

# Characteristics of entrepreneurs and public support for NTBFs

Felipe Rojas and Elena Huergo  
*GRIPICO-Universidad Complutense de Madrid\**

April 2014

## Abstract

This paper studies the role the characteristics of entrepreneurs as determinants of public financial support for New Technology Based Firms (NTBFs). Using a single database about the profile of Spanish technology entrepreneurs, we analyze the relationship between NTBF participation in the NEOTEC program run by the CDTI from 2001 to 2009 and four dimensions of the entrepreneurial team: its human capital, its link to the public system of R&D, its motivation at the time the company was created and the extent of its planning to initiate the business activity. Our results show that NTBFs founded by entrepreneurs who have less experience in management, have planned less, are more oriented toward growth and have closer ties to the public system of R&D are more likely to participate in the public aid program.

**Key words:** New Technology Based Firms, impact assessment, innovation policy

**J.E.L. Codes:** M13, H81, O38

\*Address for correspondence: GRIPICO (Group for Research in Productivity, Innovation and Competition). Dpto. Fundamentos del Análisis Económico I. Facultad de CC. Económicas y Empresariales. Universidad Complutense de Madrid. Campus de Somosaguas. 28223 Madrid. España. E-mails: [ferojas@ucm.es](mailto:ferojas@ucm.es); [ehuergo@ccee.ucm.es](mailto:ehuergo@ccee.ucm.es)

This research has been partially financed by the European Union Framework Programme 7 (Project SIMPATIC, GA No. 290597). Elena Huergo is also grateful to the CDTI for the data provided to carry out this research.

## I. Introduction

In recent decades, New Technology Based Firms (NTBFs) have been studied more because of their particular characteristics, being recognized for their fundamental role as a source of growth and generation of future employment (Storey and Tether, 1998). The main contribution of NTBFs to the strengthening of technological capabilities in intermediate economies would reside in their technological dynamism. In particular, three functions carried out by NTBFs as buyers, synthesizers and introducers of new technology can be highlighted (Fontes and Coombs, 2001): (i) the transfer of knowledge and technology from local academic research to the market; (ii) the acquisition of technological knowledge that is developed outside of the country and is combined with local knowledge and capabilities, giving rise to national competences; and (iii) the densification of technological and industrial networks in some fields where NTBFs act as technological intermediaries.

Along these lines, Licht and Nerlinguer (1998) emphasize that in Germany, NTBFs have generated indirect qualitative incentives for technological change through the transfer and diffusion of technology. Bade and Nerlinguer (2000) stress the role of German NTBFs as promoters of technological change and innovation in the 1980s. For Portugal, Fontes and Coombs (2001) demonstrate that NTBFs have contributed to strengthening technological capacity in the sectors they specialize in and improve the availability of new technological products. Lastly, Stam and Wennberg (2009), in their study on Holland, conclude that innovative start-ups might be an important focus for innovation policy, since they offer new nodes in innovation networks, which are added to the density and diversity of innovation system networks.

Because of these externalities of NTBFs, researchers have tried to identify the factors that make it difficult to create and develop them. Some of these factors are the characteristics of their founders, the technological environment the company works in, and especially their sources of financing. As such, some authors note that among founders there is usually little competence in company management tasks or, in general, few skills in non-technological areas (Fontes and Coombs, 2001). Also, it is essential to have an environment that supports the development of the scientific, technological and entrepreneurial base to generate an important flow of knowledge, technologies and production chains (in quality and

quantity) which can be transformed into high-impact innovations in the market (OECD, 2013). Finally, with regard to financial factors, small innovative companies face high capital costs (Hall, 2002), which are only partially mitigated by the presence of venture capital (Hall and Lerner, 2010).

Considering these difficulties for the development of NTBFs, public policy-makers have developed a set of support instruments for this type of company (Storey and Tether, 1998b). Among them we can highlight: (i) the creation of technology parks; (ii) the supply of doctorates in science and technology; (iii) services of technological consulting about NTBFs; (iv) financial support of NTBFs and (v) the promoting of relations between NTBFs and universities or research institutes, through company incubators, technological transfer offices and public research institutes (Lockett, et al., 2005). For the specific case of financial support, public policy includes subsidies as well as soft loans and public venture capital.

Surprisingly, there are few studies which analyze evaluation mechanisms by which public funds are allocated to NTBFs (Grilli and Murtinu, 2012). Two exceptions are the studies by Kösters (2010) and Cantner and Kösters (2012). For Kösters (2010), the novelty of the idea of business, the founders' ambition for the company to grow and the variables related to the human capital of these founders are not important for the allocation of subsidies in the eastern German state of Turingia, but the company's start-up capital is. That permits him to conclude that public policy is not contributing to alleviating the imperfections of the capital market. However, in the study done afterwards with data for the same region but considering new explanatory factors, Cantner and Köster (2012) find that the novelty of the idea and being an academic spin-off increase the chances of receiving public support.

The objective of this paper is to contribute to this debate by analyzing the role of entrepreneurial characteristics as determinants of NTBF participation in public systems of financial support designed especially for them. In particular, we provide evidence of Spanish NTBF participation within the framework of the NEOTEC program, created by the *Centro*

*para el Desarrollo Tecnológico Industrial*(CDTI), which is the main Spanish public agency with regard to R&D.<sup>1</sup>

In Spain there are still few studies that examine public financing of NTBFs in detail, fundamentally because of the difficulty of accessing detailed statistical information about this kind of company.<sup>2</sup> The data for this research come from a survey conducted by the CDTI in 2009 and 2010. The goal of this survey was to characterize the profile of the technological entrepreneur. This information has been completed with the information from *Sistema de Análisis de Balances Ibéricos* (SABI), which includes data on the sector of activity, geographic location and the year the company was founded.

To identify the determinants of participation in the NEOTEC program, we use a Probit model which includes different features of entrepreneurs and the NTBF. In particular, four different types of characteristics are considered: the human capital of the entrepreneurial team, the links of the NTBF and its founders with the public system of R&D, the motivations of the entrepreneurs at the time the company is created and the degree of previous planning. The results show that all these dimensions are important in explaining the probability of participating in the public aid program.

The rest of the paper is structured as follows. In Section II, the financial needs of NTBFs are briefly described. In Section III, the hypotheses with regard to founders' characteristics and their business plans that could determine participation in the public aid program are specified. In Section IV, the NEOTEC program and the data used are described. Afterwards, in Section V, the empirical model is presented and the results are discussed. Finally, Section VI presents the main conclusions.

---

<sup>1</sup> Although it has developed and matured in the last 20 years, there is still a deficit of venture capital for investments that include totals between 0.5 and 1 million euros (Del-Palacio et al. 2012). The public contribution of the CDTI and the Empresa Nacional de Innovación, S.A. (Enisa) has been important since the year 2005, intensifying in the years 2010-2012 in direct contributions as well as through public resources in private venture capital ([webcapitalriesgo.com](http://webcapitalriesgo.com)). As is explained in detail in Section IV, the NEOTEC program is one of the CDTI's basic resources in support of NTBFs.

<sup>2</sup> Some exceptions are the studies by Fariñas and López (2007), Fernández et al. (2007), Fernández and Hidalgo (2011) and Iglesias et al. (2012), although these studies focus on characterizing Spanish NTBFs more than analyzing the determinants of public support.

