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Influence of human and physical capital on the survival of new ventures

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RESUMEN The purpose of this study is to analyze the influence of physical and human capital on the survival of new ventures in different economic contexts. We conduct an empirical study by using a logit model to analyze new ventures' probabilities of survival. The results show that both human and physical capital influence the survival of ventures in the short and long term, with human capital playing a particularly important role. The implications of the study hinge on two key findings. First, the government's potential to promote more efficient forms of entrepreneurship is a prominent factor. Second, the motivations —necessity or opportunity— of the entrepreneurs embarking on business ventures, and the importance of certain types of capital also determine the venture's prospects for survival.

KEYWORDS firm survival, human and physical capital, new ventures.

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Influencia del capital físico y humano en la supervivencia de nuevas empresas

RESUMEN El propósito de este estudio es analizar la influencia del capital físico y humano en la supervivencia de nuevas empresas en diferentes contextos económicos. Para ello, se lleva a cabo un estudio utilizando un modelo *logit* que analiza las probabilidades de supervivencia de las empresas de nueva creación. Los resultados muestran que tanto el capital humano como el físico influyen en la supervivencia de las empresas en el corto y largo plazo, siendo especialmente importante el papel que desempeña el capital humano. Las implicaciones del estudio giran en torno a dos hallazgos sustanciales. El primero es que destaca el potencial de los gobiernos en la promoción de formas más eficientes de emprendimiento. El segundo es que el tipo de motivación –necesidad u oportunidad– del emprendedor y la importancia de ciertos tipos de capital también determinan las probabilidades de supervivencia de las empresas.

PALABRAS CLAVE capital físico, capital humano, empresas de nueva creación, supervivencia de las empresas.

Influência do capital físico e humano na sobrevivência de novas empresas

RESUMO O propósito deste estudo é analisar a influência do capital físico e humano na sobrevivência de novas empresas em diferentes contextos econômicos. Para isso, se realiza um estudo utilizando um modelo *logit* que analisa as probabilidades de sobrevivência das empresas de nova criação. Os resultados mostram que tanto o capital humano quanto o físico influem na sobrevivência das empresas em curto e longo prazo, sendo especialmente importante o papel que desempenha o capital humano. As implicações do estudo giram em torno a dois resultados substanciais. O primeiro destaca o potencial dos governos na promoção de formas mais eficientes de empreendimento. O segundo é que o tipo de motivação –necessidade ou oportunidade– do empreendedor e a importância de certos tipos de capital também determinam as probabilidades de sobrevivência das empresas.

PALAVRAS CHAVE capital físico, capital humano, empresas de nova criação, sobrevivência das empresas.

Introduction

One of the main objectives in the field of Management is to identify the factors that determine why one venture is more successful than its competitors. The Management literature presents a range of possible responses to this question from two main perspectives: external and internal (Hoskinsson, Hitt, Wan & Yiu, 1999). The external perspective, based on the analysis of the environment, is an approach initially based on Industrial Organization Economics, which gives rise to the classical paradigm of "structure-conduct-performance" (Bain, 1959; Grether, 1970). Taking this paradigm as a starting point, scholars developed the theory of the New Industrial Economy as the basis for the so-called "strategic positioning approach", whose most renowned exponents are Richard Caves' acolytes (Hunt, 1972; Newman, 1978; Porter, 1979).

The internal perspective is based on the resource-based view (RBV), according to which strategy and sustainable competitive advantage are related to the property of a number of assets—generally intangible and difficult to imitate—, abilities, and skills collected over time. These attributes also have a strong tacit knowledge component and rely on established organizational routines that allow firms to carry out their activities, and help companies differentiate themselves from competitors (Peteraf, 1993). In this sense, economists' interest in explaining the performance of ventures shifts, to some extent, from a market to a venture focus. The origin of the competitve strategy is internal and derives from the asymmetry in the initial endowment of resources, and their scarcity, imperfect and limited transference, substitutions and appropiation (Amit & Schoemaker, 1993; Barney, 1986; Dierickx & Cool, 1989). This approach is not, however, an alternative, but rather a complement to the focus that stems from the analytical and empirical literature based on the initial proposals of Bain and Porter (Mahoney & Pandian, 1992). Nevertheless, analysis of the environment is still subject to criticism from scholars because changes in surroundings may affect the relative importance of a venture's resources (Penrose, 1959).

This internal perspective focuses on three types of resources or capital: physical, human, and organizational (Barney, 1991). Physical capital includes facilities, technology, and, in general, the capacity to invest in the venture (Wright, McMahan & McWilliams, 1994). Human capital, on the other hand, refers to education, experience, intelligence, and judgment of an organization's members (Barney, 1991). Finally, organizational, or structural capital has to do with the organizational structure, the coordination systems, and the informal relationships that the venture maintains with its environment (Wright *et al.* 1994). Thus, some strategies that a venture adopts to improve its performance and its survival probabilities require, "a particular mix of physical capital, human capital, and organizational resources capital" to be implemented (Barney, 1991, p. 106).

