Business Incubation Centers and New Firm Growth in the Basque Country

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ABSTRACT. The purpose of this article is an attempt to identify those factors related to human capital and organizational resources which help in overcoming barriers to survive during the infancy period of firm start-ups. The paper aims to find out the extent to which the support received by entrepreneurs from incubator centers is critical to ensure firm life.

Primary data have been used to conduct an empirical analysis on a sample of 114 start-up firms participating in a business assistance program (i.e., business incubation centers). Results from regression analyses suggest that human capital attributes of entrepreneurs and certain start-up firm characteristics seem to be critical to explain business success. An important implication of this study is that, despite the economic advantages derived from this policy based on the promotion of business incubation centers, policy makers should be cautious in its application. Empirical evidence from our study suggests that a portion of new firms being nurtured in business incubation centers may cause the exit of more efficient incumbent firms not receiving such policy support.

1. Introduction

During the last two decades, government authorities from many regions have promoted economic development programs aimed at creating new firms. There has been a proliferation of business assistance programs to enhance the formation, survival and growth rates of small and medium size enterprises (Rice, 2002). These include Small Business Development Centers, Small Business Institutes, special programs offered through Chambers of Commerce, and so forth. Some authors have questioned the adoption of policies in support of new firm formation and survival since they may cause negative externalities on other firms (Lotti et al., 2001). This study explores the usefulness of a particular assistance program, business incubation centers, to help entrepreneurs in, not just creating, but in surviving the difficult initial years of firm gestation. A business incubation center may be defined as an organization that facilitates the process of creating successful new small enterprises by providing them with a comprehensive and integrated range of services (Adegbite, 2001).

Wennekers and Thurik (1999) highlight the resurgence of small business and the revival of entrepreneurship as an important phenomenon of the 1980s and 1990s. The authors point out that small business employment growth in Europe has been in excess of that of their large counterparts in the period 1988–1998. A recent report on small and medium size enterprises (SME) highlights the great impact new firms have in western economies (OECD, 2000). According to this report, 95% of all firms from OECD countries are SME, which capture 60–70% of total employment. In the European Union (EU), the presence of SME is even more relevant. There are about 19 million SME and represent 99% of all EU firms. It is noteworthy to stress that 93% of all EU firms have less than 10 employees (European Commission, 2000). All these facts show that SME, and among them new firms, have an enormous economic impact in western, and particularly, European countries.

Despite the positive effect that new small companies have in the economy, we must admit that young companies are fragile and the failure rate of start-ups remains high over time. Most small

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businesses discontinue operations within few years from inception. One estimate of the failure rate for new ventures is 40% in the first year and 90% over 10 years (Shepherd et al., 2000). Other studies found that about 50–60% of entrants exited within four-five years and close to 80% within ten years after entry (Dunne et al., 1989; Mata and Portugal, 1994). A recent study on the Spanish economy (Callejón and Segarra, 1999) found that while the gross rate of firm births reached an average of 6,12% during the 1980–1992 period, the average gross rate of firm deaths was 7,88%. Policy makers realize that new small firms are important for economic growth purposes, but also know that young companies are exposed to a high failure risk. Therefore, it is not surprising to observe policies aimed at assisting entrepreneurs in creating successful firms.

Our study examines new firms born in business incubation centers located in the Basque Country. Data from official sources show that 42% of Basque firms born in the 1990–2000 period had to abandon their activities within their initial five years of existence. In recent years, the policy of business incubation centers has become a popular economic development tool in this geographic area, a tool designed primarily to ameliorate this problem. Interestingly, 26% of incubation centers existing in Spain in 1999 were concentrated in the Basque region (European Commission, 2000).

The topic of business incubation has been examined in recent years by a growing body of the literature (Rice, 2002; Adegbite, 2001; Autio and Klofsten, 1998; Mian, 1996, 1997). Most of these studies provide detailed case study analyses where the unit of analysis is the incubation center. We depart from a different perspective and center our attention on the tenants and the ventures they start-up, rather than on the incubator itself. With this approach, we expect to fill the current gap in this field and gain some understanding about the human capital of entrepreneurs attracted by incubation centers, about the ventures they develop, and about the effectiveness of the services provided by the incubation center in assisting entrepreneurs.

With all these recent facts and considering the increasing research interest on business incubation, a study about the effectiveness of business incubation centers as a policy to promote new firm survival and growth becomes an opportune topic. The purpose of this article is twofold. First, this study is an attempt to find out human capital characteristics of entrepreneurs and firm start-up characteristics of ventures located in Basque incubation centers and to link this factors to business growth. Secondly, the paper aims to find out the extent to which the support received by entrepreneurs from incubator centers is critical to ensure firm life endurance and business success. The response to both questions is expected to provide a better understanding about the effectiveness of business incubation centers as a useful program to assist entrepreneurs in overcoming barriers to survive.

The next section provides a brief review of the literature on business survival and growth. Data and methodology applied in our empirical test are briefly explained in section three. The fourth section reveals our main findings, and finally, the study ends with general conclusions and implications.