## II. The financing of NTBFs

Economics literature explains the financing deficit of innovating companies mainly by the presence of information asymmetry and moral hazard, which provoke a higher cost of financing R&D&I activities with respect to ordinary investment and a lower level of private external financing of these activities (Hall, 2002; Hall and Lerner 2010). In addition, the capital structure of innovating companies would present lower levels of leverage, because banks and other sources of private financing are reluctant to lend when the investment is concentrated essentially on intangible assets.

Although these conclusions can be generalized to innovating companies, these problems are even more evident in NTBFs, where the effect of the information asymmetries entails the problem of adverse selection, because the range of variation in the real quality of the project (unobservable) can be great between “good” companies and “lemons” (Himmelberg and Petersen, 1994).

Along these lines, there is ample empirical evidence regarding the biggest financing restrictions for small innovating companies. Delapierre et al. (1998) find for France that banks have little experience in evaluating NTBFs. Moreover, banking institutions feel that evaluation work is greater than it is in other entrepreneurial projects, and as NTBFs also entail a bigger risk, the reputation of bank managers is affected. This is why, for technology-based companies, using their own resources is considered the natural instrument for investment in high technology (Himmelberg and Petersen, 1994), making way for new investors insofar as they also provide non-financial competences. For example, in Italy, Giudici and Paleari (2000) note that NTBFs are financed mainly with internal resources, and secondly, with short-term debt from banks.

If more financing is needed, one alternative would be to resort to venture capital entities (Hall and Lerner, 2010). It is expected that they contribute to the development of the company, given that they have good information on the specific sectors they invest in, they have experience in active supervision of the entrepreneurial team’s business plan and they contribute with a “signal effect” about other sources of financing (Giudici and Paleari, 2000).

Obviously, there are different types of venture capital entities, for example, generalist and high-technology. Lockett et al. (2002) note that the former face greater costs on due diligence, especially in the first stages of the NTBFs as a result of a demand for more information. This entails a higher cost of valuation among generalist venture capital entities. Once the investment is made, greater supervision of the NTBFs is needed. Another type of classification is to distinguish between public and private venture capital entities.

As for the most important factors when deciding to invest in a company, Ramón-Llorens and Hernández-Canovas (2010) note that, given the heterogeneity that exists among venture capital entities, the criteria will depend on the characteristics of these entities. That is, their goals will condition the evaluation of and criteria for selecting new proposals. In particular, public entities would have non-financial criteria, like policy and employment, as part of their objective function. But among public venture capital entities devoted to high-technology companies, the objective function stresses as selection criteria characteristics related to the management team and the company product, because its selection criteria rest on the experience of the team that evaluates the proposals. This experience allows them to become involved in early-stage investments, with an important role in orienting the product and market.

In this context, public financial support of small, high-technology companies would be justified at least for the following reasons: 1) the social return of spending on R&D exceeds the private return, in such a way that public intervention would help correct a market failure; 2) in aid programs, the public agency implicitly certifies these companies, reducing the information asymmetries, so public subsidies for small technology-based companies transmit information to other potential investors (Lerner, 1999).

### **III. Entrepreneurs and public aid for NTBFs**

In this section, we review the literature about NTBF founders'<sup>3</sup> characteristics that can influence participation in public aid programs for their creation or development. This

---

<sup>3</sup> Colombo and Grilli (2005) define founders as all persons who contribute capital and have a managerial or administrative post in the new company.

participation is the result of two decisions. First, the entrepreneurial team decides whether or not to apply for public financing. Second, the public agency decides whether or not to grant the aid, conditional on the application received. Theoretically, both decisions are influenced by different factors. However, the determinants of each decision cannot be studied separately in this research, as information about the rejected applications is unavailable. This is an important restriction because it prevents us from separating the variables that influence the self-selection of the entrepreneurial team from the variables related to the selection criteria of public organizations. These criteria can typically be designed to stimulate specific groups such as national champions (picking-the-winners strategy), companies in sectors undergoing restructuring, small and medium enterprises with greater financial limitations, or NTBFs, as is specifically the case of the NEOTEC program in Spain and the SBIR program in the United States.

Keeping this in mind, below we formulate a set of hypotheses about the effect that somefounders' characteristics have on the probability of participating in aid systems designed specifically for NTBFs.

#### **a. Human capital**

A first element that might influence the securing of public support for the creation of a company is the founders' human capital, which refers to the level of studies achieved by the entrepreneur as well as to her experience in the sector or in the creation of companies.

There is a broad consensus in the literature that founders of NTBFs have a higher level of education than founders of other new businesses (Storey and Tether, 1998). Several studies note, moreover, the existence of direct effects between human capital and the growth of NTBFs, especially if the founders have professional experience in the same sector or in previous business ventures (Colombo and Grilli, 2005; Ganotakis, 2012). For a sample of Portuguese NTBFs, Fontes and Laranja (1998) observe that most were founded by entrepreneurs that had previously worked in the private sector. Also, Ganotakis (2012) finds an inverted U-shape relationship between previous experience and business results, possibly because of an excess of entrepreneurs' own trust in their abilities and knowledge, which restricts them from gathering more information that could improve their decisions.

All of that might favor access to external sources of private financing. Colombo and Grilli (2010) note that human capital has an indirect and positive effect on the growth of the company through the attraction of venture capital, which positively values a background in economics along with experience in management from some of the founders. Moreover, they find that venture capital entities attract NTBFs that value more the learning in management skills that they can receive from the financial entity. Likewise, Gimmon and Levie (2010), in interviews with investors, highlight the importance that investors give to human capital when investing in an NTBF. For these same authors, relevant experience in management has the effect of attracting external resources.

As a consequence, the more human capital the entrepreneur has, the fewer restrictions there will be to accessing external financing, so public aid becomes less necessary and there are fewer incentives to apply for it. On the basis of these arguments, the following hypothesis is put forward:

**Hypothesis 1: NTBFs created by entrepreneurs with more human capital and, in particular, more previous experience in management, are less likely to participate in public support programs for NTBFs.**

#### **b. Personal aspirations**

As is well known, one of the most prominent characteristics of NTBFs that has justified public intervention is their contribution to the growth of economies. In this respect, if strengthening the development of local industry is among the goals of the agency, one aspect that might favor the participation of a company in the public aid system is its expectations for growth, which to a greater or lesser extent are aligned with its founders' motivations.

Along these lines, Delmar and Wiklund (2008) study the effect of motivating companies to grow on their effective behavior in terms of growth. The results obtained for a sample of small Swedish companies suggest an effect of motivation on the growth of employment, even when it is controlled by past growth that might provide feedback for the motivation. Stam and Wennberg (2009) qualify these results, remarking that R&D and motivating growth are substitutive factors as determinants of business growth: the first is



important for the growth of high-tech companies while the second is important for the growth of low-tech companies. However, as these same authors note, just as one can expect that the will to grow directly affects the effective growth of a new company, it also seems plausible that such characteristic of the entrepreneur has indirect effects on growth through stimulating R&D, developing new products and establishing business alliances.

Therefore, if the ambition to grow has an effect on expected employment growth, it is feasible that the agency will select those business projects that declare their orientation to growth as a goal of the company's evolution. This leads to formulating the following hypothesis.

**Hypothesis 2: NTBFs created by entrepreneurs who project orientation to growth as a goal of the company's evolution, are more likely to participate in public support programs for NTBFs.**

Obviously, when a company is created, there might be expectations other than orientation to growth, depending on whether the entrepreneur's personal aspirations are related to, for example, getting rich, personal satisfaction or earning external recognition. If these aspirations were aligned with the goals of public agencies, they might also influence the probability of participating in support systems.