The resource-based view has been the subject of extensive study from Management scholars (Wernerfelt, 1984; Peteraf, 1993; Hart, 1995; Verbeke & Yuan, 2013). Furthermore, a number of studies also show a link between the RBV and entrepreneurship (Hitt, Ireland, Camp & Sexton, 2001; Yli-Renko, Autio & Sapienza, 2001; Sieger, Zellwegerd, Nason & Clinton, 2011). The literature is, however, somewhat deficient in analysis of the role of different types of resources in each stage of a new venture's life: from its constitution to its consolidation in the market place.

Hence, this article is devoted to the study of the relationship between new ventures' physical and human capital at the beginning of their economic activity, and their prospects for survival in the short and long term. The analysis focuses on these two types of capital because they are the facets of the capital trichotomy that truly determine a venture's value in the market place (Johnson, 1999). We choose to omit organizational capital from the analysis because new ventures usually lack a clearly defined organizational structure, coordination systems, and consolidated informal relationships with suppliers, clients and key agents of their competitive environment (Stinchcombe, 1965). Accordingly, the development of organizational capital depends to a large degree on the burgeoning of human capital in the venture.

We focus on the services sector, because it is especially sensitive to volatility in the environment, and human capital plays a fundamental role due to entrepreneur–client proximity (Brüderl, Preisendörfer & Ziegler, 1992; Mills & Margulies, 1980).

The next section of the paper covers the theoretical framework and research hypotheses. Following this, we detail the methodology and present the results of our analysis. Finally, the last

section of the paper brings together the key conclusions and limitations of the study.

Theoretical framework

Resource-based view, physical capital, and human capital

The barriers to entry that a new venture faces when entering a market afford consolidated ventures a competitive advantage with respect to new entrants (Kerr & Nanda, 2011). Mobility barriers play a similar role, protecting the ventures that are more favorably positioned with respect to competitors from other strategic groups (Jacquemin, 1987; McGee & Thomas, 1986; Porter, 1979). These barriers are mainly a consequence of the heterogeneity and relative immobility of the resources that are distributed among the ventures that compete asymmetrically in the same market (Barney, 1991).

In this sense, one of the main barriers that an entrepreneur has to overcome is a lack of physical capital[1] (Kerr & Nanda, 2011). This barrier constitutes one of the main disadvantages for new entrants with respect to consolidated ventures, as highlighted in the theory of the Infant Industry (Aghion, 2011; Greenwald & Stiglitz, 2006). This body of theory centers on the analysis of the main reasons why new entrants start out at a disadvantage.

First, entrepreneurs are undertaking a new activity, which means they must face an uncertain environment in which succeeding in choices, location, and resource usage becomes, in some cases, a "trial-and-error" process (Starr & MacMillan, 1990: 81). This results, on the one hand, in wasted time, and, on the other, potentially investing in non-necessary or inappropriate resources for the activity. These costs nevertheless decrease over time because of learning curves and learning-by-doing (Aghion, 2011). In addition, new ventures usually start out smaller than their competitors. The greater size of consolidated ventures may result in economies of scale and scope (Parker, 2011), yet again placing new ventures at a disadvantage.

Second, the initial profits for entrepreneurs are, in general, very low with respect to start-up costs, and normally go toward covering past losses (Krueger & Tuncer, 1982). Consequently, entrepreneurs are in an unfavorable situation because they may suffer liquidity problems due to the need to handle the debts associated with starting up their businesses. During the first few years of new ventures' activity, the existence of such barriers to entry, particularly the lack of funds, results in a higher rate of failure than that of consolidated firms (Shane & Stuart, 2002).

Survival in the short and long term

The Global Entrepreneurship Monitor (GEM) establishes that entrepreneurship is a process with a series of stages. The first stage is *Nascent Entrepreneurship*, harking back to the moment of the venture's constitution and lasting the first three months of the organization's life. The second stage is *New Entrepreneurship*. This stage begins at three months and ends at three and a half years. The GEM uses these two stages to assess Total Early Activity; that is, the rate of entrepreneurship within an economy. In this sense, when ventures exceed three and a half years of maturity, the venture becomes an *Established Business*, which represents a new period in the process, a period in which the venture is considered to be consolidated (Xavier, Kelley, Kew, Herrington & Vorderwülbecke, 2012). Nascent Entrepreneurs and New Entrepreneurs seek to enter the market and achieve consolidation, and Established Businesses represent, in a sense, long-term sustainability and economic stability (Kelley, Bosma & Amorós, 2010).

Accordingly, for the purposes of this research, we consider the first two stages— Nascent Entrepreneurship and New Entrepreneurship— as short run. The stage in which the venture becomes an Established Business—after overcoming the liability of newness (Stinchcombe, 1965)—constitutes the long run.