2. Determinants of business survival and growth

For the purpose of this study, we follow an approach similar to the methods applied by other recent studies on new firm survival and growth (Peña, 2002; Schutjens and Wever, 2000; Gimeno et al., 1997). We understand the gestation period of a new firm start-up as a complicated, uncertain and challenging phase. The success level achieved by new ventures, S, can be explained by factors representing the human capital of the entrepreneur, HC; firm start-up characteristics, F; and external factors, E, among which we include the support received from the business incubation center (i.e., ε would be an error term which includes the omitted explanatory variables).

$$S = f(HC, F, E, \varepsilon) \quad (1)$$

Human capital theory has been utilized as a useful framework to explain the effect of entrepreneurs' individual attributes on business performance (Honig, 2001). According to this research stream, the talent, experience and motivation that entrepreneurs bring to an organization are critical resources; resources which can be

expected to determine the success level achieved by firms. Knowledge acquired through education (i.e., college, business courses, . . .) is expected to enrich entrepreneurs' human capital, and therefore, to enhance new firm life endurance. Owner's human capital measured as formal education was found to impact positively firm profitability (Honig, 2001). Owners' experience is another personal asset widely examined in the human capital literature. An important type of business owners' experience is the prior involvement of an entrepreneur in a managerial position. With some exceptions in mind (Boden and Nucci, 2000), studies show in general that there is a positive relationship between managerial experience and business success (Stuart and Abetti, 1990; Cooper et al., 1989). A second type of entrepreneur's experience is the prior creation of companies. Most authors suggest that entrepreneurial start-up experience increases the odds of venture success (Dyke et al., 1992, Doutriaux and Simyar, 1987).

There is a third type of owner's experience that although it is not so intense as the previous ones, it is worthwhile to mention it. It refers to indirect experiences or passive experiences. For instance, entrepreneurs whose parents, relatives or friends have gone through a business start-up process are acquainted with the endeavors of building a firm. By sharing the concerns of people close to them, entrepreneurs learn the intricacies of creating a business. Sometimes, entrepreneurs start a new firm based on the industry knowledge acquired from a previous job (i.e., knowledge about customers, suppliers, industry regulation, subsidies, . . .). Empirical evidence supports that all these less intense experiences also matter to explain business success (Duchesneau and Gartner, 1990; Schutjens and Wever, 2000).

In addition to an owner's formal education and business experience, which affect the absorptive and learning capacity of an organization, we must add another relevant human capital component: motivation. Some entrepreneurs quit their previous job to start a new firm, whereas other entrepreneurs start a company because they can not find a job. Some entrepreneurs start the company with a serious commitment to succeed (i.e., devote many hours per day to the start-up firm, invest most of their personal savings in the new venture, . . .), whereas other entrepreneurs create a business without much ambition (i.e., tend to spend a lower number of hours, launch their businesses with public funds, . . .). One may expect that entrepreneurs who feel strongly motivated to overcome the adversities of the initial years of business operations and to achieve challenging growth goals for their ventures are more likely to perform better than the rest of entrepreneurs (Peña, 2002).

In summary, the level of education, business experience and motivation of entrepreneurs constitute important human capital elements, *HC*, at the moment of starting up a new venture (i.e., equation 2). Based on the results found in the literature, these human capital assets embodied in entrepreneurs are expected to affect positively firm survival and growth.

$$HC = g(education, experience, \ldots) \qquad (2)$$

The effects of firm size and age on business growth have been widely examined in the economics literature. Gibrat's Law states that firm size is positively related to firm growth, and therefore, to the likelihood of business survival. (For a review of the early and new literature on firm size and survival, see Sutton's 1997 extensive overview.) More specifically, the law postulates that the expected value of the increment to a firm's size in each period is proportional to the current size of the firm. An empirical work by Mata et al. (1995) found that size was an important determinant of the chances to survival, and this was particularly true for firm start-ups. Besides the relevance of firm size, they found that the effect of post entry growth was important for plants established by newly created firms, where the marginal benefits of learning were larger. Since learning is accumulated within the firm over time, it seems reasonable to think that to explain survival, not only size matters, but also firm age.

One of the stylized results in Geroski's (1995) work emphasizes that both "firm size and age are correlated with the survival and growth of entrants". The effective accumulation of firm resources (i.e., tangibles and intangibles) and the capacity of learning at early stages of the life cycle are important factors which may serve to explain the survival and growth of new entrants. In Jovanovic's formal model (1982), firm owners do not know ex-ante about the appropriateness of

their managerial competence to thrive in the market but once the firm is created they notice their chances to succeed. This is discovered after firm entry, during an experimentation and learning period where the entrepreneur finds out about his or her true business ability. Firm owners learn about their efficiency as they operate in the industry. The efficient firms survive and grow, while the inefficient ones fail and exit. As Mata et al. (1995) state "the process of entry is a period of learning, in which entrepreneurs observe their performance and update their expectations". With the revised expectations, firm owners decide to continue or to exit. The length of this process depends upon the entrepreneurs' attributes and on the structural conditions of the industry in which the new firm operates. Therefore, it is not entry *per se* what seems to be critical, but the period just after entry which influences the odds for future business success. Following this line of thinking, Geroski's (1995) assertion is quite appropriate in differentiating entry from survival: ". . . entry appears to be relatively easy, but survival is not".