### **c. Links to the public R&D system**

The existence of links to the public R&D system at the time a company is created is a factor that can contribute to reducing the costs of applying for public aid. Likewise, the links might be an incentive for the granting of aid if strengthening those links is another goal of the public agencies, insofar as it favors the transfer of technology between the public sector and the private sector. These ties include the perception of external support from a Technology Transfer Office (TTO) as well as the participation of academics in the creation of the NTBF or the location of the NTBF in science parks or university business incubators.

With regard to TTOs, three of their fundamental tasks in their collaboration with companies are the following: (i) technically facilitate the creation and processing of projects; (ii) provide administrative support for the establishment of contracts and (iii) look for sources

of financing. Therefore, it is likely companies that were founded with the support of a TTO will have a greater chance of applying for and obtaining public aid from the agency.

Regarding entrepreneurs' ties to the academic world, as Murray (2004) highlights, in the case of academic start-ups, university founders contribute their human capital to the company and also their relational capital, increasing the chances of technological transfer and insertion in the region's system of innovation. Similarly, in his examination of the role of NTBFs in collaborations between universities and industry in Japan, Motohashi (2005) finds that these small companies achieve greater productivity through collaborative activities than large companies.

Another aspect to take into account is whether the entrepreneurial team's academic connection is an advantage for the future evolution of the company, which would guarantee a greater social return if it were supported by a public agency. In this regard, the evidence is mixed. In their study on the differences between U.S. academic start-ups and independent NTBFs, Ensley and Hmieleski (2005) conclude that the performance of the latter is better in terms of net cash flow and revenue growth. Zhang (2009) shows that university spin-offs have a greater survival rate than other NTBFs, but they are not significantly different in terms of the amount of venture capital collected, the probability of earning profits, or employment. However, Ortín-Ángel and Vendrell-Herrero (2014), using a set of Spanish data, obtain that university spin-offs have greater dynamic capacities than independent NTBFs. The total factor productivity grows faster in the former, so their low level of performance in the beginning disappears after two or three years of activity.

On the other hand, Gimón and Levie (2010) suggest that, among other factors, the academic status of the founders, which functions as an indicator of quality for external investors, could reduce their failure rate. The results obtained for a sample of Israeli high-tech start-ups confirm the positive impact of academic status on the securing of external financing, but it does not seem to affect the probability of survival.

As for technology parks, their connection to universities and research centers facilitates the transfer of studies with business applications, which makes them attractive for NTBFs that are looking for complementary assets, sharing costs and risks (Okamuro et al., 2011). Moreover, technology parks make it possible for academic personnel from

universities to run businesses based on their knowledge (Link and Scott, 2005), on eliminating the barriers that inhibit the application of research to business. Also, on the basis of their analysis of Swedish companies, Löfsten and Lindelöf (2002) conclude that NTBFs in science parks have a job creation rate substantially higher than NTBFs outside of parks, suggesting that policies to promote the location of NTBFs in science parks would be more effective in the creation of employment than other initiatives of generic support of NTBFs. And Colombo and Delmastro (2002) indicate that, in the case of the Italian innovation system, parks play an important role in the support of NTBFs, especially by facilitating access to public subsidies.

From this evidence we can conclude that the links that NTBFs have to the public system of R&D favor the transfer of technology and can reduce the costs of applying for public aid. Although it is not clear whether these links are an advantage for the economic development of NTBFs afterwards, considering the arguments above, the following hypothesis can be advanced:

**Hypothesis 3: NTBFs created by entrepreneurs with linkages with the public system of R&D, are more likely to participate in public support programs for NTBFs.**

#### **d. Previous planning**

NTBFs usually operate on the borders of established industrial sectors (Autio and Yli-Renko, 1998). In general terms, it is difficult to identify a market for their products and services, given that they normally concentrate on few clients. In addition, they tend to make specialized products in niche markets (Delapierre et al., 1998; Giudici and Paleari, 2000), given that large companies are inefficient in these market segments, as they are less dynamic in responding to changes in the environment and technological patterns. Given the specific nature of the niches that most of the NTBFs try to cover, access to private external financing can be facilitated by a previous definition of the company's relevant market, that is, in periods prior to the start of any activity. This would make public aid less necessary. Therefore, we derive the following hypothesis:

**Hypothesis 4: NTBFs created by entrepreneurs that define the market before starting any other activity, are less likely to participate in public support programs for NTBFs.**

#### IV. The NEOTEC program and the database

An example of public support of NTBFs in Spain is the NEOTEC program, which is articulated through two initiatives: NEOTEC loans and NEOTEC venture capital. This program is run by the CDTI, the main Spanish public agency with regard to support for business R&D&I.

The NEOTEC program began in November 2001 and its goal is to foster new feasible technological business projects that have potential for growth. This program tries to help technology entrepreneurs from the moment the business idea is conceived until it becomes a viable company (Fernández et al., 2007).

The program consists of three phases: the proposal of business ideas, the creation of the company and, lastly, the venture capital phase. The second phase considers seed loans with no interest and no additional guarantees. These loans are worth up to 300,000€ and cover up to 70% of the project budget. In addition to the seed loan, companies receive support in management and consulting. The loan starts to be paid back when the company generates positive cash flow. In the third phase, venture capital firms<sup>4</sup> are encouraged to invest in technology companies newer than two years old.

To participate in the NEOTEC initiatives, companies must meet the following conditions:

- Be less than four years old at the moment of applying
- Belong to a sector of activity where technology is the key competitive factor
- Have a coherent and feasible business plan, in terms of product market, technology, entrepreneurial team and financial plan.

Specifically, the CDTI finances a company plan, not only one R&D project. As such, all the lines of activity that the company plans to undertake in the five years considered must be presented. Nonetheless, the expenses associated with R&D activities must account for the majority of the budget for the proposal.

---

<sup>4</sup>This third phase linked to venture capital began in 2006. For more details, see Fernández and Ubiena (2011) and Fernández et al. (2007).

As can be seen in Table 1, from 2001 to 2009, the NEOTEC program presents year-to-year increases in the number of companies supported, in the amount of financing and in the proportion of the total budget for the project covered by the financing, although this trend was interrupted in 2008.

INSERT TABLE 1 ABOUT HERE

To analyze the determinants of participation in this program, in this research, we use a survey for technologically-based companies made by the CDTI. The survey gathers qualitative information about the company and its founders with the goal of characterizing the profile of the technological entrepreneur.<sup>5</sup> To complement this information, the SABI (*Sistema de Análisis de Balances Ibéricos*) database is used, containing a record of annual accounts for close to one million Spanish companies. In addition, general information about the companies, like their geographical location, age or number of employees, can be obtained from the SABI database.

The survey about NTBFs was sent to around 2,000 companies: to those which received aid from the NEOTEC program between 2000 and 2010; to NTBFs located in science parks (according to the information provided by the *Asociación de Parques Científicos y Tecnológicos de España*); to participants in a venture capital forum organized by the CDTI; or to recipients of other support from the CDTI during the period 2005-2009. A total of 337 companies answered the survey. Once the information from this survey was merged with the information included in the SABI database, the final available sample consisted of 271 NTBFs, 133 of which were beneficiaries of the NEOTEC program during the period in question. This sample size is along the lines of others in international studies of NTBFs.<sup>6</sup> Moreover, as can be seen in Figure 1, the distribution between participants and non-participants in the NEOTEC program is rather stable regardless of the year the company started its activity.

