



INITIAL CAPITAL STRUCTURE OF PORTUGUESE INNOVATIVE FIRMS: THE ROLE OF NASCENT ENTREPRENEURS' HUMAN CAPITAL

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Abstract

The aim of this study is to analyse whether the human capital of the nascent entrepreneur influences the initial capital structure of Portuguese innovative firms. The research model used includes a dependent binary variable devised to check the initial capital structure, two groups of independent variables referring to the human capital and a group of control variables. The results obtained through logistic regression show that “heterogeneity of professional experience” positively influences the initial capital structure. These results contribute to the scientific knowledge by showing that generic human capital influences the initial capital structure of the innovative firm. Our study also makes a contribution to the literature on entrepreneurial finance in terms of methodology.

Keywords: Initial Capital Structure; Innovative Firms; Human Capital.

INTRODUCTION

The creation of innovative firms is cited in the literature on entrepreneurship as one of the factors behind economic growth, creation of skilled jobs, market efficiency, renewal of the economic structure, spread of new technologies, and improvement of the competitiveness of countries (Birch, 1987; Phillips and Kirchhoff, 1989; Acs and Audretsch, 1990; Reynolds *et al.*, 1995; Wennekers and Thurik, 1999; Bednarzik, 2000; Carree and Thurik, 2003; Sarkar, 2007).

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Obtaining the financial resources that are needed and suitable to create the firm is one of the major tasks facing the nascent entrepreneur (Green & Brown, 1997; Van Auken, 2001). It is well known that bankruptcy of the firm is closely linked to unsuitable or inappropriate initial capital structure (Chaganti *et al.*, 1995) and inability or hardship in getting access to certain forms of outside financing for innovative businesses (Scholtens, 1999).

The differences in human capital between nascent entrepreneurs may be a factor that explains the differences in the initial capital structure (Bates, 1990; 1996). Nascent entrepreneurs with high levels of human capital may be in a better position to attract outside finance as they are more efficient at obtaining information about the financial market, they are more effective at negotiating with creditors and investors, and they inspire greater confidence in outside backers given the positive relation between the human capital of the entrepreneur and the performance of the firm (Cressy, 1996; Van Auken, 2001).

The studies undertaken about initial capital structure are essentially of a descriptive nature and very little empirical research has been carried out up to now on the relationship between the human capital of the founder and the initial capital structure of the firm (Bates, 1990, 1995; Scherr *et al.*, 1993; Cressy, 1996; Chandler and Hanks, 1998; Cassar, 2004). These studies do not focus specifically on innovative firms and use only a small number of variables of human capital. As such, knowledge on this topic may be enhanced through further research that uses untested variables or new methodologies.

The aim that led to the undertaking of this study is to analyse whether the generic human capital and specific human capital of the nascent entrepreneur influence the initial capital structure of the innovative firm.

This paper, anchored on the theory of human capital (Becker, 1975), uses an innovative sample that incorporates the variables of human capital only tested within the scope of studies on human capital and financing in later phases of the firm's life cycle. The innovative methodology that we use in our study (suggested by Cassar, 2004) reduces the methodological problems detected in the previous research with regard to the initial capital structure, problems related to survivorship bias and memory decay. We identified nascent entrepreneurs and monitored them throughout the start-up process, obtaining data referring to the initial capital structure as near as possible to the date of creation of the firm. As such, it was possible to improve the representation in the sample of the firms created instead of including only the surviving ones, as previous studies had done.

The remainder of our paper is structured as follows. In the section "Literature and Hypotheses" we briefly review the literature to contextualise the issue and outline the hypotheses that we intend to test. The section "Data and Methods" describes the design and methodology of how the sample was compiled, the procedures used to obtain the data and the statistical analysis technique we

implemented to test the hypotheses presented. The results of our analysis are presented in the section "Results". They are discussed in the "Discussion" section, and the implications, limitations and suggestions for future research are outlined in last section.