Survival in the short run

As illustrated in the above discussion, the liability of newness is more than just a factor explaining why startups have a higher failure rate than consolidated ventures do. Brüderl & Schussler (1990) also attribute failure to the higher risk

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1   Physical capital in this article refers to the investment made by the venture, which, obviously, depends on the funds that a venture has at its disposal at the time of its constitution.

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resulting from startups' initial size in terms of physical capital and investment capability. The main barrier to entry for new ventures is the lack of investment capability (Kerr & Nanda, 2011), which is why new ventures start out smaller. This hurdle makes new ventures more vulnerable than their established competitors.

Therefore, according to the literature, two liabilities prevent new ventures from competing on a level playing field with consolidated ventures: the liability of newness (Stinchcombe, 1965) and the liability of smallness (Brüderl & Schussler, 1990). Empirical evidence confirms that these two types of liabilities coexist (Freeman, Carroll & Hannan, 1983).

Stinchcombe's (1965) thesis is intrinsic to new ventures; every venture needs a period to develop new roles and to build relationships with its environment. New ventures' physical capital, in contrast, may vary, which means that some new ventures, although starting at a disadvantage with respect to consolidated firms, are at an advantage with respect to other new ventures (Brüderl & Schussler, 1990), due to their greater physical capital.

In the first stage of a venture's life, it is impossible to assess performance optimally, due to its predominant reliance on the first stock of initial capital. In other words, ventures sustain their economic activity by making use of their initial capital, rather than the capital that their activity itself yields. The point of inflection at which performance can be evaluated is when the venture can sustain itself without making use of initial capital. In view of the above, we deduce that new ventures that start with a greater level of physical capital will have higher survival probabilities, but that this survival may owe more to a greater stock of initial capital than to a better strategy. Thus, other resources such as human capital have a secondary role in short-run survival.

Hypothesis 1: *Ventures that start with a greater level of physical capital have a greater probability of surviving in the short run.*

Hypothesis 1a: *Initial physical capital prevails over human capital in terms of short-run survival.*

Survival in the long run

At some point, a venture will cease to be able to subsist on its initial physical capital, as there comes a time when the venture has to survive on the returns derived from its activity in the market place. This marks the moment at which performance can actually be assessed (Brüderl & Schussler, 1990) and the sustainability of the new venture estimated. Obviously, of great interest from a research perspective is the analysis of the factors that contribute most to new ventures' long-term survival in the market place.

A critical asset of new ventures is the entrepreneur; the person, "who makes the difference: he sets the conditions, the boundaries, the characteristics and, ultimately the value creating ability of the newly founded firm" (Van Praag, 2003, p. 1). The entrepreneur possesses abilities, motivations, education, and so forth; characteristics that contribute to the human capital of the venture (Harris, McMahan & Wright, 2012; Chen, Lin & Chang, 2006). In the case of big ventures, this human capital stems from the aggregation of the knowledge and abilities of the people within the company; that is to say, from the managers and workers (Barney, 1991). In the case of entrepreneurship, however, especially in the case of self-employment and the creation of small businesses, the human capital is restricted, to a large degree, to the entrepreneur, due to the fact that he or she, "sets…the value creating ability of the newly founded firm" (Van Praag, 2003, p. 1).

In the eyes of one of the pre-eminent scholars of human capital theory—Nobel laureate in Economics Gary S. Becker—, human capital is defined by on-the-job training and general education (Becker, 1962). This definition varies among authors; however, throughout the majority of the Management literature, human capital is cited as being based on previous education and related experience (Chen *et al.* 2006; Harris *et al.* 2012; Foster & Rosenzweig, 1995).

With regard to education, the literature highlights the fact that some intangible assets such as knowledge, skills, abilities, and relations with the immediate environment, are determined by a firm's employees generally having a higher level of education (Chen *et al.* 2006). Furthermore, human capital is also defined as the stock of knowledge, information, and productive abilities of innovation that the managers of a venture possess. All these skills are promoted through investment in education and training (Harris *et al.* 2012). On the other hand, studies that examine the relationship between the entrepreneur's education and performance find a positive link, with the venture's

performance level increasing with the entrepreneur's level of education (Honig, 1998; West & Noel, 2009; Headd, 2003; Van Praag, 2003). The explanation of this phenomenon lies in the capacity of a better education to help the acquisition and transformation of know-how (Haber & Reichel, 2005), which, in turn, helps entrepreneurs assess opportunities and use resources more efficiently (Castrogiovanni, 1996). Honig (1998) and West & Noel (2009) also consider that knowledge improves entrepreneurs' business management abilities.