INSERT FIGURE 1 ABOUT HERE

---

<sup>5</sup> More details about the survey can be found in Fernández and Hidalgo (2011).

<sup>6</sup> See, among others, Autio and Lumme (1998), Colombo and Grilli (2005, 2010), Gimmon and Levie (2010) and Kösters (2010).

With regard to entrepreneurs' characteristics or the business plan, the information contained in the survey is qualitative, so the variables used for the analysis in this study are categorical.<sup>7</sup>

As concerns entrepreneurs' human capital, it is possible to consider four different dimensions: (i) the highest level of education achieved by any of the founders; (ii) relevant experience in management; (iii) experience in the same sector the company operates in; and (iv) experience in creating an NTBF.

The sample reveals that founders are characterized by their high level of studies (Table 2). Fifty-one percent of the companies declare that one or more members of their teams of founders have a Master's or Doctorate degree, with a higher proportion among companies that obtain support from the NEOTEC program (60%). As for work experience, 78% declare that they have experience in the same sector and 42% declare that they have more than 10 years of managerial experience, although this is less frequent (35%) among NEOTEC program companies. With respect to experience in the creation of NTBFs, 49% of the companies declare that some of the founders have been involved in the creation of an NTBF. In short, founders have a high level of studies, experience in management and knowledge of the sector the company operates in. Mean difference tests indicate that the differences between participants and non-participants in NEOTEC are statistically significant in level of education (in favor of the participants) and experience in management (in favor of the non-participants).

INSERT TABLE 2 ABOUT HERE

As regards personal aspirations at the time the business starts, entrepreneurs declare in the survey whether their goal in terms of their evolution was to orient it towards growth or have it reach a comfortable size. Also, they are asked about their aspirations of personal satisfaction or wealth, which they must rate on a scale of 1 to 5. Most of the founders (75%) declare the pursuit of growth as their goal, and this is most frequent among companies with NEOTEC support (83%). In addition, the founders declare that the pursuit of personal

---

<sup>7</sup> In the Appendix, the exact definition of the variables used can be found.

satisfaction is very important, and to a much lesser extent, the pursuit of recognition and respect.

As for their links to the public system of R&D, approximately one-fourth of the entrepreneurs declare that they had the support of a TTO when they started their activities. This is more evident among companies in the NEOTEC group (33%) than in other NTBFs. External support of NTBFs also comes from technology parks. In total, 52% of the companies participate in these parks, and the proportions for both groups are similar. Moreover, 46% of founders of companies that participate in the NEOTEC program start their business with academic colleagues from university; among founders of other companies, this percentage is considerably lower (28%).

With regard to planning, in the survey the entrepreneur is asked about the moment interaction with the market began with the goal of orienting the marketing of the goods or services produced by the NTBF. In general, 17% of the entrepreneurs declare that they had interacted with the market before conceiving the idea, a characteristic observed to a lesser extent among NEOTEC companies (12%).

Along with the peculiarities of entrepreneurs and the conditions surrounding the creation of the company, one ought to take into account other characteristics of NTBFs that might influence their participation in public aid programs. Among them, being a manufacturing company, being located in Madrid, Catalonia or the Basque Country, and having more than 10 employees at the moment of creation will be considered control variables for analysis afterwards.

With respect to the branch of activity, some public programs specify sectorial guidelines for target recipients of aid, especially in the case of activities with strong externalities associated with them. The NEOTEC program does not consider rules directed to a specific branch, which is why we do not expect a priori any significant effect on the probability of accessing this program.

Regarding the geographical location of NTBFs, Storey and Tether (1998) note that proximity to universities and research centers improves flows of knowledge and information, formal as well as informal, between NTBFs and research institutes, universities and other

companies, especially if the companies are clients of NTBFs, creating dynamic networks and complementarities between small and big companies in innovation. For Autio and Yli-Renko (1998), a large presence of NTBFs provides an incentive for a big company to establish an operation in the same region, using NTBFs as providers of specialized technology. Concerning the relationship with research centers, Zucker et al. (1998) empirically demonstrate that the moment and the location of new companies devoted to biotechnology<sup>8</sup> are explained mainly by the presence of scientists who actively contribute to basic science at a time and in a place, highlighting the role of universities in fostering local development. And more in general, Bade and Nerlinguer (2000) demonstrate that there is a higher birth rate of NEBTs on the outskirts of big cities as well as a strong correlation between the number of NTBFs and the location of R&D centers.

To keep in mind these technological externalities associated with the location of companies, it is usual to identify when companies are located in regions that spend more on R&D, have a higher proportion of personnel in R&D compared to the working population, or have greater scientific production. In Spain, these regions correspond to Madrid, Catalonia and the Basque Country (COTEC, 2013).

As can be seen in Table 2, 19% of the companies in the sample are manufacturers and close to half are located in the autonomous regions of Madrid, Catalonia or the Basque Country; this is true for 63% of the companies in the NEOTEC program. As for initial size, only 10% of the companies are created with more than 10 employees. It is worth noting that this proportion is significantly lower among participants in the NEOTEC program (5%) than in the rest of the companies (14%).

Finally, the survey includes a set of questions about sources of financing for the creation of the company. The survey questions have a retrospective character, referring to the first three years of life. Specifically, 68% of the companies in the NEOTEC program did not have private external financing during the first year of activity, a figure higher than the one observed for the rest of the NTBFs (56%). Moreover, only a small proportion of NTBFs were financed through venture capital, and in this case there are no significant

---

<sup>8</sup> The years researched in the study by Zucker et al. (1998) correspond to the first years that biotechnology developed its first practical applications. As such, only some researchers are privy to this knowledge, although over time, as biotechnology spreads, the returns begin to diminish.



differences between participants and non-participants. In short, there is a deficit of private external financing in the first year of existence, particularly among companies that were supported through the NEOTEC program.

Note that certain characteristics of entrepreneurs and of NTBFs might be correlated between each other. In this regard, for example, the analysis of Table 3 reveals that, although the values are relatively low, there is a positive correlation between the three available indicators to reflect the extent of connections with the public system of R&D. These indicators are also positively associated with the fact that the entrepreneur has postgraduate studies. All this will have to be taken into account for the interpretation of the results presented in the following section to contrast the hypotheses put forward.

INSERT TABLE 3 ABOUT HERE

## **V. Empirical specification and results**

As previously mentioned, the probability that companies participate in an R&D support program can be expressed as the joint probability resulting from two sequential decisions (Busom, 2000; Blanes and Busom, 2004; Huergo and Trenado, 2010). In the first place, the company decides whether or not to apply for aid from the public agency. Then, the public agency decides whether or not to grant the aid, conditional on the company's application.

From a theoretical point of view, both decisions are influenced by different factors. However, in this study, it is not possible to separately estimate both probabilities, as there is no information about rejected applications in the database. As such, it is not possible to distinguish the weight of the different factors in the decision to apply for and in the decision to award public aid. Consequently, the net effect of the different factors is determined, estimated through a Probit-type discrete choice model.

The results are presented in Table 4 for seven different specifications. It is worth noting that the majority of the explanatory variables are dichotomous. As such, we will estimate the marginal effects as the change from not having the characteristic to having it

and only in the case of continuous variables the effect is evaluated on the average of the variables.

