants, previous literature on entrepreneurship and SMEs, including NTBFs, has never used this approach. The configuration approach proposes superior performance for organisations that resemble an ideal type proposed by theory (Wiklund and Shepherd 2005), with superior performance being attributed to the internal consistency, or fit, among the forms of factors relevant to the organisation (Doty, Glick, and Huber 1993). Each ideal type is a theoretical construct used to represent a holistic configuration of organisational factors (McKinney 1966) – e.g., the accumulation of all human and social resources needed to implement the chosen strategy. From this approach, the fit is conceptualised as the degree to which a firm adheres to a theoretically defined ideal profile, so allowing "[…] a researcher to specify an ideal profile and to demonstrate that adherence to such a profile has systematic implications for effectiveness" (Venkatraman 1989: 434).

Hypotheses development: NTBF's ideal configurations and venture performance

The configuration approach of fit offers the opportunity to identify the resources needed to implement the technology strategy and explore the effect of the resulting configurations

(resources and strategy) on the NTBF's performance. In particular, it can be expected that several combinations of human and social resources will generate a high level of performance in configurations where the technology strategy is involved, which is coherent with the assumption of equifinality in the configuration approach (Ndofor and Priem 2011). According to this, there are multiple, equally effective, organisational forms (Doty, Glick and Huber 1993) because "a system can reach the same final state [e.g., the same level of organisational effectiveness] from differing initial conditions and by a variety of paths" (Katz and Kahn 1978: 30). However, as it is not well-known how resources interact with each other and with the strategy within a configuration to enable the venture performance to be achieved effectively (e.g., Miller 1981), the identification of such configurations is a challenging task. In the case of NTBFs, and because these ventures operate in high-tech entrepreneurial environments with frequent ground-breaking changes (Chorev and Anderson 2006), authors claim that the successful implementation of the technology strategy, either pioneer or follower, requires relevant human and social resources (Cooper, Gimeno-Gascon, and Woo 1994; Elfring and Hulsink 2002). Figure 1 shows a map of possible NTBFs' profiles (see in Appendix I details of how we built it). In the map, cells IV.2, IV.3 and IV.4 show ideal configurations that may maximise NTBFs' performances, as we discuss below.

(Insert Figure 1)

Cell IV.4 includes NTBFs that follow a pioneer strategy, looking to be the first in the market by embracing and commercialising emerging technologies (Walsh, Kirchhoff, and Newber 2002). In other words, they pursue first-mover advantages (e.g., superior products, reputation as a leader) to outperform other incumbents (Park and Bae 2004; van de Vrande, Vanhaverbeke, and Duysters 2011). Previous literature suggests that high levels of all resources are necessary to guarantee such advantages (Finney, Lueg, and Campbell 2008) – otherwise the follower strategy should be most appropriate. However, not all combinations of resources will

generate a better performance in cases where the technology follower strategy is implemented. Cells IV.2 and IV.3 show configurations that can guarantee performance.

In cases where any of these resources included within an ideal configuration fail, as they are interlinked (Miller 1981), dysfunctionalities can be expected and the technology strategy will not be appropriately implemented, so it will negatively affect the NTBF's performance. For example, in configurations IV.2, IV.3 and IV.4, if the team of entrepreneurs lacks either managerial capabilities or technological competencies, the fit will decline. First, entrepreneurs with a greater level of managerial capabilities – but medium or low technological competence – will have a good understanding of market needs and the ability to deliver a product to customers (Newbert, Kirchhoff, and Walsh 2007). However, if they do not have the high technological competences necessary to create huge new markets through breakthrough innovations – in the case of pioneer strategies – or to improve existing incumbents' products with attributes that allow consumers to compare them with those already existing – in the case of follower strategies – (García-Villaverde and Ruiz-Ortega 2006), caution can emerge. Thus, greater levels of managerial capabilities could guide the entrepreneurs who take on the great risk associated with a NTBF (Nesheim 1997) to delay the venture's internationalisation until its position in the domestic market is consolidated. As a result, strategic performance – in terms of the geographic scope of activity – will decline and, in all likelihood, with it, financial performance, due to the lower sales associated with the smaller size of the local market. Alternatively, in cases where entrepreneurs are technically well equipped – but medium or low in managerial capability – they may have an overly optimistic view of the market potential of their technologies (Shrader and Siegel 2007). However, if they lack realistic knowledge of the market, their pioneer or follower products may face low demand and generate a worse strategic and financial performance than in cases where entrepreneurs have both managerial capability and technological competence. This may be the case because although the technological

competence is critical, without a well-conceived strategy there is little hope for the firm being able to rapidly develop consumers' preferences (Ruiz-Ortega and García-Villaverde 2010) in multiple domestic and international markets (Weerawardena *et al.* 2007), as well as garner a sustained advantage from being the first-mover (Walsh and Kirchhoff 1998) or being the late-mover (García-Villaverde and Ruiz-Ortega 2006), consequently negating the attainment of a high level of strategic and financial performance. Therefore, technological competence and managerial capability must be present in any ideal configuration for NTBFs. However, these human resources variables are not enough per se to ensure the NTBF's performance. Human resources facilitate new ventures sales and profitability only in conjunction with an adequate level of appropriate social resources (Davidsson and Honig 2003). In the case of the NTBF, it may require access to valuable partners that provide the required support (Elfring and Hulsink 2002) as discussed below.

In the case of the pioneer strategy, greater access to (1) scientific and technical support and (2) managerial and financial support is necessary (configuration IV.4). However, in the case of the follower strategy, we propose that one of them can be missing, but never both. Thus, IV.1 is not considered an ideal profile because, given the liability of newness and the dynamic nature of the high-tech environments, NTBFs will be unlikely to successfully implement any technology strategy without some external support (Elfring and Hulsink 2002). Specifically, access to technology partners are said to help the NTBF to capture explicit and tacit technological knowledge that complement its technical competences to implement the technology strategy (Walsh, Kirchhoff, and Newber 2002). However, as followers usually base themselves on industry standards and their R&D activities are expectedly less demanding (Lieberman and Montgomery 1998), their access to technological partners may be less relevant. This is especially true in cases where a NTBF has access to investment partners that provide funds and managerial support, such as venture capitalists (Sapienza, Manigart, and Vermeir

1996; Zarutskie 2010), and so may help the NTBF to deal with any technological challenge, for example, identifying suitable suppliers and providing capital to acquire the required technological resources via licenses or patents (configuration IV.2). Yet other ideal configurations may not require such partners. As financial institutions such as banks and leasing companies are usually prone to financing business projects that have less risk (Colombo and Grilli 2005, 2010), a follower may find it easier than a pioneer to obtain funding from them, so reducing the need to access investment partners that provide funds and managerial advice to develop highly risky projects. Configuration IV.3 takes into account this circumstance, which may be a feasible option in cases where the NTBF has greater access to technological partners, and so is not dependent on the deep financial resources needed to acquire the protected technologies through market transactions (e.g., patents) that investment partners would otherwise provide. Moreover, the lack of managerial support from investment partners may be to some degree compensated by advice regarding the use of technology, production know-how, and even legitimacy provided by technological partners in the eyes of potential financial institutions, all this facilitating the acquisition of funding from these more risk-averse institutions.