LITERATURE AND HYPOTHESES

Human capital has been identified as a critical aspect of entrepreneurial knowledge that is especially important in obtaining different resources, including financial resources (Greene and Brown, 1997). Cressy (1996) states that founders with the highest levels of human capital are likely to be more efficient at obtaining information about the financial market and they should be more able to attract funding. Human capital also aids access to social networks (Glaeser *et al.*, 2002), which can be extremely useful in obtaining certain kinds of financing, namely venture capital, where the value of informal contacts and references is well known (Brilee *et al.*, 2004). Oakey (1984) points out that a high level of human capital makes the entrepreneur better prepared to negotiate with potential financiers. The founder's human capital positively influences the survival and performance of the firm (Bruderl *et al.*, 1992; Bates, 1995; Cressy, 1996; Gimeno *et al.*, 1997; Mata and Portugal, 2002;) and hence becomes especially relevant for potential outside financiers. If more and better human capital is directly linked to the viability of the new firm, access to outside financing should be greater for these firms (Storey, 1994; Bates, 1997). In the gestation phase of innovative firms, the knowledge and skills of the founders are the primary assets (Cooper and Bruno, 1977). Therefore, nascent entrepreneurs with more investment in human capital are in a better condition to gain access to outside financing.

The empirical research carried out up until now about the relationship between the founder's human capital and the initial capital structure is scarce, does not specifically refer to innovative firms and uses a limited number of variables (Bates 1990, 1995; Coleman and Cohn, 2000; Carter *et al.*, 2003; Scherr *et al.*, 1993; Coleman, 2004; Cassar, 2004; Hogan and Hustson, 2005). Bates (1990) researched the relation between the founder's level of education and the leverage in the start-up and concluded that there was a positive relation. In a subsequent study he stated that commercial banks grant higher loans to owners with a higher level of education (Bates, 1995). Coleman and Cohn (2000) found a positive relation between the owners' education and the obtaining of external loans. Coleman (2004) concluded that among the firms that requested bank loans, those whose owners have a higher level of education had more chance of being approved. However, in this same study, firms in which the owners had a higher level of education were also those that least asked for loans. The positive

influence of generic human capital (higher education level) on the obtaining of venture capital was confirmed in the studies by Carter *et al.* (2003) and Hogan and Hustson (2005). Cassar (2004) concluded that the founder's level of education does not impact upon the initial capital structure after considering firm characteristics.

Scherr *et al.* (1993) concluded that the leverage is negatively related to owners' professional experience. This result was also confirmed by Cassar (2004), based on the initial financing study in a random sample of Australian firms less than one year old.

Although the results regarding the influence of human capital on the main external sources of finance are contradictory and the studies referring to the influence of the founder's human capital on the initial capital structure are scarce and do not confirm a positive relation, we firmly believe that in the case of innovative firms, higher education in the area of management can facilitate access to extremely useful social networks to obtain outside financing and increase the ability to negotiate and discuss specific assessment issues during the negotiating process. Likewise, a wide range of professional experience may inspire greater confidence in outside financiers owing to its positive relation with performance. Based on these arguments we put forward the following hypotheses:

Hypothesis 1: Higher education of the nascent entrepreneur in the field of management positively influences the use of outside financing on the date of creation of the innovative firm.

Hypothesis 2: The nascent entrepreneur's prior professional experience in different functional areas positively influences the use of outside financing on the date of creation of the innovative firm.

With regard to specific human capital, empirical research is also scarce and inconclusive. The empirical studies of Scherr *et al.* (1993) and Westhead and Wright (1998) arrived at opposite conclusions about the influence of the founder's previous start-up experience on the leverage. Coleman (2004) reveals that firms set up by owners' with more business experience use fewer loans, suggesting that a higher level of specific human capital is linked to minimum usage of outside financing and the respective costs. The entrepreneur's experience in industry and previous start-up experience also do not seem to be critical factors in the use of venture capital according to studies carried out by Hustedde and Pulver (1992), Carter *et al.* (2003) and Hogan and Hustson (2005).

To sum up, the results obtained up until now refer in most cases to studies closely related to the object of our study, given that the samples are not exclusively made up of firms in the start-up date and/or are not exclusively made up of innovative firms, and the dependent variables generally refer to a given type of outside financing. We surmise that in the start-up process of innovative firms,

experience in industry and previous start-up experience influence the use of outside financing because this can facilitate access to certain important social networks for outside financing, enable familiarisation with different sources of funding, and enable better performance in the negotiating phase. Further, owing to the positive relation between specific human capital and performance, this experience is pondered by the outside financiers.