In addition to education, studies provide evidence that an entrepreneur's sector-related experience at the moment of constituting the venture is a relevant element of human capital (Foster & Rosenzweig, 1995). In this sense, the literature defines such experience as the undertaking of economic activities in the same sector or as an entrepreneur in any sector (Sheperd, 1999; Luk, 1996). Further refinement of this definition is necessary, however. Studies show that when related experience is measured as the entrepreneur's participation in the same sector, whether as an entrepreneur or not, the performance of the venture tends to improve. Conversely, when related experience refers to an entrepreneur's previous entrepreneurial experience in another venture outside the current sector, this experience has no significant influence on the performance of the second venture (Van Praag, 2003). Without doubt, the experience that is actually related to better performance is that which helps the entrepreneur meet the needs of the sector in which he or she conducts his or her activity (Van Praag, 2003), as experience facilitates the discovery and exploitation of opportunities (Shane & Venkataraman, 2000).

In addition to these two variables—education and experience—associated with the "capability to do," the importance of the entrepreneur's and employees' motivation—the "desire to do"—is also an element that constitutes human capital. Motivation determines "the intensity of their work" (Becker, 1962, p. 30), commitment (Roca-Puig, Beltrán-Martín & Segarra Cipres, 2012), and performing tasks in a "harder and smarter" way (Huselid, 1995, p. 637). Regarding the entrepreneur's motivation, GEM differentiates between opportunity and necessity entrepreneurs. Opportunity entrepreneurs are driven by the prospect of autonomy, independence, and vocation for their chosen business activity. Conversely,

necessity entrepreneurs are forced to undertake an activity because of a lack of employment opportunities (Reynolds, Camp, Bygrave, Autio & Hay, 2001). Studies reveal a consensus of opinion in that opportunity ventures have greater chances of survival than those born of necessity. The literature proposes different rationales for this conclusion. The first of these asserts that the necessity entrepreneur leaves the activity as soon as he or she finds a new job (Headd, 2003; Van Praag, 2003). The second cause for this higher survival rate resides in performance differences. Studies find a positive relationship between creativity and innovation and opportunity entrepreneurship (Ho & Wong, 2007), which may lead to greater efficacy and efficiency. Finally, Block & Sandner (2009, p. 119) argue that opportunity entrepreneurs, "are likely to have prepared more systematically for their entry in self-employment, and are likely to have invested more in the specific human capital necessary to succeed as a business owner."

In this sense, a greater level of human capital is mainly determined by a greater level of education and related experience. Furthermore, according to extant studies, greater motivation boosts this human capital, which, as far as entrepreneurship goes, is determined by opportunity motivation. Thus, in accordance with the analyzed studies, a greater level of human capital will lead to greater productivity from a venture (Bates, 1985). This results in greater efficiency in managing productive processes and in the attraction of new clients (Brüderl et al., 1992).

In the short run, the liability of smallness coexists with the liability of newness. When measuring short-term survival, the influence of human capital in the venture's survival may play a secondary role. In this case, initial physical capital prevails, because high levels of this kind of capital help ensure survival, even if human capital is scarce. In the long run, however, survival is affected by real performance, which is largely down to human capital (Chen et al., 2006; Wright et al., 1994). In summary, during the first phase of entrepreneurship, new ventures survive on their stock of initial capital, but, in the long run, human capital plays a more relevant role, as ventures have to base their survival on a good strategy and performance (Brüderl & Schussler, 1990), with strategy planning and implementation depending on the venture's human capital.

Hypothesis 2: *Ventures with a higher level of human capital show high rates of survival in the long run.*

The influence of the economic context

As explained at the beginning of this paper, survival is determined by more than just the venture's resources, also depending on the conditions of the venture's surroundings (Porter, 1979). A static or dynamic environment or a setting that is more or less hostile affects the new venture's chances of achieving better performance and surviving in the marketplace (Amburgey, Kelly & Barnett, 1993; Stevenson & Jarillo, 1990; Keasy & Watson, 1999).

The current economic downturn means that the environment for new ventures is undergoing several unprecedented changes (Naudé, 2011). This foray into unchartered territory creates great uncertainty. On the one hand, entrepreneurs lack information about environmental factors, while, on the other, they are unable to predict a strategy's outcome, and, ultimately, are ignorant of how the environment may affect the success or failure of the organization (Duncan, 1972). The level of error of international organizations' growth forecasts is a prime example of the unpredictable nature of the present economic climate. In 2007, the International Monetary Fund (IMF) predicted that the global economy would grow by almost 4% in 2008. In reality, however, the global economy grew by just 3%. In Spain, the government predicted that Spanish GDP would shrink by 0.5% in 2013, and unemployment would hit 24.3%. Despite this, according the European Commission's forecasts for the same year, Spanish GDP would fall by 1.4%, and unemployment would climb to 27%. Similarly, the Spanish government asserted that the deficit would remain below 7% of GDP in 2013, whereas the European Commission placed the Spanish public deficit at almost 10% (El País, 2013).