The interactions that take place between social resources, human resources, and the technology strategy within an ideal configuration are multiple and complex. Therefore, we choose a configuration and discuss these possible interactions as an example. Specifically, we focus on the configuration IV.4 because it is the one that most resources demand, and thus more interactions may be illustrated. In configuration IV.4 social resources are of great relevance because they may help to supplement entrepreneurs' education, experience, and financial capital, and hence amplify - but also mitigate - human resources effects on the new venture's performance (Bruderl and Preisendorfer 1998; Coleman 1988). For example, if the NTBF is lacking financial resources, and the entrepreneurial team does not have access to investment

partners, it may harm any attempt on the part of entrepreneurs with managerial capabilities and technological competence to implement the pioneer strategy. But the reverse direction of interaction may also take place. Although acquaintances offer entrepreneurs valuable contacts and support when relating, for example, to venture capitalists – as such partners provide financial and managerial support to mainly technology-based, growth-oriented new ventures (Fernhaber, McDougall-Covin, and Oviatt 2007) – NTBFs wishing to access those funds and having entrepreneurs with managerial capabilities and technological competence may aim at an early international scope in order to achieve the high levels of growth required by venture capitalists – otherwise, these partners may not provide the required support.

Finally, NTBFs will require complementary technology as part of their core technical competences, as it is unlikely these new ventures can be technologically aware and efficient regarding all the technical aspects the new product requires when implementing the technology pioneer strategy (Walsh, Kirchhoff, and Newber 2002). Such complementary technology may be sourced from technology partners. With the NTBF being novel, and therefore lacking in reputation, it needs the support of social resources to access key technological partners (Florin, Lubatkin, and Schulze 2003). This is of great relevance to the NTBF's performance because the outsourcing of some specific technological developments that are not at the core of the firm's technology generates superior profitability in comparison to choosing in-house development (Oh, Cho, and Kim 2015). Here, the entrepreneurs' managerial ability to develop and maintain agreements to obtain valuable resources, as well as their technological competence to identify what must be developed in-house or sought from technological partners, are key to implementing the pioneer strategy. In addition, the access to the support of investment partners that provide trust regarding the survival of the venture project because they support the project with managerial advice and funds is of relevance in attracting qualified technological partners. Obviously, the access to qualified technological partners, as well as the

entrepreneurs' managerial capability and technological competence, will be considered by potential investment partners in order to evaluate the NTBF's project and make a decision about counseling and funding.

As the previous interactions between resources and the strategy show several high-performing configurations, we propose:

H1. The better the fit between the NTBF and the theoretically derived ideal types for the technology follower strategy, the greater the venture performance will be, that is, in cases where the firm chooses the follower strategy and the entrepreneurs have:

(H1a) high technological competences and managerial capabilities (i.e., human resources), and high access to investment partners, albeit not to technology partners (i.e. social resources); or

(H1b) high technological competences and managerial capabilities (i.e., human resources), and high access to technology partners, albeit not to investment partners (i.e. social resources).

H2. The better the fit between the NTBF and the theoretically derived ideal type for the technology pioneer strategy, that is, in cases where the firm chooses the pioneer strategy and entrepreneurs have high technological competences and managerial capabilities (i.e., human resources), and high access to investment partners and technology partners (i.e., social resources), the greater the venture performance will be.

Methodology

Sample

We reviewed the literature and established the criteria for cataloguing a firm as a NTBF according to Storey and Tether's (1998) conceptualisation. A business venture can be regarded as a NTBF when: it has fewer than 250 employees (Eurostat 2008); is less than six years old

(Shrader and Siegel 2007); is not integrated into a corporate group (Spence and Crick 2006); and operates in a high-technology sector, following the OECD's (2001) classification of industries based on technology. Although we use the restrictive criterion of six years to catalogue a firm as new, according to Bantel (1998), Ruiz-Ortega and García-Villaverde (2010), and Zahra, Ireland, and Hitt (2000), we could have considered firms up to 10 years of age, as firms of 12 years have survived the liability of newness.

The sample consisted of 175 Spanish NTBFs that met the above criteria and were identified from the SABI database in 2008 (published by Bureau van Dijk). These firms have been operating for an average of 84.5 months (approximately seven years). The slight difference compared to the theoretical criterion is because the data available from the SABI database, retrieved in 2008, corresponds to the firms' situation in December 2006, whereas this fieldwork was carried out in 2009. This average age is slightly above the initial criterion of six years, but it is well below Zahra, Ireland, and Hitt's (2000) limit of 12 years. Furthermore, the sample firms had an average staff of 19.3 employees.

Measures

Information to test the hypothesis was gathered from a questionnaire – with the exception of that related to profits, which was compiled from a database. All the measures are detailed below.

Human Resources. The entrepreneurs' technological competencies and managerial capabilities (Marino 1996; Newbert, Kirchhoff, and Walsh 2007) have been regarded as the relevant resources available to NTBF's founders (Feeser and Willard 1990). In particular, Colombo and Grilli (2005, 2010), among others, measure them through the economic and managerial education, scientific and technical education, and work experience in management of the founding team. Accordingly, the human resources of the founders was operationalised

with the following indicators: (i) Fraction of founders that have a Degree in Business Administration or economics; (ii) Fraction of founders that have a Master in Science or Technology; and (iii) Fraction of founders that have previous work experience in management in a large firm. Specifically, we asked participants to specify the training and experience of the founding team using a 5-point scale, where 1 means that the fraction equals 0 (e.g., none has the Degree), 2 means that the fraction is less than or equal to 25%, 3 means that the fraction is less than or equal to 50%, 4 means that the fraction is less than or equal to 75%, and 5 means that the fraction is 100% (e.g., all the founders have the Degree). We used the responses in the ranked order and included the variables in our model, treating them as interval variables (numeric).

Social Resources. Following some previous works, social resources were approached in terms of business relationships/partnerships (e.g., Dai and Liu 2009; Florin, Lubatkin, and Schulze 2003; Prajapati and Biswas 2011) instead of focusing on the nature of the resources – the extent of social interaction or ties embedded within a network (Anderson, Dodd, and Jack 2010), number of valuable social contacts in ego's network (Seibert, Kraimer and Liden 2001). As suggested by Hormiga, Batista-Canino, and Sánchez-Medina (2011), the use of measures such as the number of hours dedicated by the entrepreneur to establishing and maintaining social relationships may be controversial because they are not equivalent to the quality of relationships themselves. Therefore, we follow the approach based on relationships/partnerships because it allows the suitability/quality of social resources for providing entrepreneurs with access to the necessary external support to start-up the NTBF to be clearly known. In the case of these firms, Elfring and Hulsink (2002) state that investment and technology partners facilitate the search of critical assets. Accordingly, respondents were asked about the social resources being operationalised with the following indicators: i) investment partners; and ii) technology partners. The answers are measured on a 7-point Likert

scale, where 1 means low and 7 a high level of support.