Hypothesis 3: The nascent entrepreneur's previous experience in industry positively influences the use of outside financing on the date of creation of the innovative firm.

Hypothesis 4: The nascent entrepreneur's previous start-up experience positively influences the use of outside financing on the date of creation of the innovative firm.

DATA AND METHODS

Sample

Our study used a sample of nascent entrepreneurs. We used the concept of the nascent entrepreneur as defined, among others, by Reynolds *et al.* (2004) and in the GEM project (2004). A nascent entrepreneur is a person who is now trying to start a new business. The study involved two phases. The first identified a set of nascent entrepreneurs who were currently attempting to create an innovative firm. Innovative firms are considered those that base their productive activity on an innovation or advancement in the productive or social environment, which results in new products/services or processes, based on the application of the knowledge (OECD, 2001). In relation to these individuals and the respective business initiatives, the data concerning the independent variables and control variables of the model pertaining to the date of their identification were obtained.

These nascent entrepreneurs were then monitored for a period of time (26 months), at the end of which they answered a follow-up questionnaire to determine the results of their efforts for the creation of the firm, and if successful, to analyse the initial capital structure. The association between the start-up of the firm and the first sale has been consistently used in the literature (Gatewood *et al.*, 1995; Carter *et al.*, 1996; Newbert, 2005), so we also used these criteria in this study. The data obtained (second phase) were used to build the dependent variable of the model.

The initial sample we used in this study consisted of 476 nascent entrepreneurs (57% individuals and 43% teams) who entered three contests for innovative business ideas that took place in Portugal in the 2nd and 3rd quarters of 2004, organized by government entities under the aegis of the Ministry of the Economy.

In line with the way the sample was designed, the data were compiled from a survey carried out at two moments:

- 1) After identification of the nascent entrepreneur (2nd or 3rd quarter of 2004);
- 2) 26 months after this identification (3rd or 4th quarter of 2006).

The final sample of 63 nascent entrepreneurs who created a firm was used to analyse the influence of the human capital of the entrepreneur on the initial capital structure.

Model

The research model used includes a dependent binary variable devised to check the initial capital structure (use of outside medium/long-term financing), two groups of independent variables referring to the generic human capital and the specific human capital, and a group of control variables.

The generic human capital is represented by variables related to the formal education and professional experience of the nascent entrepreneur and the specific human capital includes variables referring to industry experience and start-up experience.

In order to control for the effects of other factors mentioned in the literature which, like the human capital of the entrepreneur, may influence the initial capital structure of the innovative firm, we included two variables in the model: "start-up capital" (Cassar, 2004, Chittenden *et al.*, 1996; Hutchinson, 1995) and "planning" (Rhea, 1989; Harvey and Evans, 1995; Delmar and Shane, 2003).

Dependent variable: The binary variable "exterfin" which was coded "1" if medium/long-term outside financing was used (medium/long-term debt and/or venture capital), and "0" if no medium/long-term outside financing was used.

Independent variables: Generic human capital is usually represented through formal education and professional experience (Gimeno *et al.* 1997). Formal education was made operational through the "maneducation" variable. Therefore, if the individual nascent entrepreneur or at least one member of the team has a degree, post-graduation, Master's degree or PhD in management, the value of "1" is assigned, and in all other cases the value is "0". We selected the "funcdivers" variable to assess the professional experience of the nascent entrepreneur. The "funcdivers" variable considered the diversity of the functional areas in which the professional experience occurred. We used the classification of Gartner *et al.* (1999), who after excluding management and industry experience admit that professional experience can occur in three major functional fields (Marketing/Sales;

Finance and Accounting; Operations). The variable "funcdivers" was coded "1" if the nascent entrepreneur (or any member of the team) possessed professional experience in more than one functional field, and "0" in all other cases.

The specific human capital of the nascent entrepreneur was measured through two dichotomous variables: "industexp" and "entrepexp". The variables pertaining to the specific human capital were coded "1" if the nascent entrepreneur (or at least one of the team members) had prior experience in industry or had been involved in the start-up of a new firm, and were coded "0" when neither of these kinds of experiences existed. The data referring to all the independent variables refer to the date of identification of the nascent entrepreneur.