A recent work by Agarwal and Audretsch (2001) concludes that entrants that are successful at the initial critical stage will grow, whereas those that are not successful will remain small and probably be forced to exit the industry. However, they claim that firm growth is not a necessary condition to survive. The authors draw on the theory of strategic niches and state that while the likelihood of survival confronting small entrants is generally less than that confronting their larger counterparts, the relationship does not hold for mature stages of the product life cycle or in technologically intensive products. Their results suggest that small firms are not necessarily under pressure to grow in order to survive so long as they are able to occupy successfully strategic niches in, for instance, mature high-tech industries. Furthermore, business growth may not be the primary objective of managers of some incubator centers; venture survival or the development of a sustainable enterprise comes first (Rice, 2002).

In short, the literature is not conclusive enough about the existence of a sound relationship between firm size and survival as it is established by Gibrat's law. As far as firm age is concerned, empirical studies suggest that companies evolve through a learning process and find out about their ability to adjust to market conditions. A minority of entrants seems to survive after 5–6 years of business activity. Hence, most firms apparently make the decision to abandon the market during this period of time.

Following this line of thinking, the initial years of start-up firms seems to be relevant to ensure survival and future growth. In our opinion, new venture success must be understood as a multidimensional phenomenon. It is well known that new firms face serious difficulties in surviving their initial years of operations. Strong industry competition and small firm fragility are some of the most often cited arguments that explain business failure in the business management literature.

Besides firm size and age, other organizational attributes (i.e., firm resources and capabilities, or the effective implementation of competitive strategies) seem to influence business performance. When a venture is started by a team of entrepreneurs, the pool of assets and capabilities of an organization tends to be larger and more diverse than that of a self-employment type of business activity. Both a larger amount of resources and a more diversified resource base (i.e., including tangible and intangible assets) contribute to enriching the core competencies of the new organization. In this regard, some studies reveal that business performance is considerably superior when the firm is started up by a team of entrepreneurs, rather than by an individual (Woo et al., 1989).

Entrepreneurs are exposed to a higher uncertainty than incumbents since they do not have historical records and information about their ventures. Therefore, new firm owners initiate an experimentation and learning process after inception, which implies successive changes that often alter the course of initial business strategies. Business strategies are the result of managerial decisions, decisions that are constrained to the resources of a firm and the learning ability of entrepreneurs. A larger amount of financial capital provides an entrepreneur with more flexibility to undertake a wider array of strategies, and therefore, would influence positively business performance (Boden and Nucci, 2000). In new ventures, changes along dimensions of strategy reflect a process of "try and see" learning, whereby the

entrepreneur seeks to develop an understanding of the competitive environment and position successfully the company in the market (Nicholls-Nixon et al., 2000). Business strategies follow an iterative process as entrepreneurs discern right decisions from wrong decisions. In this experimentation process, some entrepreneurs are more prone than others to introduce continuous changes along different strategy dimensions. The ultimate goal of the "try and see" experimentation process is to achieve an instructive chain of decisions or changes that determines the successful evolution of new organizations.

In sum, firm age, size, resources, and strategies are important organizational factors that may affect new firm survival and growth (i.e., equation 3). Prior findings reveal, in general, that these factors are positively associated with the effective adjustment of a new organization to the competitive environment.

$$F = h(\textit{firm age}, \textit{size}, \textit{resources}, \textit{changes in strategies}, \ldots) \quad (3)$$

Besides human capital and organizational factors, there are also external factors affecting the future wealth of start-up businesses (i.e., vector *E* in equation 1). Some external factors have to do with location-specific advantages, industry-specific advantages, macroeconomic conditions and benefits from public policies. Start-up firms may benefit from positive externalities coming from both location and urbanization economies (Henderson et al., 1995). While localization economies derive from a buildup of knowledge associated with ongoing communications among local firms in the same industry, urbanization economies derive from a buildup of knowledge associated with industry diversity. Thereby, the selection of a particular geographical location to build a business may be critical so long as advantages from network opportunities (i.e., with suppliers, customers, competitors, financial institutions, consultants, . . .) and agglomeration economies translate into higher profits. On the other hand, the characteristics of the industry sector in which the new organization will operate may determine the odds for future success. Sandberg and Hofer (1987) found that companies which entered markets in continuous disequilibrium, development or growth stage, with product heterogeneity and high entry barriers were more likely to experience superior business performance. Regarding the macroeconomic conditions, depending upon de business cycle in which a firm is started, the odds for new entry and venture success are higher during expansionary periods.

A recent study shows that between 60 and 78 percent of individuals with entrepreneurial intent who received outside business assistance started a firm as compared to 48 percent of the general population who indicated intent (Chrisman, 1999). Public policies aimed at encouraging new business creation are expected, not only to promote firm formation, but also to enhance venture survival and growth. A business incubator is a popular business assistance program with the goal of nurturing new and small-scale enterprises. This program provides entrepreneurs with the expertise, networks and tools they need to make their ventures successful. The US National Business Incubation Association defines business incubation as "a dynamic process of business enterprise development. Incubators nurture young firms, helping them to survive and grow during the start-up period when they are most vulnerable. Incubators provide hands-on management assistance, access to financing and orchestrated exposure to critical business or technical support services. They also offer entrepreneurial firms shared office services, access to equipment, flexible leases and expandable space – all under one roof. An incubation program's main goal is to produce successful graduates – businesses that are financially viable and freestanding when they leave the incubator usually in two to three years". Numerous case studies suggest that business incubators contain both tangible (i.e., space, equipment, . . .) and intangible (i.e., formation programs, technical assistance, networking possibilities, entrepreneurial camaraderie, . . .) resources which help start-up firms overcome their difficult initial years (Rice, 2002; Adegbite, 2001; Autio and Klofsten, 1998; Mian, 1996, 1997).