INSERT TABLE 4 ABOUT HERE

The first four specifications correspond to models that, along with the control variables, sequentially incorporate the blocks of variables associated with each hypothesis, while the estimations of columns (5) to (7) show the results of adding each block as an alternative to the previous one.

Included as control variables in all the estimations are three dichotomous variables which indicate whether the company is a manufacturer, whether it is located in Madrid, Catalonia or the Basque Country and whether its size at the moment of creation was greater than 10 employees. As can be observed, there are no significant differences between manufacturing companies and service companies. However, having a size larger than 10 employees reduces the probability of obtaining public aid from the agency. The agency is less sensitive to supporting larger companies with the NEOTEC program, probably because they can be supported through other more general programs devoted to innovation. In addition, it is confirmed that the probability of participating is higher when the company is located in the autonomous regions of Madrid, Catalonia or the Basque Country, regions where the great majority of indicators of innovation stand out with respect to the rest of the autonomous regions (COTEC 2013).

With regard to human capital (column (1) of Table 4), neither experience in the sector nor experience as a founder seem to have an effect on participation in NEOTEC. Contrary to what was expected, postgraduate studies increase the probability of participating. However, that might be because there is a high correlation between this variable and those that reflect the connection of the NTBF project to the public system of R&D. In fact, when the latter are added to the estimation (column (3) of Table 4), postgraduate studies cease to be significant.

In addition, having relevant experience in management reduces the probability of participating by close to 20 percentage points, confirming Hypothesis 1. This result, which holds in all the estimations where this variable is introduced, is in line with the greater

accessibility to resources that companies with founders greatly experienced in management have.

As for founders' aspirations at the time the company is created, striving for recognition plays against their participation in the aid program, while seeking personal satisfaction is positively related to their probability of participating in the aid program (column (5) of Table 4), although this relationship is weaker depending on the rest of the variables included in the specification.

However, it is orientation to growth as the goal of the company's evolution that has a greater impact, such that NTBFs with entrepreneurs who declare to have this goal are around 20 percent more likely to be supported. This result confirms our Hypothesis 2, although it contradicts what Kösters (2010) and Cantner and Kösters (2012) find for the eastern German state of Turingia: that expected sales growth is not related to the awarding of financial aid. This would imply that German and Spanish public agencies pursue different goals with the design of their programs.

The third block of variables analyzed refers to the connections of the NTBF and its entrepreneurial team to the public system of R&D (columns (3), (4) and (6) of Table 4). As Cantner and Kösters (2012) find, in Spain, creating a company with academic colleagues seems to be positively valued by the agency. Likewise, although location in a technology park does not seem to have an impact, having the support of a TTO increases the probability of having public support, and generally, this set of variables is significant, which would confirm our Hypothesis 3.

Finally, with regard to planning, previous interaction with the market (columns (4) and (7) of Table 4) has a negative impact on the awarding of public aid, providing favorable evidence for Hypothesis 4. Also note that, as occurs with experience in management, the effect of planning is slightly less when this variable is included in isolation than when it is inserted in the rest of the blocks. That might be indicating that both factors are reinforced, facilitating access to private external financing and discouraging the company to apply for public aid.

In general, the complete specification presents a good fit,<sup>9</sup> correctly predicting 72.2% of the companies that participate in the NEOTEC program and 72.5% of the companies that do not participate. In short, companies whose founders have less experience in management, are oriented to growth, have the support of a TTO, are academic entrepreneurs, have not previously interacted with the market or are in Spanish regions which excel in R&D are more likely to participate in the public aid program. However, experience in the sector or in the founding of another NTBF and location in a technology park are not relevant factors.

## **VI. Discussion and conclusions**

The objective of this study is to identify which characteristics of entrepreneurs determine the participation of Spanish companies in financial aid programs designed for NTBFs. The analysis considers the net effect of these characteristics on the entrepreneur's decision to apply for financing within the framework of the NEOTEC program and the decision by the CDTI, the public agency that runs the program, to grant the aid.

To this end, we have access to a unique database on the profile of Spanish technology entrepreneurs, allowing us to analyze the determinants of NTBFs' participation in the NEOTEC program between 2001 and 2009. Specifically, there are four dimensions evaluated: the entrepreneurs' human capital, the connections of the NTBF and its founders to the public system of R&D, the motivations at the time of creating the company and the extent of initial planning.

The results obtained by estimating Probit models for the probability of participating in the NEOTEC program allow us to highlight the following conclusions:

In the first place, as concerns the entrepreneur's human capital, the results are not conclusive. On one hand, as was expected, we obtain evidence that having relevant experience in management reduces the probability of participating in the public program,

---

<sup>9</sup> The Hosmer-Lemeshow specification test is used. This test assesses the goodness of fit, comparing the sample frequency of the observed dependent variable with the adjusted probability among subgroups of observations. See more in Cameron and Trivedi (2010).

which is coherent with greater access to private external resources which founders with extensive experience in business management can normally resort to. On the other hand, having postgraduate studies seems to increase a founder's probability of participating in the public program, although that might be explained by the high correlation between this feature and being an academic entrepreneur. This also implicitly entails closer connections of the NTBF project to the public system of R&D. In fact, when the factors indicative of these links are added to the specification, postgraduate studies cease to be relevant.

Secondly, our empirical results with regard to founders' motivations suggest that seeking recognition diminishes the probability of participating in the aid program, while seeking personal satisfaction and, above all, the goal of orientation to growth have a positive effect. This evidence contributes to amplifying the knowledge of behavioral aspects and their relation to public support. Although in any allocation there are informal aspects that are assessed by the agency, they have not been systematically compiled by the literature related to technology companies. In this regard, it is novel to be able to assess the role that personal motivations play in participating in public aid systems.

Thirdly, we find that, although location in technology parks is not relevant for receiving public aid, having help from TTOs or academics on the entrepreneurial team positively influence the participation in the NEOTEC program, confirming the favorable role of connections to the public system of R&D. This might be because support from TTOs makes it possible to reduce the costs of applying for public aid, and because the agency positively evaluates the relational capital of academic entrepreneurs, which increases the possibility of technological transfer and insertion in the regional system of innovation.

Finally, the planning of the entrepreneurial team, measured by the existence of interaction with the market previous to developing the idea with the goal of orienting the marketing of the products made by the NTBF, has a negative impact on the probability of participating in the public program. This is coherent with the hypothesis that more initial planning facilitates access to private external financing, making public aid less necessary.

In this regard, the limitation of the analysis performed resides in the impossibility of separating the impact of entrepreneurs' characteristics on the decision to apply for public financing from the public agency's decision to award aid. Having a larger sample of

companies and more information about rejected applications would allow us to qualify these conclusions, and would point to a natural extension of this research.