Another of the main indicators of market uncertainty is rating agencies' risk assessment of financial institutions and national governments. Moody's assessed Spanish government bonds as A3 in 2011 and the first half of 2012. By June of 2012, however, the agency had lowered their rating to Baa3 (Moody's, 2012), which means the bonds had gone from having, "the highest quality, with minimal credit risk," to having a "moderate risk" due to their "speculative characteristics"

(Moody's, 2009, p. 8). The above observations all point to the Spanish economy's current volatile predicament.

This uncertainty, together with the increasing complexity of the entrepreneurial environment, makes the current circumstances especially hostile for new ventures, their performance, and their survival. This is clearly exemplified by more than 390,000 Spanish ventures ceasing their activities in 2012; 50% more than in 2007, before the housing bubble burst (INE, 2013).

One of the most direct consequences of this turmoil is the drying up of credit from the banking system due to the increase in customer defaults. For example, in 2012, one of the biggest Spanish banks, Santander, cut its quantity of borrowed assets by almost 8% with respect to the previous year (Cinco Días, 2012). Therefore, one path toward adapting to the changes brought about by the recession is the discovery of opportunities that, as well as being profitable, also require relatively low levels of investment, and, furthermore, display an efficient use of assets.

Because of these changes the political and legal context is also uncertain. Evidence of this uncertainty is the high degree of change in Spanish laws and political regulations. One of the most important changes has occurred in labor regulations. In the last 30 years, the main regulation that governed the relationship between employer and employee has been modified eight times—twice since the beginning of the economic crisis (El País, 2012).

These changes are also a consequence of the social environment. In Spain, one of the most important changes in recent years has been the growing number of immigrants, which has led to a mixture of cultures in Spanish citizens' living conditions. This demographic change has also affected the business world. This mix of cultures has meant that today's top management teams are more international, which affords them a broader business perspective and allows them to adapt better to environmental changes.

Another key change in the businesses environment is the role of technology. Businesses' ICT adoption generally implies changes in the way workers organize their schedule and, crucially, allows businesses to connect fully with suppliers, clients, coworkers, other businesses, and so forth.

Therefore, in turbulent environments such as the present one, the speed of adaptation to the

environment prevails over productivity (Sarathy, 2013).

Wright *et al.* (1994) assert that a greater flexibility when facing change is determined by "cognitive ability." This translates into greater knowledge within the organization's human resources, due to the role of previous knowledge in helping individuals acquire new knowledge faster and subsequently transforming this knowledge into know-how (Haber & Reichel, 2005). In this sense, Castrogiovanni (1996) considers that previous knowledge enables entrepreneurs to assess the opportunities and harness potential resources more effectively. Thus, greater levels of human capital can help ventures survive due to the speed of assessing the environment and establishing a new strategy.

Hypothesis 3: *Human capital prevails over physical capital in the long term, especially during periods of recession characterized by turbulence and hostility.*

Sample and methodology

Sample

Through a collaboration agreement between the Valencian Youth Institute and the University of Valencia, we obtained access to a sample of 2,855 service ventures created between 2000 and 2005. The average size of the workforce is 1.8 employees, including the entrepreneur. The average eligible capital, used as a proxy for the initial capital, is 32,477 Euros, in spite of half of the companies starting with a capital of less than 20,000 euros. Thus, the sample is mostly made up of microenterprises, as defined by the Recommendation 96/280/EC of the European Commission (European Comission, 1996).

Variables

We study the following variables.

Independent variables

• *Physical capital*, measured using a proxy of start-up capital—subsidized capital according to the criteria of Program Management and Planning Service from the Valencian Youth Institute (IVAJ).

• *Level of education* indicates the entrepreneur's level of education. In the case of the ventures constituted by more than one person, this variable takes the value of the highest level of education of all constituents. The variable takes one of four values: primary studies, secondary + vocational training I, vocational training II + baccalaureate, and university studies.

• *Related education* is a dichotomous variable that indicates whether the entrepreneur has some type of specific education related to the business.

• *Related experience* is a dichotomous variable that indicates whether the entrepreneur has at least a year of work experience related to the business.

• *Type of entrepreneurship* is a dichotomous variable that indicates if the entrepreneur is driven by opportunity or necessity motives. In order measure this variable, we look at the entrepreneur's previous labor situation. If the entrepreneur was unemployed or in a situation of precarious employment, we consider this entrepreneur a necessity entrepreneur. If the entrepreneur was in a stable employment situation, we consider this entrepreneur an opportunity entrepreneur.

These last four variables determine the human capital of the venture. According to the literature, the level of education, and the related education and experience are the purest variables regarding human capital (Foster & Rosenzweig, 1995; Harris *et al.*, 2012), and the type of motivation represents the variable that promotes human capital through the "intensity of the work" (Becker, 1962, p. 30).

Dependent variables:

• *Survival in the short run* is calculated by testing firm survival on December 31 at the three year mark from the constitution of the entrepreneurial activity. The data on the possible cessation or ongoing nature of the activity come from the Chambers of Commerce of Valencia, Castellón, and Alicante.