In sum, external factors such as location economies, industry characteristics, macroeconomic conditions and public policies seem also to determine new firm life endurance.

$$E = k(\textit{location}, \textit{industry}, \textit{macroeconomic condition, public policy}, \ldots) \quad (4)$$

Building on the preceding literature, one can understand the process of launching a new business as a multidimensional and complex phenomenon. For simplicity reasons, three sets of factors have been identified in this study: human capital, organizational and external factors. Each of these factors can be broken down into a more detailed subset of constructs, constructs that we will use next in our empirical test.

3. Data and methodology

Our study aims at exploring new firm survival and growth patterns of incubating ventures in the Basque Country. To our knowledge, there is not much empirical work in the literature which examines the human capital characteristics of entrepreneurs and firm start-up attributes of ventures operating in business incubators, and links these factors to business performance. More specifically, our purpose is to test the effect of entrepreneur's human capital, new firm resources-strategies, and business incubation services on venture growth.

We believe that the Basque Country is an appropriate region to conduct our empirical test. On the one hand, the Basque Country was one of the pioneering regions in Spain implementing a business incubation policy and this fact allowed us to collect better quality data (i.e., longer history-data from incubating firms). On the other hand, while only 6% of all Spanish firms were from the Basque region, 26% of business incubators were located in the Basque area. Therefore, the Basque Country was a region that made a relatively greater effort, compared to other Spanish regions, in implementing a policy based on business incubation centers (i.e., a policy to assist entrepreneurs and new firm start-ups). This fact allowed us to obtain a larger-size study sample.

Other facts from the Basque economy revealed that there were, on average, 19,500 newborn firms and 18,000 business failures annually during the nineties. Almost half of these newborn firms failed within the initial five years of existence. Considering the firm-demographics of the Basque economy, we believe that our study sample may be representative of newborn firms from the EU zone, as both the business incubation policy implemented in the Basque Country and the economic facts on new firm survival are analogous to those of other European or western countries (Mata and Portugal, 1994; Callejón and Segarra, 1999; European Commission, 2000; NBIA, 2001).

With all these facts in mind and also being aware of the need in the literature to explore further on business incubation, a field study was conducted in the Basque Country. Once our questionnaire was designed, data were gathered from entrepreneurs who decided to start-up a business during the 1997–1998 period. All the companies participating in the study had in common that they were nurtured under the same business assistance program (i.e., business incubation program of the Basque region) and remained in business while they lived in the incubation center. Nine business incubation centers of the ten existing at that time in the Basque Country participated in our study. Of the 364 start-up projects (i.e., still in the business conception phase) presented by entrepreneurs to the respective incubator directors, about 60% of them became in a real firm, that is, in an officially registered firm. With the collaboration of the directors of the nine incubators, finally we obtained a study sample of 114 start-up firms.

We asked entrepreneurs questions concerning their human capital characteristics, resources and strategies of their ventures, and also, the usefulness of the services provided by the incubation center. We also gathered information about business performance in terms of annual sales, profits and firm employment. Growth measures were obtained using each of these performance variables. We noticed that the three growth indicators (i.e., employment growth, sales growth and profit growth) were not highly correlated. Therefore, we ran separate multivariate linear regression models (i.e., Ordinary Least Squares, OLS) for each growth dependent variable.

We realized that, regardless the support received from the incubation center (i.e., all the sample firms get more or less the same support level), some firm owners were facing serious difficulties to cope with barriers to survive, whereas other entrepreneurs were building successful start-up companies. In view of this fact, it seemed reasonable to us to question what was making some firms to stagnate and other firms to grow, while they all were getting the same services from the

incubation center. Consequently, we decided to examine separately the effect of three sets of independent variables (i.e., human capital, firm resources-strategies, and business incubation variables) on business growth (i.e., employment growth, sales growth and profit growth). A detailed description of both dependent and independent variables is provided in the Appendix of this study. A summary of the descriptive statistics and correlation coefficients for the variables are illustrated in Table I.

While most entrepreneurs started their firms with similar employment bases, this was not true for venture sales and profits bases. Hence, we thought that both sales and profit growth variables had to be size-adjusted (Nicholls-Nixon et al., 2000). We size-adjusted sales and profit growth by using logarithms of these variables. As far as the set of independent variables is concerned, we included variables related to entrepreneur's education and business experience, which represented venture owners' human capital (i.e., *college, mgmtexper, startupexper, familyentr, ideaprevjob*). We expect that a higher education level, managerial and start-up experience, and previous exposure to running an entrepreneurial business would have a positive impact on firm growth.

In addition to conventional firm-resource variables (i.e., firm size and firm age), we created firm-strategy related variables (i.e., *changes, alliances* and *intlmarket*), which represented strategic adjustments experienced within the organization, the pursuit of external growth through alliances and the degree of openness towards international markets. Our belief is that companies that start with a larger amount of financial resources are capable to prolong business activities for a longer period of time. Similarly, companies that have been operating longer accumulate experience and get immersed in a learning process through continuous experimentation, which is also expected to affect positively business survival. We included the strategy variable *alliances* because inter-organizational agreements with other firms serve often to complement lacking resources and capabilities and the variable *intlmarket* because entry into foreign markets can be considered as an expansion-strategy leading to firm growth.