## References

- Autio, E., Lumme, A. (1998): "Does the innovator role affect the perceived potential for growth? Analysis of four types of new, technology-based firms", *Technology Analysis & Strategic Management*, 10, 41-54.
- Autio, E., Yli-Renko, H. (1998): "New, technology-based firms in small open economies—An analysis based on the Finnish experience", *Research Policy*, 26(9), 973-987.
- Bade, F-J., Nerlinguer, E. (2000): "The spatial distribution of new technology-based firms: Empirical results for West-Germany", *Papers Regional Science*, 79, 155-176.
- Blanes, J., Busom, I. (2004): "Who participates in R&D subsidy programs? The case of Spanish manufacturing firms", *Research Policy*, 33, 1459-1476.
- Busom, I. (2000): "An empirical evaluation of the effects of R&D Subsidies", *Economics of Innovation and Technology*, 9(2), 111-148.
- Cameron, A., Trivedi, P. (2010): *Microeconometrics Using Stata*, Revised Edition, Stata Press.
- Cantner, U., Kösters, S. (2012): "Picking the winner? Empirical evidence on the targeting of R&D subsidies to start-ups," *Small Business Economics*, 39(4), 921-936.
- Colombo, M., Delmastro, M. (2002): "How effective are technology incubators? Evidence from Italy", *Research Policy*, 31, 1103-1122.
- Colombo, M., Grilli, L. (2005): "Founders' human capital and the growth of new technology-based firms: A competence-based view", *Research Policy*, 34, 795-816.
- Colombo, M., Grilli, L. (2010): "On growth drivers of high-tech start-ups: Exploring the role of founders' human capital and venture capital", *Journal of Business Venturing*, 25, 610-626.
- Cotec (2013): *Informe COTEC 2013: Tecnología e Innovación en España*, COTEC Foundation for technological innovation, Madrid, Spain.
- Delapierre, M., Madeuf, B., Savoy, B. (1998): "NTBFs—the French case", *Research Policy*, 26(9), 989-1003.
- Delmar, F., Wiklund, J. (2008): "The Effect of Small Business Managers' Growth Motivation on Firm Growth: A Longitudinal Study", *Entrepreneurship Theory and Practice*, 32(3), 437-457.

- Del-Palacio, I., Zhang, X., Sole, F. (2012): "The capital gap for small technology companies: public venture capital to the rescue?" *Small Business Economics*, 38, 283-301.
- Ensley, D. E., Hmieleski, K. M. (2005): "A comparative study of new venture top management team composition, dynamics and performance between university-based and independent start-ups", *Research Policy*, 34, 1091-1105.
- Fariñas, J., López, A. (2007): "Las empresas pequeñas de base tecnológica en España: delimitación, evolución y características", *Economía industrial*, 363, 149-160.
- Fernández, J., Hidalgo, A. (2011): "Empresas tecnológicas creadas en España entre los años 2000 y 2010: perfil del emprendedor e importancia de la ayuda pública en su desarrollo", *Dirección y Organización*, 45, 11-19.
- Fernández, J., Trenado M., Ubierna, M., Huergo E. (2007): "Las nuevas empresas de base tecnológica y la ayuda pública: evidencia para España", *Economía Industrial*, 363, 161-177.
- Fernández, J., Ubierna, M. (2011): "El papel del sector público como 'venture capitalist': cómo favorecer a las nuevas empresas de base tecnológica", *Papeles de Economía Española*, 127, 204-222.
- Fontes, M., Laranja, M. (1998): "Creative adaptation: the role of new technology based firms in Portugal", *Research Policy*, 26(9), 1023-1036.
- Fontes, M., Coombs, R. (2001): "Contribution of new technology-based firms to the strengthening of technological capabilities in intermediate economies", *Research Policy*, 30, 79-97.
- Ganotakis, P. (2012): "Founders' human capital and the performance of UK new technology based firms", *Small Business Economics*, 39, 495-515.
- Gimmon, E., Levie, J. (2010): "Founder's human capital, external investment, and the survival of new high-technology ventures", *Research Policy*, 39, 1214-1226.
- Giudici, G., Pleari, S. (2000): "The Provision of Finance to Innovation: A Survey Conducted among Italian Technology-Based Small Firms", *Small Business Economics*, 14, 37-53.
- Grilli, L., Murtinu, S. (2012): "Do public subsidies affect the performance of new technology-based firms? The importance of evaluation schemes and agency goals", *Prometheus*, 30(1), 97-111.
- Hall, B. (2002): "The financing of research and development", *Oxford Review of Economic Policy*, 18(1), 35-51.
- Hall, B., Lerner, J. (2010): "The Financing of R&D and Innovation", *Handbook of the Economics of Innovation*, Vol. 1, 609-639.
- Himmelberg, C., Petersen, B. (1994): "R&D and Internal finance: A panel study of small firms in high-tech industries", *The Review of Economics and Statistics*, 76(1), 38-51.

- Huergo, E., Trenado, M. (2010): "The Application for and the Awarding of Low-Interest Credits to Finance R&D Projects", *Review of Industrial Organization*, 37, 237-259.
- Iglesias, P., Jambrino, C., Peñafiel, A. (2012): "Caracterización de las Spin-Off universitarias como mecanismo de transferencia de tecnología a través de un análisis clúster", *Revista Europea de Dirección y Economía de la Empresa*, 21, 240-254.
- Kösters, S. (2010): "Subsidizing Start-Ups: Policy Targeting and Policy Effectiveness", *Journal of Industry, Competition and Trade*, 10(3-4), 199-225.
- Lerner, J. (1999): "The Government as Venture Capitalist: The Long-Run Impact of the SBIR Program", *The Journal of Business*, 72(3), 285-318.
- Licht, G., Nerlinguer, E. (1998): "New technology-based firms in Germany: a survey of the recent evidence", *Research Policy*, 26(9), 933-946.
- Link, A., Scott, J. (2005): "Opening the ivory tower's door: An analysis of the determinants of the formation of U.S. university spin-off companies", *Research Policy*, 34, 1106-1112.
- Lockett, A., Murray, G., Wright, M. (2002): "Do UK venture capitalists still have a bias against investment in new technology firms", *Research Policy*, 31, 1009-1030.
- Lockett, A., Siegel, D., Wright, M., Ensley, M. (2005): "The creation of spin-off firms at public research institutions: Managerial and policy implications", *Research Policy*, 34, 981-993.
- Löfsten, H., Lindelöf, P. (2002): "Science Parks and the growth of new technology-based firms—academic-industry links, innovation and markets", *Research Policy*, 31, 859-876.
- Motohashi, K. (2005): "University-industry collaborations in Japan: The role of new technology-based firms in transforming the National Innovation System", *Research Policy*, 34, 583-594.
- Murray, F. (2004): "The role of academic inventors in entrepreneurial firms: sharing the laboratory life", *Research Policy*, 33, 643-659.
- OECD (2013): *Start-up Latin America: Promoting Innovation in the Region*, Development Centre Studies, OECD Publishing.
- Okamuro, H., Masatoshi, K., Honjo, Y. (2011): "Determinants of R&D cooperation in Japanese start-ups", *Research Policy*, 40, 728-738.
- Ortín-Ángel, P., Vendrell-Herrero, F. (2014): "University *spin-offs* vs. other NTBFs: Total factor productivity", *Technovation*, 34(2), 101-112.
- Ramón-Llorens, M., Hernández-Canovas, G. (2010): "Venture capitalists in Spain: cluster analysis of criteria used in the screening process", Working Papers, Series EC, Instituto Valenciano de Investigaciones Económicas (IVIE), 2010-08.



- Stam, E., Wennberg, K. (2009): "The roles of R&D in new firm growth", *Small Business Economics*, 33, 77-89.
- Storey, D., Tether, B. (1998): "New technology-based firms in the European Union: an introduction", *Research Policy*, 26(9), 1005-1022.
- Storey, D., Tether, B. (1998b): "Public policy measures to support new technology-based firms in the European Union", *Research Policy*, 26(9), 1037-1057.
- Zhang, J. (2009): "The performance of university *spin-offs*: An exploratory analysis using venture capital data", *Journal of Technology Transfer*, 34(3), 255-285.
- Zucker, L., Darby, M., Brewer, M. (1998): "Intellectual human capital and the birth of U.S. biotechnology enterprises", *The American Economic Review*, 88(1), 290-306.