- *Survival in the long run* is calculated by testing firm survival on December 31 at the six year mark from the constitution of the entrepreneurial activity.

Our model also includes certain control variables, which are additional variables that the specialist literature relates to new firms' performance. They have been included in order to prevent the relationship between the independent variables and the dependent variable—survival—mistakenly emerging as significant as an upshot of the absence of other relevant variables.

- *Sector* is a categorical variable that indicates in which services sector the activity lies. This variable is a classification of the ventures' activities according to the CNAE-93 activity code.

- *Number of employees* is the number of employees of the venture, including the entrepreneur(s).

- *Social interest* is a dichotomous variable that indicates if the venture has any social end or if it is purely business focused.

- *Location* has three possible values depending on the location of the venture. If the venture is located in an area of fewer than 2,000 inhabitants, we consider it to be situated in a rural environment. If the venture is located in an area of between 2,000 and 10,000 inhabitants, we consider it to be situated between a rural and urban area. Finally, if the venture is located in an area of more than 10,000 inhabitants, we consider it to be situated in an urban location[2].

To study the economic cycle, we use the following variables.

- *Unemployment* is the average unemployment rate during the two years prior to testing the venture's survival.

- *GDP* is the evolution of the GDP during the two years prior to testing the venture's survival.

Due to the dichotomous character of the dependent variables, we opt for a multivariate logistic, or logit, model. This model shows the probability of surviving or failing as a function of a number of independent variables. The variable

entry method is a step-by-step conditional selection process, using an entry value of 0.05 and an exit value of 0.1.

We apply the Mann–Whitney U test for two independent samples to test whether or not the distribution of a parameter is the same in two independent samples. In this case, this test yields results as to whether a relationship exists between the chances of firm survival and physical capital.

For the tests on categorical variables, we take one of the categories as a reference. For the case of level of education, the reference category is "primary studies".

For the quantification of the goodness of fit, we examine the statistic defined as minus two times the natural logarithm of the verisimilitude (-2LL). The closer the value to zero, the better the fit. In addition to this, we also calculate Nagelkerke's R^2, which shows the variance explained by the model. Finally, we apply Hosmer and Lemeshow's test to test the calibration of the model; that is, the degree to which forecast probability conforms to reality. If the significance of the test is smaller than 0.05, the model is adjusted inadequately to the data.

The significance level throughout is 5% (α=0.05).

Results

The values for the mean and median physical capital of the ventures that survive at three years indicate that when the venture starts with a greater physical capital it has greater chances of survival. Mann–Whitney's test indicates that the significance is less than 0.05. This confirms that ventures that start with a greater physical capital have more probability of surviving in their first years of existence, thereby corroborating the first hypothesis (Table 1).

We then test whether physical capital is relevant in the survival of the ventures in the short run in the presence of the other variables (Table 2). To do this, the variables "level of education", "related education", "related experience", "type of entrepreneurship", "sector", "number of employees", and "social interest" are fed into a logit model, along with "physical capital".

As the model shows, all of the variables are significant, except the variables "sector", "related education", and "social interest", which remain outside the model. The relationship between "level of education" and new ventures survival

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2   This classification follows the classification of the National Statistics Institute (INE)

TABLE 1. Survival in the short run

		SURVIVAL IN THE SHORT RUN		
		Total	Survival	Not survival
PHYSICAL CAPITAL	Average	32477.06	35148.57	25324.31
	Median	18804.5	19934.00	15204.00
	Standard deviation	42490.3	46094.22	29697.39

Source: Authors

TABLE 2. Logit model of survival in the short term

STEP 5	B	S.E	WALD	DF	P-VALUE	EXP(B)	C.I. 95.0% FOR EXP(B)	
							Inferior	Superior
Primary studies (Ref. cat.)			15.001	3	**0.002**			
Secondary studies + vocational training I	-0.527	0.168	9.82	1	**0.002**	0.59	0.424	0.821
Vocational training II + baccalaureate	-0.498	0.152	10.757	1	**0.001**	0.608	0.451	0.818
University Studies	-0.481	0.139	12.014	1	**0.001**	0.618	0.471	0.811
Related experience	-0.256	0.102	6.302	1	**0.012**	0.774	0.634	0.945
Type of entrepreneurship	0.284	0.107	7.061	1	**0.008**	1.328	1.077	1.638
Number of employees	-0.344	0.058	34.624	1	**0.000**	0.709	0.632	0.795
Eligible capital	-0.007	0.002	16.943	1	**0.000**	0.993	0.99	0.997
Constant	0.174	0.185	0.888	1	0.346	1.19		

Source: Authors

is significant, as expected, but the nature of the relationship is somewhat surprising. Survival probabilities do not increase proportionally to the level of education. The level of education that most reduces the risk of failure is "secondary + vocational training I". In the short run, the risk of failure drops by 41% in the case of entrepreneurs in this category of education, versus 39% and 38% in the case of entrepreneurs with "vocational training II and baccalaureate" and "university studies", respectively. For related experience, results match those in the literature. The risk of failure decreases by 23% among entrepreneurs with any type of experience related to the activity. In the case of "type of entrepreneurship", results once again agree with those in the extant literature, since, for necessity entrepreneurs, the risk of failure increases by 33%.