Last, but not least, we included variables representing the services offered by a business incubation center. In particular, these variables describe different advantages derived from the incubator: business education programs and assistance services (i.e., *training*), savings coming from the use of space and equipment at below market prices (i.e., *saving*), networking and exchange activities carried out with other tenants (i.e., *exchknow, tradeprod*), and contacts facilitated by the director of the incubator with external agents, such as venture capitalists, financial institutions, local authorities, realtors, etc (i.e., *networking*). All these services and opportunities available in business incubation centers are expected to enhance the chances for new firm survival and growth.

4. Regression analysis results

Three dependent variables were created to measure firm growth: employment growth (i.e., variable *emplgrowth*), sales growth (i.e., *salesgrowth*) and profit growth (i.e., *profitgrowth*). As opposed to our employment and sales growth models, the profit growth model did not perform as desired. We decided to ignore this model, because the explanatory power of its different versions were low (i.e., the highest R-Square obtained was 0.13), and in addition to that, we did not find any significant explanatory variable (See Table II). However, this result merits some comment. There is a belief in the academic community that profit is not an accurate measure to capture venture growth, at least during their first 3–4 years. Certainly, entrepreneurs often do not reveal having profits because they include them as part of their salary or just invest them for continuing in business. This reasoning supports Reid's (1999) assertion which states that the entrepreneur is willing to sacrifice profit initially in order to survive and grow on. We thought that the discussion of results from our profit model could be troublesome both technically and conceptually. We will ignore then our profit model, and after this brief remark, we will center our attention on the discussion of both employment and sales growth models.

Following the literature on human capital, we tested the effect of entrepreneur's level of education and previous business experience on venture growth (i.e., equation 2). Our results for employ-

TABLE I
Descriptive statistics and pearson correlation coefficients

	Mean	Std.dev.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Emplgrowth	0.61	2.73																	
Salesgrowth	0.09	0.20	0.43**																
Profitgrowth	12.66	116.59	0.02	0.19*															
College	0.45	0.50	0.22*	0.25**	0.04														
Mgmtexper	1.69	4.43	0.17	–0.02	0.02	0.14													
Startupexper	0.18	0.39	–0.10	–0.21*	0.07	0.03	0.37**												
Familyentr	0.46	0.50	–0.12	–0.02	0.00	0.13	0.08	0.02											
Ideaprevjob	0.64	1.27	0.83**	0.35**	–0.04	0.06	0.10	–0.04	–0.05										
Firmage	33.15	17.88	0.17	0.24*	0.09	0.27**	0.16	0.16	0.04	0.04									
Investment	15.03	1.39	–0.03	–0.17	–0.19*	–0.11	0.19	–0.02	–0.01	0.01	–0.10								
Changes	3.80	2.90	0.30**	0.24*	0.21*	0.32**	0.07	–0.07	0.19*	0.20*	0.25	–0.22*							
Alliances	0.19	0.40	0.20*	0.25**	–0.04	0.23*	–0.06	0.11	0.27**	0.14	0.22*	–0.12	0.14						
Intlmarket	5.45	22.25	0.14	0.03	0.20*	0.11	0.23*	–0.01	0.04	0.06	0.09	–0.20*	0.32**	0.18					
Exchknow	1.65	3.51	0.01	–0.03	0.12	–0.01	–0.06	–0.06	0.08	0.05	–0.12	–0.22*	0.08	0.02	0.11				
Tradeprod	1.23	2.30	–0.07	–0.05	0.03	0.11	0.00	0.08	0.08	–0.04	–0.11	–0.19*	0.07	0.15	0.11	0.45**			
Trainging	0.63	0.48	–0.06	–0.15	0.02	–0.04	–0.07	–0.20*	–0.03	–0.15	–0.19*	0.11	–0.04	–0.04	0.11	–0.14	–0.03		
Saving	0.12	0.33	–0.06	–0.02	–0.04	0.15	–0.14	–0.04	–0.02	–0.04	–0.09	–0.17	–0.02	0.22*	0.03	0.56**	0.55**	0.12	
Networking	0.39	0.49	–0.10	–0.10	0.05	–0.08	–0.14	–0.15	0.02	–0.10	–0.09	–0.11	–0.02	0.15	0.04	0.03	0.15	0.62	0.30

* Correlation is significant at the 0.05 level (2-tailed).
** Correlation is significant at the 0.01 level (2-tailed).