## Appendix: Definitions of Variables

### Dependent Variable:

- **NEOTEC Company:** dummy variable that takes the value 1 if the company receives public support through the NEOTEC program.

### Independent Variables:

#### 1. Human capital

- **Postgraduate:** dummy variable that takes the value 1 if at least one member of the founding team has a Master's or Ph.D. as their maximum level of studies attained.
- **Managerial experience:** dummy variable that takes the value 1 if at least one member of the founding team has 10 or more years of managerial experience.
- **Experience in sector:** dummy variable that takes the value 1 if at least one member of the founding team has three or more years of experience in the sector of her present company.
- **Experience as a founder:** dummy variable that takes the value 1 if at least one member of the founding team has been involved in the creation of an earlier NTBF that failed.

#### 2. Personal aspirations

- **Orientation to growth:** dummy variable that takes the value 1 if the founders declare orientation to growth as the goal of the NTBF's evolution.
- **Personal Satisfaction:** variable on a Likert scale for the importance of personal satisfaction in the decision to create the company. The value 1 signifies little influence and the value 5 signifies much influence.
- **Recognition:** variable on a Likert scale for the importance of recognition and respect in the decision to create the company. The value 1 signifies little influence and the value 5 signifies much influence.

#### 3. Link to the public system of R&D

- **TTO support:** dummy variable that takes the value 1 if the company has the external support of a Technology Transfer Office(TTO) at the time of its creation.
- **Location in technology park:** dummy variable that takes the value 1 if the company is located in a technology or science park.

- **Academic entrepreneurs:** dummy variable that takes the value 1 if the founding team set up the company with university colleagues or academics.

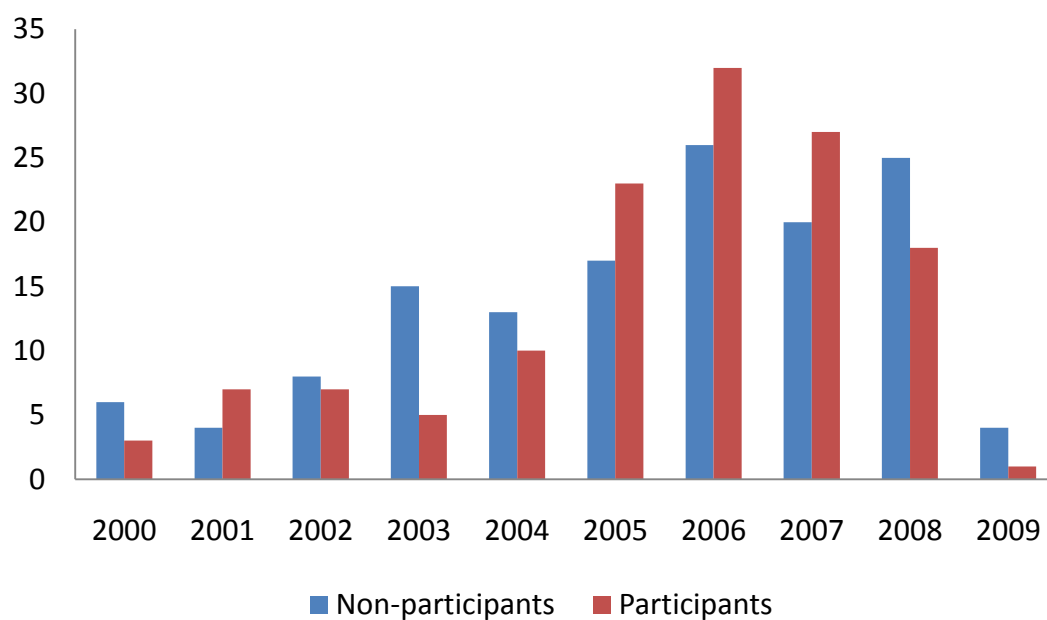
#### 4. Planning

- **Previous interaction with market:** dummy variable that takes the value 1 if the founding team began to interact with the market to market the product before doing anything with regard to the company.

#### 5. Other Variables

- **Manufacturer:** dummy variable that takes the value 1 if the company operates in the manufacturing sector.
- **Created with more than 10 employees:** dummy variable that takes the value 1 if the company has 10 or more employees during the first year of existence.
- **Madrid-Catalonia-Basque Country:** dummy variable that takes the value 1 if the company is located in the autonomous regions of Madrid, Catalonia or the Basque Country.
- **No private external financing Year 1:** dummy variable that takes the value 1 if the company did not have financing from banks, Business Angels or access to venture capital during the first year of existence.
- **Financed with venture capital Year 1:** dummy variable that takes the value 1 if the company had financing through venture capital during the first year of existence.

**Figure 1: Distribution of participants in the NEOTEC program according to the year the company was created**



Source: Own elaboration from CDTI database

**Table 1: Financing through the NEOTEC program from 2002 to 2009**

<b>Year</b>	<b>Number of companies supported</b>	<b>Total subsidy (in thousandsof euros)</b>	<b>Percentage of financing</b>
2002	31	8,583	52.3
2003	34	9,168	47.4
2004	38	10,985	46.6
2005	46	15,225	51.0
2006	51	17,695	54.6
2007	57	19,124	55.3
2008	73	25,719	58.1
2009	58	19,920	61.5

Source: Own elaboration from CDTI database

Table 2: Descriptive statistics

Variables		Range of values	Average values			t-test	[p-value]
			Total sample	Participants in NEOTEC	Non-participants		
<b>Human capital</b>	Postgraduate	0-1	0.51	0.60	0.41	-3.15	[0.001]
	Experience in management	0-1	0.42	0.35	0.50	2.59	[0.010]
	Experience in sector	0-1	0.78	0.81	0.75	-1.17	[0.245]
	Experience as a founder	0-1	0.49	0.50	0.48	-0.29	[0.768]
<b>Personal aspirations</b>	Orientation to growth	0-1	0.75	0.83	0.67	-2.95	[0.003]
	Personal satisfaction	1-5	4.58	4.69	4.48	-2.59	[0.010]
	Recognition	1-5	1.90	1.72	2.08	2.71	[0.007]
<b>Link to public system of R&amp;D</b>	TTO support	0-1	0.23	0.33	0.12	-4.18	[0.000]
	Location in technology park	0-1	0.52	0.52	0.52	0.05	[0.962]
	Academic entrepreneurs	0-1	0.37	0.46	0.28	-3.04	[0.002]
<b>Planning</b>	Previous interaction with market	0-1	0.17	0.12	0.22	2.15	[0.033]
Manufacturer		0-1	0.19	0.16	0.21	1.40	[0.163]
Created with more than 10 employees		0-1	0.10	0.05	0.14	2.85	[0.005]
Madrid-Catalonia-Basque Country		0-1	0.47	0.63	0.31	-5.55	[0.000]
No private external financing Year 1		0-1	0.62	0.68	0.56	-2.02	[0.045]
Financed with venture capital Year 1		0-1	0.10	0.11	0.09	-0.53	[0.597]
Number of companies			271	133	138		

Note: *t*-test denotes the difference of averages contrast between participants and non-participants in NEOTEC. The contrast corresponds to the Wilcoxon rank-sum test (Mann-Whitney) for discrete variables.