Venture strategy. This variable came from a survey question rated by the entrepreneurs who answered it. According to the conceptualisations of Zahra, Nash, and Bickford (1995) and Park and Bae (2004), that question was: My firm uses a technology that is innovative in the market, was developed by the firm and is commercialised by it (we are technology pioneers). Respondents were asked to classify the venture strategy as a pioneer strategy when these three conditions were satisfied. If at least one of these three conditions were not met, respondents had to classify their NTBFs as followers. Following previous authors, venture strategy is a dummy variable that equals 1 if the firm met the three conditions (uses the pioneer strategy), or 0 otherwise. Specifically, for distinguishing between pioneer and follower, Robinson and Chiang (2002) use a dummy variable from one item and Durand and Coeurderoy (2001) use dummy variables extracted from a categorical variable.

Performance. Past studies reveal that new venture performance is multidimensional in nature (Kakati 2003). Thus, some authors recommend the use of financial and nonfinancial indicators (e.g., Murphy, Trailer, and Hill 1996). In particular, we propose that the complementary use of strategic and financial measures of performance is important when researching NTBFs. In addition, authors recommend the use of subjective and objective measures when researching new ventures (Brush and Vanderwerf 1992; Murphy, Trailer, and Hill 1996). Several challenges in the research into NTBFs' performances justify the use of subjective measures: (1) Figures on performance indicators such as revenue or sales can significantly vary with the type of products/services commercialised by sample NTBFs or because of the mixed firm sizes (Batjargal 2003), resulting in growth indicators (instead of figures) offering more suitable measures for comparative purposes (e.g., Brush and Vanderwerf 1992; Zahra, Ireland and Hitt 2000); (2) standard growth measures such as growth in sales or in market share may also be unsuitable since NTBFs are heterogeneous in terms of the time

necessary for introducing their innovations into the market (Aspelund, Berg-Utby, and Skjevdal 2005); (3) market share growth may also be inappropriate for NTBFs using pioneering strategies, as they would reach the total market share (100%) only upon entering the market (Kakati 2003). As an alternative for dealing with all these limitations, entrepreneurs' satisfaction with the increasing of financial and nonfinancial indicators are useful for capturing the venture's growth (Robinson 1999; Vesper 1996; Watson, Stewart, BarNir 2003). Accordingly, eight variables were used to measure the NTBFs' results in this study. The first of these variables – the profits (earnings before taxes) – was obtained from the SABI database, which includes firms' annual accounts reported to the authorities, indicating the quantitative and secondary nature of this financial information. The remaining 7 variables were measured on a 7-point Likert scale, where 7 means total satisfaction with the strategic performance achieved by the NTBF. Specifically, the item is "Please indicate the extent to which you are satisfied with the following indicators regarding the growth of your firm: 1) sales growth in domestic market; 2) sales growth in foreign markets (international scale); 3) market share growth; 4) increase in number of foreign markets (international scope); 5) customer satisfaction; 6) success of the venture; and 7) expected growth". This last set of seven Likert scale variables was reduced to two hypothetical variables using factor analysis (Table 1). After applying the Harris-Kaiser oblique rotation method, the variance explained by Factor 1 and Factor 2 is 48.5 percent and 23.2 percent of the total variance, respectively. The results show that the Kaiser-Meyer-Olkin (*KMO*) Test and Bartlett's Test of Sphericity (χ^2) both offer satisfactory levels (*KMO*=0.748; χ^2=580.620***). Cronbach's alpha coefficient indicates that the scale used has internal consistency (0.802). The first factor loads high on variables dealing with generic and domestic issues, while the second factor loads high on variables dealing with foreign market issues. As all the firms in the sample are young and independent, we can say that the second factor refers to early internationalisation (e.g., Autio, Sapienza, and Almeida

2000; McDougall, Shane and Oviatt 1994).

(Insert Table 1)

Fit. To calculate the configurational fit variable between each NTBF in the sample and one of three ideal types theoretically identified, we followed the procedure suggested by Doty, Glick, and Huber (1993: 1248-1250) based on Euclidean distance, also used with some adaptations by Ndofor and Priem (2011: 802-803). To calculate the value of each fit, we first established the three ideal profiles, using for each a set of extreme values of each variable participating in forming the fit index and without reference to the dependent variable (i.e., strategic and financial performance), such as Venkatraman (1989) and Ndofor and Priem (2011) suggest. Specifically, the human resources variable was measured on a 5-point scale, the social resources variable was measured on a 7-point Likert scale, and the technology strategy using a dummy. Thus, the ideal profile for configuration IV.4 (see Figure 1) using the maximum theoretical values for each variable was established – 5 points in the case of each human resource, 7 points in the case of each social resource and "1" (pioneer) in the case of technology strategy. We proceeded in an analogous manner for configurations IV.2 y IV.3, but changing the values of the affected variables: technology strategy was established as "0" (follower), access to technology partners equaled to 1 point in the case of configuration IV.2, and access to investment partners equaled to 1 point in the case of configuration IV.3. In the data set, some observations reached maximum and minimum values. Next the fit variable for each venture was calculated from the NTBF's deviation from each theoretical and multivariate profile represented by each ideal type (Doty, Glick, and Huber 1993). Specifically, deviation was calculated as the average Euclidean distance between all the variables included in the configuration (see an example in Figure 2). Thus, each of the three fit variables (for configurations IV.2, IV.3 and IV.4) was measured as the opposite of the addition of all deviations of a NTBF's resources and strategy from the ideal type. Following Ndofor and Priem

(2011), we weighted variables within the configuration so that each human and social resource and strategy would contribute equally to the fit measure. Mathematically, the calculation is as follows: Let x_k is a variable measured on a Likert scale. Then, the square of the distance between venture j and the ideal profile i on variable x_k is

$$d_{ijk}^2 = (\frac{x_{ik}}{r_k} - \frac{x_{jk}}{r_k})^2$$

where r_k is the rank of variable x_k. Thus, if the venture fits the ideal type perfectly, then $x_{jk}= x_{ik}= x_{max}$ and $d_{ijk}=0$. If the venture does not fit the ideal profile and, for example, $x_{jk}=x_{min}$, then $x_{ik} - x_{jk} = x_{max} - x_{min} = r_k$ and $d_{ijk} = 1$, which is the maximum possible value for d_{ijk}. As the ideal type was measured with multiple variables, we calculated the deviation D_{ij} as the average distance along all relevant K dimensions. Mathematically,

$$D_{ij} = \sqrt{\frac{1}{K}\sum_{k=1}^{K} d_{ijk}^2}$$

The fit F was calculated as follows: $F_{ij} = 1-D_{ij}$. In other words, from the theoretically established ideal profile, the variable fit measured the similarity between each NTBF in the sample and the ideal profile. Its range is $0 \leq \text{fit} \leq 1$. When fit = 1, the firm exactly fits the ideal profile, and when Fit = 0, there is no coincidence between the firm's profile and the ideal one. We calculated fit in the same manner for the three studied configurations.