TABLE II
Impact on profit growth

	Human capital			Adding firm resources and strategies			Adding incubation variables		
	Estimated coefficient, β	*t*-student	*p*-value	Estimated coefficient, β	*t*-student	*p*-value	Estimated coefficient, β	*t*-student	*p*-value
Constant	7.94	0.42	0.68	135.47	1.02	0.31	94.38	0.67	0.51
College	11.03	0.48	0.63	–3.73	–0.15	0.88	6.01	0.24	0.81
Mgmtexper	–0.05	–0.02	0.99	–1.19	–0.40	0.69	–1.41	–0.47	0.64
Startupexper	20.01	0.64	0.52	30.33	0.96	0.34	36.87	1.13	0.26
Familyentr	–2.85	–0.13	0.90	–2.20	–0.09	0.93	–8.65	–0.36	0.72
Ideaprevjob	–3.92	–0.44	0.66	–5.51	–0.61	0.54	–5.99	–0.65	0.52
Firmage				0.29	0.44	0.66	0.36	0.51	0.61
Investment				–10.01	–1.18	0.24	–8.49	–0.95	0.35
Changes				6.79	1.53	0.13	6.17	1.37	0.17
Alliances				–35.28	–1.13	0.26	–27.59	–0.82	0.41
Intlmarket				0.81	1.47	0.15	0.70	1.22	0.22
Exchknow							6.50	1.54	0.13
Tradeprod							–0.33	–0.06	0.96
Training							8.73	0.27	0.79
Saving							–63.33	–1.28	0.20
Networking							20.90	0.67	0.51
R-Square	0.01			0.11			0.13		
Adj. R-Square	–0.04			0.02			0.01		

ment and sales growth consistently show that entrepreneurs' human capital is an important intangible component which seems to affect new firm survival and growth (See Table III and Table IV). In both employment and sales growth models, the set of human capital variables showed the largest explanatory power (i.e., $R^2 = 0.74$ and $R^2 = 0.22$ respectively).

In particular, entrepreneurs who obtained a higher education level, had a longer managerial experience, and capitalized on ideas acquired in previous jobs were more likely to create a successful company. Our findings suggest that, business knowledge and the management experience are important human capital components to ensure business endurance. These results confirm previous findings of other studies (i.e., Schutjens and Wever, 2000; Cooper et al., 1989; Stuart and Abetti, 1990; Doutriaux and Simyar, 1987; Peña, 2002).

Surprisingly, we found that start-up experience and having a family of entrepreneurs had a negative impact on employment and sales growth. Possibly after business failure, entrepreneurs try the creation of a new venture again, but in a more comfortable environment such as a business incubation center. Regarding the negative effect of having entrepreneur relatives, it is well known that good lessons can be learnt from a family of successful entrepreneurs, but the ones that achieve success are not many. Unfortunately, we had no data available which explained the success level achieved by the venture of other family members.

Our second set of variables included in the growth models represented resources and strategies of the ventures (i.e., equation 3). When we added these variables to the human capital model, the explanatory power of the extended model did not experience any substantial increase (i.e., $R^2 = 0.76$ for employment growth and $R^2 = 0.31$ for sales growth). Once again, this confirms the importance of entrepreneurs' human capital attributes in building successful ventures.

According to our employment and sales growth results, it seems that the establishment of interorganizational arrangements helps companies in overcoming survival barriers. Venture entrepreneurs may benefit from tangible (i.e., financing, equipment, products, . . .) and intangible (i.e., knowledge, experience, . . .) assets of partner

TABLE III
Impact on employment growth

	Human capital			Adding firm resources and strategies			Adding incubation variables		
	Estimated coefficient, β	*t*-student	*p*-value	Estimated coefficient, β	*t*-student	*p*-value	Estimated coefficient, β	*t*-student	*p*-value
Constant	–0.60	–2.60	0.01	–0.21	–0.13	0.90	0.46	0.27	0.79
College	0.92	3.35	0.01	0.55	1.89	0.06	0.57	1.90	0.06
Mgmtexper	0.07	2.09	0.04	0.08	2.30	0.02	0.08	2.27	0.03
Startupexper	–0.75	–2.01	0.05	–0.93	–2.44	0.02	–0.87	–2.25	0.03
Familyentr	–0.62	–2.26	0.03	–0.84	–2.99	0.01	–0.88	–3.09	0.01
Ideaprevjob	1.70	15.85	0.01	1.63	15.00	0.01	1.63	14.84	0.01
Firmage				0.01	1.31	0.19	0.01	1.34	0.18
Investment				–0.05	–0.49	0.63	–0.11	–1.05	0.30
Changes				0.08	1.50	1.14	0.07	1.38	0.17
Alliances				0.75	1.97	0.05	1.01	2.53	0.01
Intlmarket				0.01	–0.13	0.89	0.01	–0.54	0.59
Exchknow							0.04	0.72	0.47
Tradeprod							–0.02	–0.21	0.83
Training							0.78	2.04	0.04
Saving							–0.63	–1.07	0.29
Networking							–0.54	–1.45	0.15
R-Square	0.74			0.76			0.78		
Adj. R-Square	0.72			0.74			0.74		

TABLE IV
Impact on sales growth

	Human capital			Adding firm resources and strategies			Adding incubation variables		
	Estimated coefficient, β	*t*-student	*p*-value	Estimated coefficient, β	*t*-student	*p*-value	Estimated coefficient, β	*t*-student	*p*-value
Constant	0.04	1.26	0.21	0.32	1.59	0.11	0.41	1.92	0.06
College	0.10	2.84	0.01	0.05	1.44	0.15	0.05	1.36	0.18
Mgmtexper	0.01	–0.17	0.86	0.01	0.80	0.43	0.01	0.76	0.45
Startupexper	–0.10	–2.12	0.04	–0.14	–3.00	0.01	–0.15	–3.14	0.01
Familyentr	–0.01	–0.35	0.73	–0.04	–1.08	0.28	–0.04	–1.09	0.28
Ideaprevjob	0.05	3.74	0.01	0.04	3.19	0.01	0.04	2.87	0.01
Firmage				0.01	1.78	0.08	0.01	1.37	0.17
Investment				–0.02	–1.66	0.10	–0.02	–1.79	0.08
Changes				0.01	0.80	0.43	0.01	0.77	0.44
Alliances				0.10	2.19	0.03	0.12	2.39	0.02
Intlmarket				0.01	–1.40	0.16	0.01	–1.24	0.22
Exchknow							0.01	–0.31	0.76
Tradeprod							0.01	–0.28	0.78
Training							–0.02	–0.34	0.74
Saving							–0.02	–0.24	0.81
Networking							–0.04	–0.84	0.40
R-Square	0.22			0.31			0.34		
Adj. R-Square	0.18			0.25			0.23		