The variable "number of employees" is also included in the model. This variable has a positive effect on new venture survival, as the risk of failure falls by 29% for each extra worker in the workforce.

Upon analyzing "eligible capital", results also confirm hypothesis 1, which posits that ventures that start with a greater level of physical capital have a greater probability of survival. Results fail to validate hypothesis 1a, however, since the risk of failure is reduced by just 7% for each 10,000 Euro increase in physical capital. Therefore, the probability of failure reduces most according to the level of education.

In terms of goodness of fit, Nagelkerke's R^2 is 9%, so the explanatory capacity of the model is low (a value of 9% implies that the variables taken into account explain just 9% of the survival of new ventures). Nevertheless, the values of -2LL and Hosmer–Lemeshow's test indicate that the goodness of fit of the model is greater when more variables are included in the model (2,662 in the first step and 2,606 in the second). In any event, the model fits the data well because of the non-significant value for the Hosmer–Lemeshow statistic (0.155; greater than 0.05).

Referring to hypothesis 2, results show that the p-value from the X^2 is greater than 0.05 in the

variables referred to human capital, therefore hypothesis 2 is met. Ventures with a high level of human capital –measured here as entrepreneurs with a high level of education, with a motivation for opportunity and with related education and experience- influences positively on the survival of new ventures in the long run. Furthermore, advancing the results of the next hypothesis, we can see in table 3 that when we introduce in the model the variable unemployment, the human capital continues positively influencing on survival in the long run.

For the long run, we examine the same variables as for the short run, also adding the variable "unemployment". We omit the variable GDP because of the high degree of correlation between this variable and "unemployment" (Spearman's Rho = -0.836). The introduction of both variables could therefore lead to a miscalculation of the multivariate model. We opt for the variable "unemployment" because it is linked to the opportunity cost of self-employment. This variable is excluded from the previous model of survival in the short term because the short run allows insufficient time for significant changes in the economic situation to take effect.

The logit model for survival in the long term shows that six of the variables included are relevant for determining the probabilities of venture cessation (Table 3).

In this model, "level of education", one of the main variables of human capital included in the short-term model, is excluded here. "Related education", which does not appear in the short-term logit model, does, however, feature in the long-term model. The variables that most reduce the probabilities of venture failure are those related to human capital, work force, and unemployment.

In this sense, related experience, related education, and type of entrepreneurship are, as expected, related to the probability of surviving. For the type of entrepreneurship, the risk of failure increases by 46% among necessity entrepreneurs. Nevertheless, one of the variables with the weakest relationship is physical capital, because the risk of failure falls by 4% for each 10,000 Euro increase in capital.

One of the most striking results of this study from a statistical point of view, however, is the inversely proportional relationship between the rate of unemployment and the probability of survival. The risk of failure drops by 23% for each percentage-point increase in the rate of unemployment.

To validate the third hypothesis, we divide the sample into three periods corresponding to the economic cycle. The first period, characterized by high GDP growth, corresponds to the ventures created in the years 2000, 2001, and 2002, whose status in the years 2005, 2006, and 2007, respectively, determines their values for the survival variable. For business created in 2003, the reference point for survival is 2008, the year in which the housing bubble burst (Naudé, 2011). The year 2008 therefore marks the transition period. The last two years, corresponding to the ventures created in 2004 and 2005, constitute the crisis period.

The results in Table 4 show that the only variable common to the three periods is "number of employees". This variable is always positively related to survival of new ventures, especially in the transition period. On a different note, only the level of studies is positively related to survival probability in growth periods, although this relationship disappears in both the transition and the crisis periods. Somewhat counterintuitively, in the

TABLE 3. Logit model of survival in the long term

STEP 6	B	S. E.	WALD	DF	P-VALUE	EXP(B)	C.I. 95.0% FOR EXP(B)	
							Inferior	Superior
Related education	-0.496	0.106	21.946	1	**0.000**	0.609	0.495	0.749
Related experience	-0.380	0.109	12.158	1	**0.000**	0.684	0.553	0.847
Type of entrepreneurship	0.378	0.104	13.312	1	**0.000**	1.460	1.191	1.788
Number of employees	-0.361	0.049	53.227	1	**0.000**	0.697	0.633	0.768
Eligible capital	-0.004	0.001	9.060	1	**0.000**	0.996	0.993	0.999
Unemployment	-0.255	0.015	289.759	1	**0.000**	0.775	0.752	0.798
Constant	3.787	0.233	263.084	1	**0.000**	44.133		