(*Insert Figure 2*)

Control variables. We controlled for respondent founder's age (in years) and gender (female=0, male=1), firm's age (in years), firm's size (the log of the number of employees, founders included), and level of venture innovation. We controlled for innovation with three items indicating whether the entrepreneur: emphasises differentiation based on innovation; emphasises R&D and continuous technological development; is satisfied with the relationship

between actual and expected number of patents granted since the firm's founding. These three criteria can be used to measure the venture's level of innovation (Shrader and Siegel 2007; Suzuki, Kim, and Bae 2002). Each item was measured on a 7-point scale, where 1 = totally disagree and 7 = totally agree, and they were reduced to one hypothetical variable using factor analysis. A principal components factor analysis was carried out (*KMO*=0.580; Bartlett's Test of Sphericity χ^2=94.160***; *N*=166), providing one factor that explained 60.05 percent of the variance and a Cronbach alpha of 0.633.

Data analysis

Hypotheses testing was done using ordinary least squares regressions, but first regressing technology strategy on the control variables and the entrepreneurs' human and social resources through a probit selection model. Technology strategy (i.e., pioneer or follower) may be endogenous if the decision to pursue or not to pursue the strategy is correlated with unobservables that affect performance. For example, if more able entrepreneurs are more likely to choose the pioneer strategy and their ventures therefore achieve – ceteris paribus – superior performance, then failure to control for this correlation will yield an estimated effect of strategy on performance that is biased up. The two-step correction procedure recommended by Heckman (1979) was therefore used. Let V_{ij} be the maximum attainable utility for entrepreneur *i* if he/she chooses strategy *j* (*j=1 or 2*). The central presumption would be that *i* would choose strategy 1 over 2 if $V_{i1}>V_{i2}$ and choose 2 over 1 if $V_{i2}>V_{i1}$. The utility function may be assumed to be a linear function of exogenous variables:

$$V_{i1} = \Sigma a_{k1} W_{ik} + v_{i1}$$

$$V_{i2} = \Sigma a_{k2} W_{ik} + v_{i2}$$

Then, V_{i1} will be greater than V_{i2} if $V_{i1}-V_{i2}>0$ and it will be less than V_{i2} if $V_{i1}-V_{i2}<0$. Suppose we let Z_i^* be this difference, then:

$$Z_i^* \equiv V_{i1}-V_{i2}=\Sigma(a_{k1}-a_{k2})W_{ik}+(v_{i1}-v_{i2})$$

We can simplify above equation by letting $\gamma_k=a_{k1}-a_{k2}$ and $u_i=v_{i2}-v_{i1}$, obtaining:

$$Z_i^* = \Sigma \boldsymbol{\gamma_k W_{ik}} - u_i$$

The choice perspective says that entrepreneur *i* chooses strategy 1 over 2 if $V_{i1}>V_{i2}$ or if $Z_i^*>0$. But this means that strategy 1 is chosen if $\Sigma \boldsymbol{\gamma_k W_{ik}} - u_i>0$, i.e., if $u_i<\Sigma \boldsymbol{\gamma_k W_{ik}}$. If Z_i, the observed strategy made by entrepreneur *i*, is equal to 1 when $Z_i^*>0$ and is equal to 0 when $Z_i^*<0$, then we are led naturally to a probabilistic statement:

$$P(Z_i=1) = P(Z_i^*>0) = P(u_i<\Sigma \boldsymbol{\gamma_k W_{ik}}) = \Phi(\Sigma \boldsymbol{\gamma_k W_{ik}})$$

$$P(Z_i= 0) = P(Z_i^* < 0) = P(u_i> \Sigma \boldsymbol{\gamma_k W_{ik}}) = 1 - \Phi(\Sigma \boldsymbol{\gamma_k W_{ik}})$$

Where $\Phi(\cdot)$is the normal distribution function. Next, we create the inverse Mills' ratio in the following way:

$$\widehat{\lambda_i} = \frac{\phi(\Sigma \gamma_k W_{ik})}{\Phi(\Sigma \gamma_k W_{ik})} for Z_i = 1 \; and \widehat{\lambda_i} = \frac{\phi(\Sigma \gamma_k W_{ik})}{1-\Phi(\Sigma \gamma_k W_{ik})} for Z_i = 0$$

Where $\phi(\cdot)$is the standard normal density function. In the second step, the resulting inverse Mills' ratio (Lambda) is used in the subsequent ordinary least square regression to estimate the NTBF's performance:

$$Y_i = \Sigma \beta_k \boldsymbol{X_{ik}} + \beta_\lambda \lambda_i + \varepsilon_i$$

Specifically, we estimated seven models, regressing the NTBF's performance on: (1) the controls; (2) the controls plus human and social resources; (3) the controls plus technology strategy (and Mills' ratio); (4) the controls plus human and social resources and technology strategy (and Mills' ratio); (5) the controls plus human and social resources, technology strategy (and Mills' ratio), and configurational fit for Profile IV.4; (6) the controls plus human and social resources, technology strategy (and Mills' ratio), and configurational fit for Profile IV.3; and (7) the controls plus human and social resources, technology strategy (and Mills' ratio), and configurational fit for Profile IV.2. The selection process for all the regressions was the Enter method.

In addition, initial analyses showed that the distribution of the error variable ε_i was

positively skewed (non-normality). The log transformation of the dependent variable ($Y_i' = \log Y_i$) corrected this problem. Moreover, in order to analyse the robustness of the multiple regression, we tested the possibility of increasing the robustness by eliminating the outliers. One way of detecting these outliers is through Cook's distance, which, when it is greater than 1, indicates that a sample individual is an outlier. Moreover, we tested Gaussian white noise through the four required conditions of regression analysis: (1) the error variable ε is normally distributed; (2) the mean value of the error variable is zero, i.e., E(ε)=0; (3) the variance of the error variable is Var(ε)=σ2, which is a fixed but unknown value (homoscedasticity); and (4) the values of the error variable are independent of one another, i.e, Cov(ε_i,ε_j)=0, for every i≠j.

Results

Sample characteristics

The average entrepreneur in our sample was 40 years old at the time of data collection. Concerning gender, 87.7 percent of our sample is male. 67.9 percent of the respondent founders has a Degree in Business Administration or Economics, and another 2.5 percent a Master in Science or Technology. 85.5 percent of the ventures operate in high-technology service sectors, whereas 14.5 percent operate in high-technology manufacturing sectors. With regard to social resources, 15.0 percent of the ventures have access to financial partners and 23.0 percent of the firms to technological partners. We found it extremely interesting that 36.7 percent of the NTBFs have some international activity, while 28.6 percent (47 observations) follow the technology pioneer strategy.

Table 2 presents the means, standard deviations, and correlations of the independent variables.

(Insert Table 2)

Hypothesis testing

In order to analyse the effects that the entrepreneurs' resource endowments and chosen strategy have on strategic and financial performance, several linear regression models were estimated (using as independent variables generic and domestic performance, foreign market performance, and earnings before taxes, respectively). The significant results came from linear regression models with the foreign market performance variable (Table 3). In column 1 (Model 0), we first report the results of the probit estimates of the selection equation. This model estimates the influence of the human and social resources on the choice of the technological strategy (1=pioneer; 0=follower), plus control variables. Results show that only two control variables have a significant influence on the choice of that strategy. These results suggest that entrepreneurs may choose strategies for which they lack critical resources, so facing problems in being successful in implementing such strategies. That is likely the reason why rational criteria related to the resource-based view (Barney 1986) can cause some difficulty when explaining the entrepreneurial process (Rae 2006) and so results are in concordance with Barth's (2003) and Stevenson and Jarillo's (1990) ideas referring the relevance that for entrepreneurs have intuition in the decision-making process. The inverse Mills' ratio (Lambda) was parametrically estimated through this probit model.