firms, particularly when the venture is a key target for that partner firm.

We created the variable *firmage* as a proxy for organizational learning and *investment* as a proxy for initial firm size, since they have been widely examined in the literature. We found some support in our sales growth model for the presumably positive relationship between firm age and firm growth (Mata et al., 1995). As organizations learn through exploration and trial-and-error experiences over time, they are more likely to better adjust to new market conditions, and therefore, to survive longer. Companies that are flexible and persist in refining their strategies over time are the ones that thrive and perform best. According to our results, mature firms have gone through an experimentation, learning and transformation process for a longer period of time, which supposedly, is expected to increase the odds for survival and growth (Birley and Westhead, 1990; Kalleberg and Leicht, 1991).

As far as firm size is concerned we obtained a puzzling result. A larger amount of money as an initial investment devoted to the venture was negatively related to sales growth. One plausible explanation of this result is that larger companies may obtain a larger sales volume in absolute terms than that of smaller firms during the first year of operations. As such, we might have favored smaller firms in our study due to their lower initial base, even though we tried to adjust our sales growth variable for firm size as it has been suggested elsewhere (Nicholls-Nixon et al., 2000). Additional refinements for the measurement of growth for entrepreneurial ventures are called for. We left this issue for further research.

All the business owners participating in this study have in common that their ventures are being nurtured in a business incubation center. We examined the effect of the services provided by this business assistance program on business growth. The explanatory power of the full models did not experience any major improvement (i.e., $R^2 = 0.78$ for employment growth and $R^2 = 0.34$ for sales growth). Compared to the other two sets of independent variables (i.e., human capital of entrepreneurs and organizational resources-strategies), the set of incubation services did not add much significant explanation to our venture growth models.

Interestingly, we found that the business courses, individual consulting assistance and monitoring services provided by the business incubation center were positively related to employment growth. This result confirms previous findings on business incubators (Mian, 1996). Presumably, a business incubation center offers a unique setting to develop an important relational capital element, such as the support climate among entrepreneurs created within the incubator to overcome together the difficult moments of the firm gestation period. All these services and networking opportunities offered by the incubation center contribute positively to firm mortality risk reduction (Shepherd et al., 2000). However, we did not find in any significant positive contribution of these advantages to venture growth in our study. Perhaps, the directors of business incubation centers are not exploiting sufficiently the possibilities for networking both inside and outside the incubation facility. As Adegbite (2001) suggests, directors of business incubation centers still can make a more effective use of their facilities and services, which ultimately is expected to favor new firm survival and growth.

5. Conclusions and implications

There is no doubt about the important role that new firms play in the development of economies, and particularly, in the development of certain industry sectors and geographic regions. Young firms are a major source of new jobs, sales and innovation in most economies (OECD, 2000; European Commission, 2000). Paradoxically, young firms are fragile and entrepreneurs face serious barriers to survive and thrive during the gestation period. Business incubation centers have emerged as a popular growth policy to respond to this general concern. We have examined Basque ventures which have benefited of this policy. Also, factors explaining start-up firm growth have been identified.

Our work extends previous research on business incubation (Rice, 2002; Adegbite, 2001; Autio and Klofsten, 1998; Mian, 1996, 1997) by using the new venture, rather than the incubator itself, as the unit of analysis. Another contribution of this paper is that it adds to the growing body of new firm survival literature with a pioneering

analysis concerning the linkage between incubation services and business endurance. Our findings suggest that the most influential determinants for new business survival and growth are those factors representing the human capital of the entrepreneur. More specifically, business owners with advanced education and business management experience are expected to perform better than entrepreneurs without such skills. We also offer some tentative thinking regarding the positive effect of certain firm-related variables, such as the arrangement of strategic alliances, entry into foreign markets and organizational learning on business growth. Successful start-ups firms look for lacking resources and capabilities by targeting other firms and markets, which will allow them to complement and enrich their initial pool of assets. By exploring and experimenting during the gestation period, star-up firms learn and adapt to the prevailing competitive environment in the market. The longer they survive, the more they learn and *viceversa*.

The non-significance of the majority of variables related to the assistance provided by the business incubation center raises important questions regarding the relevance and effectiveness of this program as an instrument to promote firm growth. It seems that firm growth is mostly the result of the own skills of entrepreneurs and certain organizational factors of the start-up firm. Therefore, according to our findings, firms should be able to thrive by themselves without any assistance from the incubator. In fact, the only significant variable positively associated with firm growth was the management training and assistance services provided by the incubator. With these results in place, policy makers and directors of incubation centers should focus on enhancing the human capital of entrepreneurs. Additionally, a more effective use of networking opportunities in and out of the incubator could improve the odds of venture success (i.e., access to venture capitalists, financial institutions, potential partners to form alliances, public services to support entry into foreign markets, etc.).