Table 3: Pairwise correlation matrix

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1 NEOTEC company	1																
2 Postgraduate	<b>0.188</b>	1															
3 Experiencein management	<b>-0.156</b>	-0.092	1														
4 Experiencein sector	0.071	0.068	<b>0.164</b>	1													
5 Experienceas a founder	0.018	-0.026	0.104	-0.076	1												
6 Orientation togrowth	<b>0.177</b>	<b>0.126</b>	<b>0.153</b>	0.066	<b>-0.134</b>	1											
7 Personal satisfaction	<b>0.155</b>	0.077	-0.022	<b>0.135</b>	0.065	<b>0.157</b>	1										
8 Recognition	<b>-0.162</b>	-0.073	<b>0.224</b>	0.027	0.031	<b>0.120</b>	0.113	1									
9 TTO support	<b>0.249</b>	<b>0.162</b>	0.002	0.070	-0.101	0.067	0.019	0.047	1								
10 Location in technology park	-0.003	<b>0.144</b>	0.003	-0.023	<b>-0.202</b>	-0.011	-0.035	-0.003	<b>0.128</b>	1							
11 Academic entrepreneurs	<b>0.182</b>	<b>0.236</b>	-0.038	-0.097	-0.041	0.072	0.030	-0.024	<b>0.284</b>	<b>0.199</b>	1						
12 Previous interaction with market	<b>-0.129</b>	-0.044	0.109	0.024	0.110	0.103	0.103	-0.050	-0.032	0.100	-0.061	1					
13 Manufacturer	-0.085	<b>-0.155</b>	<b>0.150</b>	0.007	0.050	0.023	0.009	0.110	-0.016	-0.057	-0.062	0.029	1				
14 Created with more than 10 employees	<b>-0.169</b>	-0.054	-0.026	-0.071	0.059	0.015	-0.058	<b>0.153</b>	-0.086	-0.013	-0.067	0.086	0.064	1			
15 Madrid-Catalonia-Basque Country	<b>0.321</b>	0.071	-0.013	0.012	0.076	0.100	0.096	-0.099	-0.028	-0.105	-0.075	-0.011	<b>-0.176</b>	-0.080	1		
16 No private external financingYear 1	<b>0.122</b>	0.115	-0.105	0.025	-0.066	-0.089	-0.070	-0.110	-0.029	0.032	-0.073	-0.027	<b>-0.136</b>	-0.052	<b>0.163</b>	1	
17 Financed with venture capital Year 1	0.032	0.071	0.024	0.051	0.007	0.074	-0.002	0.064	0.067	0.086	<b>0.140</b>	-0.014	0.063	-0.064	-0.029	<b>-0.416</b>	1

Note: In bold type if the correlations are significant at 95%.

Table 4: Determinants of participation in the NEOTEC program. Probit Model

		(1)		(2)		(3)		(4)	
		dy/dx	S.D.	dy/dx	S.D.	dy/dx	S.D.	dy/dx	S.D.
Human capital	Postgraduate	0.165 **	0.064	0.138 **	0.066	0.075	0.070	0.067	0.072
	Experiencein management	-0.188 ***	0.067	-0.194 ***	0.069	-0.202 ***	0.071	-0.200 ***	0.072
	Experiencein sector	0.105	0.081	0.083	0.085	0.105	0.087	0.109	0.088
	Experienceas a founder	0.035	0.066	0.064	0.068	0.090	0.072	0.116	0.072
Personalaspirations	Orientation to growth			0.222 ***	0.073	0.216 ***	0.075	0.246 ***	0.076
	Personal satisfaction			0.074	0.046	0.079 *	0.045	0.095 **	0.045
	Recognition			-0.060 *	0.032	-0.081 **	0.032	-0.093 ***	0.033
Link to public systemof R&D	TTOsupport					0.308 ***	0.077	0.312 ***	0.077
	Location in technologypark					-0.010	0.073	0.016	0.074
	Academic entrepreneurs					0.153 **	0.073	0.141 *	0.075
Planning	Previous interaction withmarket							-0.238 ***	0.088
Manufacturer		0.030	0.085	0.028	0.089	0.044	0.091	0.042	0.089
Created with> 10 employees		-0.275 ***	0.102	-0.274 ***	0.105	-0.236 **	0.112	-0.226 *	0.117
Madrid-Catalonia-Basque Country		0.319 ***	0.061	0.292 ***	0.063	0.344 ***	0.064	0.345 ***	0.065
Wald Test [p-value]: Human capital		[0.003]		[0.012]		[0.031]		[0.023]	
Personal Aspirations				[0.003]		[0.001]		[0.000]	
Link topublic system ofR&D						[0.000]		[0.000]	
Correct predictions		66.79		66.42		70.48		72.23	
Correct predictions (1/0)		(67.67/65.94)		(66.92/65.94)		(67.67/73.19)		(72.18/72.46)	
Adjusted R2		0.137		0.173		0.233		0.251	
Number of observations		271		271		271		271	

Note: The marginal effects (dy/dx) are evaluated at the sample mean. For the dichotomous variables, the marginal effect corresponds to the change from 0 to 1. S.D. indicates standard deviation. \*  $p < 0.05$ ; \*\*  $p < 0.01$ ; \*\*\*  $p < 0.001$ . Wald Test [p-value] indicates the p-value of the Wald test for joint significance for the block indicated.



**Table 4 (cont.): Determinants of participation in the NEOTEC program. Probit Model**

		(1)		(5)		(6)		(7)	
		<i>dy/dx</i>	S.D.	<i>dy/dx</i>	S.D.	<i>dy/dx</i>	S.D.	<i>dy/dx</i>	S.D.
<b>Human capital</b>	Postgraduate	0.165 **	0.064						
	Experience in management	-0.188 ***	0.067						
	Experience in sector	0.105	0.081						
	Experience as a founder	0.035	0.066						
<b>Personal aspirations</b>	Orientation to growth			0.200 ***	0.072				
	Personal satisfaction			0.100 **	0.048				
	Recognition			-0.078 **	0.030				
<b>Link to public system of R&amp;D</b>	TTO support					0.286 ***	0.073		
	Location in technology park					-0.029	0.067		
	Academic entrepreneurs					0.171 **	0.070		
<b>Planning</b>	Previous interaction with market							-0.176 **	0.082
Manufacturer		0.030	0.085	-0.027	0.085	-0.014	0.085	-0.034	0.082
Created with > 10 employees		-0.275 ***	0.102	-0.246 **	0.101	-0.241 **	0.105	-0.261 ***	0.100
Madrid-Catalonia-Basque Country		0.319 ***	0.061	0.283 ***	0.062	0.356 ***	0.061	0.316 ***	0.060
Wald Test [p-value]: Human capital		[0.003]							
Personal aspirations				[0.000]					
Link to public system of R&D						[0.000]			
Correct predictions		66.79		64.94		69.00		67.16	
Correct predictions (1/0)		(67.67/65.94)		(63.16/66.67)		(74.44/63.77)		(60.90/73.19)	
Adjusted R <sup>2</sup>		0.137		0.137		0.160		0.105	
Number of observations		271		271		271		271	

Note: The marginal effects (*dy/dx*) are evaluated at the sample mean. For the dichotomous variables, the marginal effect corresponds to the change from 0 to 1. S.D. indicates standard deviation. \*  $p < 0.05$ ; \*\*  $p < 0.01$ ; \*\*\*  $p < 0.001$ . Wald Test [p-value] indicates the p-value of the Wald test for joint significance for the block indicated.