Let us now consider the Foreign market performance equations (Models 1 to 7). In these models, the analysis of variance is significant (*F statistic*), which means that the introduced research variables added prediction power. Note that Mills' ratio is always not significant, and so there is no emerging evidence of non-random selection of entrepreneurs across the different strategies. In other words, as Mills' ratio does not have a significant effect on Foreign market performance, it implies that firms pursing a pioneer strategy may not have unmeasured characteristics that influence venture performance. In addition, when comparing Models 1-7 to Model 0, except for venture innovation that is significant when testing one out of three fit effects

(Model 5 in Table 3), the rest of the variables that condition the NTBF's performance are not significant in the probit selection model.

We also tested the Cook's distance to analyse the robustness of the multiple regressions. The greatest Cook's distance found in the analysis was for case number 32 in the regression, including the configuration IV.4 effects: 0.12659, well below 1. With respect to the white noise error terms (Gaussian white noise), we tested the four required conditions. In our models, the mean value of the residuals is zero (condition 2 satisfied). The values of the skewness and the kurtosis are all in the interval [-2, 2], so condition 1 is satisfied. The value of the Durbin-Watson statistic is close to 2 in all the models. That means that there is strong evidence that the errors are uncorrelated (condition 4 satisfied). There are several methods of testing for the presence of homoscedasticity. We used White's General test (White 1980). The White test is computed by finding nR^2 from a regression of e_i^2 on $\hat{y}_i$, including a constant. This statistic is asymptotically distributed as chi-square with 1 degree of freedom. Since the computed values of nR^2 do not exceed the critical value of 6.635 (at the 1% level of significance), we accept the null hypothesis (the variance of the error variable is constant) and condition 3 is satisfied.

(Insert Table 3)

With respect to the results, Models 5 to 7 estimate the configuration effects of the three ideal profiles (IV.4, IV.3 and IV.2, respectively) where the complex fit variable is introduced. The previous Models, 1 to 4, show the direct effects of single and latent variables. Model 1 estimates the control variables effect. The NTBF's size and level of innovation positively condition the foreign market performance, it being the only effect of size identified in all the estimated models. Model 2 estimates the control variables and entrepreneurs' resources effects. As expected, the results do not support the existence of a direct relationship between the availability of human resources to the entrepreneurs and the NTBF's foreign market performance. These results are consistent with Davidsson and Honig's (2003) findings, who

found that human resources variables are not enough per se to ensure the new venture's financial performance, albeit our result extends this finding to strategic performance. In addition, access to investment partners provided by social resources shows an unexpected direct and positive influence on foreign market performance (Models 1 and 4). With regards to technology strategy (Models 3 and 4), the results suggest that adopting a pioneer or follower behaviour does not have a direct effect on performance.

In Models 5, 6, and 7, fit variables corresponding to configurations IV.4, IV.3 and IV.2 are introduced, respectively. As mentioned above, the configuration approach allows us to estimate how a set of resources and the chosen strategy affect the venture's performance using only one variable (Fit). This variable encompasses the ideal combination of all the resources necessary to implement the chosen technology strategy, either the pioneer (Model 5) or the follower (Models 6 and 7). So, if we look at Model 5, the fit variable is positive and significant ($p<0.05$). It implies that firms with a high level of all the human and social resources and implementing a pioneer strategy (in other words, NTBFs that fit to the theoretically defined configuration IV.4) will achieve a higher level of performance. For Model 6, which estimates the fit effect in the case of configuration IV.3 that involves the follower strategy, we also find a positive and significant effect of fit. It means that NTBFs with a high level of all the human resources in the entrepreneurial team and access to technology partners, although having low access to investment partners, will also reach a higher level of performance. These results are consistent with the concept of equifinality in the configuration approach (Ndofor and Priem 2011), as they suggest that firms may reach a higher level of performance by a variety of paths (Katz and Kahn 1978). Model 7 does not find a significant effect for fit, so indicating that configuration IV.2 either is not an empirically confirmed ideal type or that this configuration is not able to generate a higher level of performance with respect to the measures used in this study. Thus, our results support H1b and H2, but not H1a.

Finally, in the regression models that estimate the fit effects (Models 5, 6 and 7), the individual influence of resources and strategy differ greatly from Models 2 to 4, in which only direct effects were estimated. Contrasting with the control variables that are not included in the compound fit index, and which almost keep their effect when estimating direct or configuration effects, several resources and the type of strategy, included in the fit index, change their influence. In particular, resources and/or strategies greatly needed as part of a configuration tend to show an individual effect on performance that is negative and significant in models that estimate the configuration effect. It might suggest that when a resource/strategy is estimated as part of a configuration that gathers its positive effect, its possible individual effect estimated in the same model is unlikely to confirm a universally direct, positive relationship to venture performance, as happens and is argued in Ndofor and Priem's (2011) work. It is worth highlighting the effect of access to investment partners in Model 6. Configuration IV.3 does not require greater access to investment partners and hence this variable retains its potential to positively condition foreign market performance.

Post hoc analysis: comparing Generic and domestic performance and financial results between aligned and non-aligned firms for ideal configurations

We explored the possible positive relationship of fit variables to performance measures that were not significant in the linear regressions estimated (profits and generic and domestic performance). We carried out a number of difference of means tests between aligned and non-aligned firms. These tests can only provide evidence on the possible relationship between the variables, but not on causes, although they help us to understand how key variables in this study are related. To do this, our sample was split into two sub-samples for each ideal profile (configurations IV.2, IV.3 and IV.4): aligned firms are those for which *Fit* is higher than 0.5, the range of this variable being $0 \leq \text{fit} \leq 1$, and non-aligned firms are those for which *Fit* is lower than 0.5.

Firstly, we expected aligned ventures to have higher profits (Earnings before taxes) than non-aligned firms (Table 4). Results indicate that the profits are higher in the aligned firms than in the non-aligned ones, whatever the ideal configuration considered (p-value<0.05). Furthermore, tests provide evidence of a significant difference in generic and domestic performance between aligned and non-aligned firms for configurations where the follower strategy is involved (IV.2 and IV.3), with the aligned NTBFs demonstrating a higher level of performance. These results suggest the need to fit any of the ideal configurations identified in theory in order to generate profits, and the suitability of fitting ideal configurations for the follower strategy to increase generic and domestic performance. Although these contrasts provide evidence on the relationship between the variables in this study, it is reasonable to say that they are not sufficient to support H1a, H1b and H2.