A key feature of our study has been the suggestion that the incubation center may attract entrepreneurs having experienced business failures in the past, as we consistently found it in our employment and sales growth models. Furthermore, we think that some *inefficient* firms may survive their gestation period while they are hosted in the incubator (i.e., thanks to the support they receive) but at the same time, they may place other more efficient firms out of the market (i.e., the so-called *displacement effect*). In this case, the outcome of this policy, namely a higher social efficiency level, would be more apparent than real. These result casts some doubts about the effectiveness of this type of assistance programs since not only new entrants may not receive effective support, but what is worse, this policy may develop negative externalities against incumbent firms and "would-be" entrepreneurs (Lotti et al., 2001). Business assistance programs entice new firm entry as it is pointed out by Chrisman (1999), but the real question becomes: do they help entrepreneurs in achieving efficiency levels so as to compete successfully in the market?

An important implication for business practitioners is that the enhancement of human capital and firm resources appears to be a more important goal than the dependence on external policies to ensure the endurance of start-up firms. Policy makers should be selective in their choices about the start-up companies that must be promoted. Like other business assistance programs, business incubation centers are aimed at helping ventures survive and grow. However, incubation center directors should be aware of the harm that they may cause to other incumbent firms when tenant firms do not attain desirable efficiency thresholds. In order to avoid this problem, incubator managers should monitor tenant firms by following a proactive and developmental approach. Instead of being attended in a reactive and episodic way (i.e., tenants stop by the incubator-manager's office once a while to address specific questions), firm owners should be counseled in a continual and broad way by the incubator manager, like they were "quasi-partners" in the same business (Rice, 2002).

Caution is recommended in the interpretation of our results. An important limitation of this study is that it relies upon a reduced-size and unusual sample. All the observations represent new firm start-ups born in business incubation centers, which are located in a region known as the Basque Country. As noted previously in the paper, we were not able to obtain better quality

data to describe certain variables (i.e., success level achieved by family ventures, additional incubation service measurement, . . .). With all the shortcomings and limitations in mind, we still believe that our results are robust enough to shed some light on growth determinants of new start-up firms nurtured in incubation centers.

Further research is needed to value the benefits and costs of this increasingly popular growth policy. It would be desirable to develop a clearer understanding of the efficiency achieved by tenant firms while they are in the incubator. This would allow us to test more deeply the effectiveness of business incubation centers in reducing barriers to survive, rather than in promoting new firm entry. One way to explore this issue would be by conducting a comparative analysis between incubating and non-incubating firms. Are incubation centers attracting relatively less efficient firms? In this line of thinking, it would be interesting also to examine what happens when firms graduate from the incubation center. This leaves unanswered questions (i.e., do firms continue after graduation? If so, how long?), which could provide valuable insights about the post-incubation period, and most importantly, about the overall usefulness of this business assistance program.

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Appendix

Description of variables

- *Business Growth*:

Emplgrowth: Increase in number of employees since inception.

Salesgrowth: Increase in sales (in pesetas) measured as the difference in the logarithm of sales since inception.

Profitgrowth: Increase in profits (in pesetas) measured as the difference in the logarithm of profits since inception.

- *Human Capital*:

College: Entrepreneur had a college degree (1 = Yes, 0 = No)

Mgmtexper: # of years of the entrepreneur in a managerial position prior to firm start-up

Startupexper: Entrepreneur had prior start-up experience (1 = Yes, 0 = No)

Familyentr: Entrepreneur had a family with entrepreneurial experience (1 = Yes, 0 = No)

Ideaprevjob: Entrepreneur got idea from previous job (1 = Yes, 0 = No)

- *Start-up Firm Resources and Strategies*:

Firmage: # of months of the company since business creation

Investment: Logarithm of initial financial investment (in pesetas)

Changes: An index (from 1 to 10) based on the changes introduced into the organization since inception regarding the following ten items: major changes in product line, product prices, product quality, customer base, supplier base, firm's human resources, location or business space, founding team, internal organization and financial sources.

Alliances: Had an inter-firm agreement with other organization (1 = Yes, 0 = No)

Intlmarket: % of total sales in international markets

- *Business Incubation Center Services*:

Exchknow: # of days per month in which entrepreneur discussed business or entrepreneurship-related issues, exchanged knowledge, . . . with other business owners in the incubator facility.

Tradeprod: # transactions (i.e., purchase/sale of products or services) per month made by entrepreneur with other business owners in the incubator facility.

Training: Intangible services (i.e., business courses, monitoring and consulting services) provided by the incubation center had a major positive impact on venture success (1 = Yes, 0 = No)

Saving: Tangible services (i.e., use of below market rental space, meeting rooms, shared equipment such as fax machines, photocopying services, . . .) provided by the incubation center had a major positive impact on venture success (1 = Yes, 0 = No)

Networking: Contacts established by the director of the business incubator center for the entrepreneur (i.e., access to new financial sources including venture capitalists, to local government authorities for grant and taxation related issues, to local developers and realtors for a future business location, . . .) had a major positive impact on venture success (1 = Yes, 0 = No)

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