Source: Authors

TABLE 4. Factors that influence on survival in the long term

	GROWTH		CRISIS	
	p-value	EXP(B)	p-value	EXP(B)
Primary studies (Ref.cat.)				
Secondary studies + vocational training I	**0.028**	0.523		
Vocational training II + baccalaureate	**0.001**	0.387		
University studies	**0.001**	0.395		
Related experience	**0.000**	0.567	**0.018**	0.678
Related education			**0.003**	0.617
Type of entrepreneurship	**0.049**	1.334	**0.007**	1.561
Social interest	**0.023**	1.611		
Number of employees	**0.000**	0.701	**0.005**	0.772
Eligible capital	**0.032**	0.995	**0.000**	0.990
Constant	**0.000**	6.132		

Source: Authors

case of "education level", the level of studies that most influences survival is "vocational training + baccalaureate", which has a more strongly significant positive relationship with survival than the "university studies" level.

The variable "related education" only has a significant positive relationship with survival in periods of transition and crisis, which is stronger during the period of transition than the period of crisis. The results are distinct for the variable "related experience", which is significantly related to survival in growth and crisis periods—with a stronger positive relationship during the period of growth—but not in the transition period. Specifically, in growth periods, entrepreneurs with related experience are 43% more likely to survive than entrepreneurs without related experience. This percentage decreases to 32% in crisis periods.

Regarding motivation, necessity entrepreneurs have lower probabilities of surviving in periods of growth (33% less). Despite this finding, this variable remains outside the model for the periods of transition and crisis.

Hypothesis 3 is partially supported, given that some of the variables that measure human capital are positively related to firm survival; namely, the variables "education level" and "type of entrepreneurship" in growth periods, the variable "related education" in crisis periods, and "related experience" in periods of growth and crisis. Thus, in hostile environments, the type of human capital most closely linked to survival is specific knowledge of the sector. Related education has a positive relationship with survival in this type of environment, but exhibits no significant relationship in growth periods. Therefore, it seems that different environmental conditions require different skills, or at least the relative importance of these skills varies when environmental conditions change. In growth periods, the role of a high education level stands out, while, in hostile environments, related experience and knowledge (i.e., the knowledge of the sector) become more relevant.

Conclusions

This study takes its lead from the theory of the liability of newness (Stinchcombe, 1965). Following this line of thinking in a context of entrepreneurship, new ventures have lower probabilities of survival than consolidated ventures. Brüderl & Schussler (1990) attribute the high failure rate to the liability of smallness; that is, to the smaller size and limited resources of new ventures. The scarcity of physical capital constitutes one of the principal barriers to entry and threats to new firms' short-term survival.

Our initial hypothesis is that greater initial size in terms of physical capital makes ventures more durable, at least in the short run. In this first period, the initial amount of resources that organizations have at their disposal helps them survive for some time, giving them a chance to establish themselves and to help founders and other relevant stakeholders build a basis for judging performance (Brüderl & Schussler,

1990). Over a longer period, entrepreneurs are more capable of assessing performance, physical capital begins to play a secondary role, and human capital comes to the fore because performance is a consequence of the quality of the personnel within the firm.

The aim of this study is to demonstrate how physical capital of new ventures is more strongly related to survival in the short run than in the long run, and, conversely, that human capital is strongly related to survival in the long run. We perform analysis in different periods of the economic cycle, first analyzing survival in a period of economic growth, then in a period of transition, and lastly in a period of crisis. The third hypothesis refers to human capital's stronger relation to survival in periods of crisis than in growth periods. This third hypothesis is based on an organizational model that is especially important in dynamic environments because of its conduciveness to fast adaptation to changes in the surroundings.

Results clearly demonstrate that ventures that start with a greater level of physical capital have more chances of surviving, although human capital is also related to higher survival probabilities of new ventures, both in the long and short term. This study fails to uncover evidence that physical capital is more important than human capital in any period we analyze herein.

Nevertheless, the results indicate that the strength of the relationship between human capital and survival of new ventures varies according to the economic context in which the venture is operating. In a period of growth, education level has a positive relationship with survival, whereas, in turbulent and hostile contexts, the level of education ceases to have a significant relationship, being replaced in the model by "related education".

Another variable that measures human capital is related experience. This factor of human capital is always significantly related to new venture survival in the short and long run, and in crisis and growth periods. Furthermore, in spite of the importance of physical capital as a factor in the survival of new ventures, human capital exerts a greater influence.

This study is, of course, subject to certain limitations. First, the sample is excessively homogeneous. All the ventures are located in the same geographical context. In addition, differences in the sizes of the ventures are minor; the average size of the ventures is 1.8 employees, taking into account the entrepreneur, and the average initial capital is 32,477 Euros, with half the ventures possessing less than 20,000 Euros of startup capital (i.e., the sample consists almost solely of microenterprises). This shortage of heterogeneity in size may distort, to some extent, the results. It would thus be advisable to repeat the study with a more heterogeneous sample, which would permit us to draw clearer conclusions about how size can affect short-term survival.

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