(Insert Table 4)

Discussion and Conclusions

This work explores a configuration approach of fit in order to shed some light on the existing inconsistency in the literature on NTBFs regarding the effect of resources and the technology strategy on a venture's performance. Our findings suggest the need to identify the set of specific human and social resources that must be under the control of entrepreneurs for a successful implementation of a given strategy, and so positively affect the NTBF's strategic and financial performance. Otherwise, although having a strong position in terms of human and social resources not specifically associated with a given strategy can surely nurture the firm, this will not be enough to guarantee a good performance when implementing such a strategy. This contribution is quite relevant for NTBFs, as entrepreneurs tend to pursue opportunities without considering the resources they actually control. In the case of the technology pioneer strategy, our findings suggest that the entrepreneurial team must have high levels of at least the following resources to hand: knowledge of business administration, knowledge about

technology, experience in large firms, and access to technology and investment partners, all of them included in the fit variable. In the case of the technology follower strategy, results suggest that entrepreneurs must have to hand the same resources as pioneers with the exception of access to investment partners, which can be low. In addition, our findings indicate that if any of the aforementioned required resources are missing or weak, the technology strategy will not guarantee superior performance in foreign markets (and, in all likelihood, will not guarantee a superior financial performance either). This general contribution of our work can be useful for both technology entrepreneurs and academics. The former may consider these findings as a guideline when deciding which technology strategy to implement. The latter may consider them an incentive to focus their works on the identification of new configurations in order to gradually determine the set of specific resources that are needed to implement each strategy, and so offer more qualified advice to entrepreneurs aspiring to start up a NTBF.

In addition to this overall contribution, more concrete additions are offered to the literature on NTBFs as this work also extends those focused on the new venture's financial performance to include strategic performance, particularly in terms of the scope and scale achieved in international markets by NTBFs, and so it can be related to early and rapid internationalisation. Firstly, our findings show that only when the NTBF resembles two of the ideal configurations identified (IV.4 or IV.3) will it reach a high level of strategic performance in the international markets, and likely a superior financial performance. This is consistent with equifinality of venture performance – that is, different combinations of organisational factors can yield a similar level of performance (Ndofor and Priem 2011). Although we have not found the effect of fit on financial performance through robust statistical tests, but rather association tests (i.e., difference of means), this effect is expected to increase with time, once the new internationalised NTBF recovers its initial investment to enter foreign markets, and incomes derived from higher sales may result in higher profits (Lu and Beamish 2004). In addition, in

cases where the NTBF adopts any theoretical ideal type where the follower strategy is involved, it would likely also reach a high level of generic and domestic performance, with no evidence about this effect for the ideal type where the pioneer strategy is involved being found. The results suggest, for instance, that a NTBF with a high level of technological competences and managerial capabilities, but lacking either technological partners or investment partners and using a follower strategy, may absorb existing technologies and adapt them to successfully offer specific products in a segment of its local market. The firm may, in this way, achieve a higher level of performance than other NTBFs that compete in the same local market but do not fit to any ideal configuration where the follower strategy is involved. We advise that these findings, related to the fit effect on generic and domestic performance, are supported in a difference of means test, and so must be considered with caution. This set of theoretical contributions adds to those provided by previous studies based on direct, mediating and moderating effects that show divergent results regarding the effect of resources and strategy on venture performance. Coherently, our findings respectfully suggest the need for academics to reconsider, when possible, the methods used to examine antecedents of the NTBF's performance, since results obtained from direct, mediating and moderating analysis might serve to confound conclusions.

Secondly, our findings suggest that although the financial performance measures, such as profits, are highly relevant as they condition NTBFs' long term survival, they can be insufficient when studying NTBFs as these ventures need time to develop consumers' preferences and increase sales during the first years of the venture lifespan, so that it might seem that financial performance is not conditioned by fit – this only being true in the early stages of the NTBF. However, strategic performance measures in terms of the geographic scope and scale of activity are clearly conditioned by fit from the early stages of the NTBF, this being relevant as this performance indicator informs us about some of the NTBF's sources of competitive advantage that are responsible for its future developmental progress. In particular,

the relevance of early and rapid internationalisation is associated with the recovery of the high investment in R&D that the NTBF usually makes. In addition, as previous research on early and rapid internationalisation of the new venture is rather inconclusive and researchers emphasise the importance of finding new theoretical frameworks for explaining this phenomenon that challenges the dominant logic of time-based experience and the accumulation of resources as prerequisites for internationalisation (e.g., Autio, Sapienza, and Almeida 2000; McDougall, Shane and Oviatt 1994; Weerawardena *et al*. 2007), our work also makes a contribution to this literature, as it finds some conditions under which early and rapid internationalisation takes place.

Finally, our study found that only a single resource – the investment partner variable – has a direct effect on the NTBF's strategic performance when that effect is estimated through the conventional linear regression models that, as mentioned above, have provided conflicting results in previous literature. This effect remains in the model that estimates configuration effects for profile IV.3, so showing that investment partners can have an influence additional to, and independent of, the fit effect in configurations where a high level of access to this social resource is not required for NTBFs to achieve a superior performance in the international market. This implies that the more a NTBF fits profile IV.3 (which doesn't require greater access to investment partners), the better its foreign market performance will be, with this performance also benefiting from access to investment partners in cases where these exist. As access to investment partners, either being a part of a configuration (fit effect) in profile IV.4 or considering it individually in the case of profile IV.3, has a positive effect on foreign market performance, our results show the relevant role of investment partners in the NTBF's international expansion, irrespective of the chosen technology strategy. This finding suggests that: (1) introducing an innovative product, either as part of a pioneer or follower strategy, in multiple foreign markets while the firm is still young requires a high level of financial resources,

and this can be greatly facilitated by the help of investment partners; (2) NTBFs willing to access funds from investment partners may aim early on at an international scope in order to achieve the high rate of growth required by venture capitalists (Fernhaber, McDougall-Covin, and Oviatt 2007); (3) venture capitalists that invest in a NTBF have a very strong reason to support the venture's performance (Lee, Lee, and Pennings 2001), and so they provide NTBFs not only with financial resources, but also with managerial support (Sapienza, Manigart, and Vermeir 1996), which helps the NTBF to internationalise.

Practical implications. Our general findings may be relevant for technology entrepreneurs. Of interest to them may be our results on the importance of taking into account the set of specific human and social resources under their control before choosing a particular technology strategy. In fact, the NTBF's founders are free to decide on different strategies. Our study identifies some key resources that NTBFs need in order to successfully implement technology pioneer and follower strategies and achieve a superior performance. Specifically, the NTBF's founding team must be aware of the existence of two strategic configurations related to the technology strategy with which to align themselves in order to reach superior foreign market performance. In addition, generic and domestic performance might be enhanced by two different resources-technology follower strategy fits, and financial performance by all three theoretical configurations identified in this work.

Limitations and future research. This research suffers from some limitations that, when considered, might help advance future research. First, the context of analysis, which is limited to NTBFs located in Spain. Thus, the results could be conditioned by the characteristics of these technology-based sectors and the geographical context. Consequently, the authors recommend that these results be examined and compared to other sectors and geographical locations. Second, as high-tech development is quite a broad category and different industry conditions exist that can affect the choice of technology pioneer or follower strategy, the use of industry

controls in the estimated models seems recommendable. However, because of the high number of different and specific activities of sample NTBFs, the use of these controls was not possible in the current work. Third, although the choice of which technology strategy to pursue (i.e., pioneer or follower) is a decision made by the entrepreneurs, successfully implementing the chosen strategy may be dependent not only on the fit of the NTBF to any ideal configuration, but also on other incumbents' resources and actions. Therefore, new research might benefit from extending the current research by introducing information about competitors (e.g., product innovativeness, budget for I+D, participation in research centers). Fourth, since the pioneer strategy is highly risky for the NTBF as it provides high growth opportunities, but also high probability of failure, future research should benefit from longitudinal methodologies for analysing a NTBF's performance in regard to time evolution. This also applies to NTBFs that implement a follower strategy and that must be kept profitable while competing with pioneers and other followers in order to survive in the long term. This provides researchers with the opportunity to include, in addition to successful firms, those that do not survive after using a given technology strategy in the sample with different levels of fit. These analyses must encompass both financial and foreign market performance. Finally, further research studying the performance of firms may also try to elucidate the relevance of the fit between entrepreneurs' resources and the chosen strategy compared to entrepreneurial traits, such as alertness, proactivity and commitment, hard work, and entrepreneurial flair.

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Appendix I. Building a theoretical map of possible configurations for NTBFs

As, according to the competence-based view (e.g., Prahalad and Hamel 1990), the founders' knowledge and skills are the distinctive capabilities of NTBFs (Feeser and Willard 1990) to present a theoretical map of NTBFs' possible profiles, we first developed a basic combination of entrepreneurs' technological competences and managerial capabilities (see Figure 1). Four cells (I to IV) show the combinations of low and high levels of human resources, with entrepreneurs nurtured more fully with such resources located in cell IV. However, these resources must be complemented with social resources to shape configurations able to guarantee an NTBFs success. Therefore, two other dimensions are added to build a more comprehensive map: access to investment partners that provide financial and managerial support and technology partners that offer scientific and technical knowledge. Hence, the basic combination is replicated four times in the extended chart, with 16 cells with possible combinations of resources emerging. Combinations I.1 to IV.1 are considered not to be able to shape an ideal configuration when a NTBF deals with the implementation of a technology pioneer or follower strategy because entrepreneurs lack some human resources, the support of the two types of partners, or both. Thus, the map shows three ideal configurations that potentially maximise NTBFs' performances: IV.2, IV.3 and IV.4. Although some ventures could survive with other profiles in Figure 1, such combinations cannot be considered ideal.

Table 1. NTBF's strategic performance: Factor analysis

Variables	Factor 1 Generic and domestic performance	Factor 2 Foreign market performance
Sales growth in domestic market	**.831**	-.206
Sales growth in foreign markets	.524	**.786**
Market share growth	**.793**	-.054
Increase of foreign markets	.465	**.820**
Customer satisfaction	**.606**	-.465
Success of the venture	**.858**	.176
Expected growth	**.695**	-.210
Kaiser-Meyer-Olkin Test	.748	
Bartlett's Test of Sphericity ($\chi 2$)	580,620***	
Explained variance	71.7%	
N	165	

***p<.01.

Table 2. Descriptive statistics and correlation matrix

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1. Founder age	--															
2. Firm age	.233***	--														
3. Firm Size (log)	.170**	.247***	--													
4. Innovation	.125	-.015	.033	--												
5. Degree in Buss. Adm.	.130*	0.073	.202**	.197**	--											
6. Master in Science	-.055	.021	.148*	.116	.103	--										
7. Management exp.	.257***	.001	.252***	.150*	.295***	.067	--									
8. Investment partners	-.155*	-.001	.233***	-.004	.240***	.017	.171**	--								
9. Technology partners	-.043	.158**	.143*	.234***	.068	.058	.038	.492***	--							
10. Fit (IV.4)	.117	.088	.343***	.352***	.552***	.402***	.490***	.594***	.521***	--						
11. Fit (IV.2)	.001	-.001	.277***	-.020	.635***	.493***	.553***	.413***	-.004	.522***	--					
12. Fit (IV.3)	.056	.079	.237***	.097	.579***	.559***	.499***	.178**	.311***	.534***	.844***	--				
13. Mills' ratio	.078	-.07	.026	.459***	.023	-.050	.170**	.065	.180**	.348***	-.193**	-.143*	--			
14. For. mark. perf (log)	-.032	-.05	.180**	.256***	.018	.048	.030	.166**	.169**	.213***	.057	.058	.178**	--		
15. Gen&dom. perf (log)	-.067	.028	.221**	.204***	.079	.091	-.073	.070	.112	.069	.034	.061	.020	.221***	--	
16. Profit	.076	.116	.516***	.047	.048	.017	.351***	.243**	.179*	.291***	.171*	.138	-.020	.069	.031	--
Mean	**40.06**	**7.031**	**2.096**	**.004**	**2.315**	**1.975**	**1.543**	**1.943**	**2.245**	**.165**	**.268**	**.280**	**.551**	**.571**	**1.336**	**45,485**
SD	**8.56**	**4.701**	**1.097**	**1.00**	**1.47**	**1.37**	**1.09**	**1.59**	**1.72**	**.133**	**.117**	**.111**	**.411**	**.505**	**.374**	**160,746**

Mean of dummy variables Founder gender and Technology strategy is .877 and .286 respectively.
*p<.10; **p<.05; ***p<.01.

Table 3. Direct and configuration effects on Foreign market performance

	Probit (Technology pioneer strategy)	OLS regressions						
	Model 0	**Model 1**	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**	**Model 7**
	Selection model	**Direct effects**	**Direct effects**	**Direct effects**	**Direct effects**	**Configuration effects (Profile IV.4)**	**Configuration effects (Profile IV.3)**	**Configuration effects (Profile IV.2)**
	Control variables + Resources	Control variables	Control variables + Resources	Control variables + Technology strategy	Control variables + Resources + Technology strategy	Control variables + Resources + Technology strategy + Fit IV.4	Control variables + Resources + Technology strategy + Fit IV.3	Control variables + Resources + Technology strategy + Fit IV.2
	Coefficient (χ^2 value)	**Coefficient (t-value)**	**Coefficient (t-value)**	**Coefficient (t-value)**	**Coefficient (t-value)**	**Coefficient (t-value)**	**Coefficient (t-value)**	**Coefficient (t-value)**
Constant	-1.704**	.747***	.771***	.797***	.676***	1.130***	.496*	.479*
	(5.90)	(3.80)	(3.39)	(3.81)	(2.88)	(3.59)	(1.93)	(1.81)
Control variables								
Founder age	**.027***	-.004	-.004	-.007	-.004	-.003	-.004	-.003
	(2.74)	(-.89)	(-.79)	(-1.39)	(-.66)	(-.55)	(-.66)	(-.58)
Founder gender	-.062	-.151	-.166	-.199	-.192	-.183	-.178	-.191
	(.02)	(-1.25)	(-1.31)	(-1.59)	(-1.50)	(-1.46)	(-1.40)	(-1.50)
Firm age	-.006	-.010	-.009	-.008	-.008	-.008	-.008	-.008
	(.04)	(-1.16)	(-1.05)	(-.88)	(-.92)	(-.94)	(-.89)	(-.94)
Size (log)	.153	**.093****	**.080****	**.092****	**.081****	**.078****	**.073***	**.072***
	(1.66)	(2.58)	(2.02)	(2.52)	(2.05)	(1.99)	(1.84)	(1.79)
Innovation	**.782*****	**.103*****	**.096****	.066	.070	**.088***	.077	.077
	(20.0)	(2.61)	(2.25)	(1.44)	(1.48)	(1.84)	(1.62)	(1.62)
Human resources variables								
Degree in Bus. Admin.	-.119		-.027		-.024	**-.113****	**-.109***	**-.112***
	(1.62)		(-.90)		(-.80)	(-2.22)	(-1.85)	(-1.76)
Master in Science	-.078		-.003		.002	**-.098***	-.090	-.091
	(.73)		(.10)		(.05)	(-1.79)	(-1.45)	(-1.38)
Management exp.	-.050		-.019		-.031	**-.136****	**-.124***	**-.132***
	(.20)		(-.49)		(-.76)	(-2.15)	(-1.81)	(-1.73)
Social resources variables								
Investment partners	.063		**.061***		**.063***	-.021	**.095****	-.008
	(.39)		(1.82)		(1.88)	(-.40)	(2.48)	(-.14)
Technology partners	.016		-.000		-.005	**-.071***	-.067	.030
	(.04)		(-.01)		(-.18)	(-1.71)	(-1.45)	(.84)
Strategic variables								
Technology strategy				-.053	-.076	**-.437****	.206	.202
(1: pioneer; 0: follower)				(-.48)	(-.68)	(-2.17)	(1.02)	(.96)
Mill's ratio				.197	.204	.181	.178	.193
				(1.57)	(1.58)	(1.42)	(1.38)	(1.50)
Configuration						**3.103****	**2.552***	2.694
Fit						(2.14)	(1.68)	(1.56)
No. of observations	**152**	**159**	**152**	**152**	**152**	**152**	**152**	**152**
Log likelihood	**-73.97**							
Durbin Watson		**2.121**	**2.031**	**2.093**	**2.034**	**2.010**	**1.998**	**2.017**
F		**3.53*****	**2.27****	**2.94*****	**2.11****	**2.35*****	**2.19****	**2.15****
R^2		**.103**	**.138**	**.125**	**.154**	**.181**	**.171**	**.169**
Final adjusted R^2		**.074**	**.077**	**.082**	**.081**	**.104**	**.093**	**.090**

*p<.10; **p<.05; ***p<.01.

Table 4. Comparing generic and domestic performance and profits between aligned and non-aligned firms for ideal configurations

Ideal profiles	Mean		*T*-test
	Non-aligned firms	Aligned firms	
IV.4 (*Pioneer strategy*)			
Generic and domestic performance	1.33	1.42	-1.044
Profits	35,337.75	326,902.50	-3.711***
IV.3 (*Follower strategy*)			
Generic and domestic performance	1.33	1.50	-2.214*
Profits	37,733.34	298,698.67	-2.868**
IV.2 (*Follower strategy*)			
Generic and domestic performance	1.32	1.51	-2.604**
Profits	35,118.66	384,113.00	-3.968***

*p<.10; **p<.05; ***p<.01.

Figure 1. Three theoretical ideal configurations for NTBFs

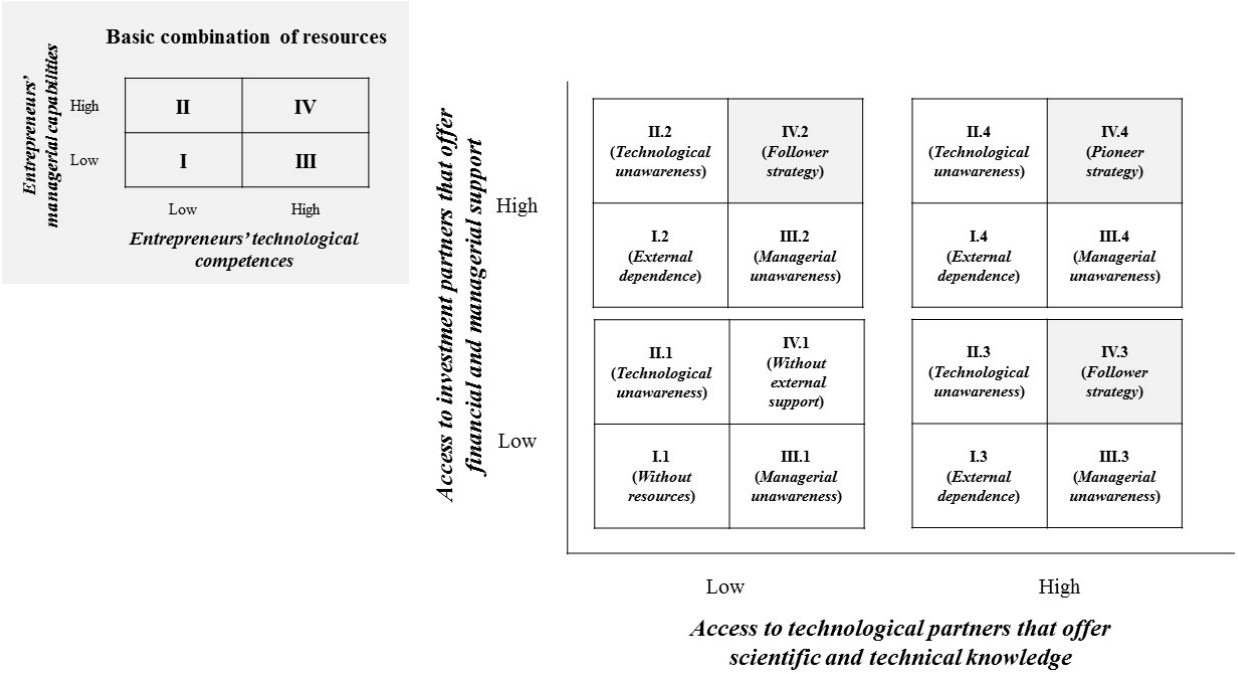
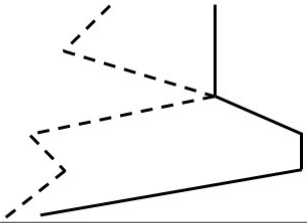


Figure 2. Procedure for calculating the configurational fit variable: An example

Variables	Maximum potential value	Min	Max
1. Degree in Business Administration	5		
2. Master in Science	5		
3. Maanagement experience	5		
4. Investment partners	7		
5. Technology partners	7		
6. Technology strategy (dummy, 1=pioneer)	1		



Ideal profile ---------- NTBF's profile

$$\underset{\text{(Average Euclidean distance)}}{\text{Deviation}_{1i}} = \sqrt{\frac{[(3-5)/4]^2+[(2-5)/4]^2+[(5-5)/4]^2+[(1-7)/6]^2+[(2-7)/6]^2+(0-1)^2}{6}}$$

Fit = 1- Deviation