Control variables: As a measurement of the dimension we considered the forecast investment sum. The "startupcapital" variable has been used before by Cooper *et al.* (1994) in a study on the influence of the human capital of the entrepreneur on the performance of the firm. We converted it into the dummy variable, attributing "0" for investments forecast at less than €250 000 and "1" for sums equal to or greater than €250 000. The variable "Planning" was defined as follows: if the nascent entrepreneur on the date of his/her identification had written a detailed formal business plan or financial forecasts together with the compilation of information on potential clients, suppliers and competitors, the value "1" was attributed. In all other cases it was "0". The data referring to all the control variables refer to the date of identification of the nascent entrepreneur.

RESULTS

Descriptive Statistics

The sample used to study of the influence of the nascent entrepreneur's human capital on the initial capital structure of the firm is made up of 63 nascent entrepreneurs who had created the firm on the follow-up date. Breaking down the firms set up into sectors of activity we see that Industry (36.5%) and Services (34.9%) dominate in relation to the sectors of Transport and Commerce (15.9%), Energy (7.9%) and Tourism (4.8%). Almost 4 in every 5 firms created innovated as regards the product/service, while innovation in process and commercialisation only accounted for 17.5% and 4.8% respectively. The percentage of firms that use outside financing in the initial capital structure is 32%.

Multivariate Analysis

The hypotheses formulated in our study require a binary dependent variable and a set of dichotomous explicative variables. Owing to its similarity with regression and because it does not require distributional assumptions for the data and equality of variance matrices between the groups – characteristics not found in any of the situations – we preferred to use binominal logistic regression in this study.

Version 14.0 of the Statistical Package for the Social Sciences (SPSS) was used to analyse the logistic regression.

Although some of the correlations in the matrix of correlations between the independents and control variables used in the model are significant, they are not high enough, which leads us to conclude that the question of multicollinearity does not arise among the variables of the model used in our study (Table 1).

TABLE 1
Correlation Matrix

		1	2.	3.	4.	5.	6
1. Maneducation	Pearson Correlation	1					
	Sig. (2-tailed)						
2. Funcdivers	Pearson Correlation	,464(**)	1				
	Sig. (2-tailed)	,000					
3. Industexp	Pearson Correlation	,042	,250(**)	1			
	Sig. (2-tailed)	,631	,004				
4. Entrepexp	Pearson Correlation	,197(*)	,236(**)	,238(**)	1		
	Sig. (2-tailed)	,024	,007	,006			
5. Planning	Pearson Correlation	,184(*)	,332(**)	,034	,199(*)	1	
	Sig. (2-tailed)	,035	,000	,704	,023		
6. Startupcapital	Pearson Correlation	,030	,184(*)	-,179(*)	,033	,424(**)	1
	Sig. (2-tailed)	,734	,036	,041	,710	,000	

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

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

Analysis of the logistic regression that aimed to identify the variables of generic human capital and specific human capital able to predict the use of outside financing on the date the innovative firm was created proved to be a statistically significant model (difference test / chi-square = 23.248, df = 6, $p = 0.001$). The result of the Hosmer-Lemeshow test (chi-square = 3.739; df = 8; $p = 0.880$) confirmed that the model fits the data. The classification table indicates that the model correctly classifies in 76.2% of cases. According to the Nagelkerke R Square, the dependent variable variance explained by the model is 43%. Analysis of Table 2 enables identification of the significant Wald coefficient in one variable of generic human capital ($p < 0.05$): "funcdivers" ($B = 2.231$; $p = 0.020$), suggesting that the nascent entrepreneurs with experience in several functional areas use medium / long-term outside financing in the initial capital structure more than those who had acquired professional experience only in one functional area. The generic human capital variable "maneducation" and the specific human capital variables "industexp" and "entrepexp" – also used in the model - do not exceed the fixed statistical significance limit ($p < 0.05$). The evidence obtained through this model backs up one hypothesis that associated the generic human capital and the use of more medium/long-term outside financing in the initial capital structure (hypothesis 2). The link was not found between the degree, post-graduation, Master's degree or PhD in managerial education and the dependent variable (hypothesis 1). Furthermore, hypotheses 3 and 4, which related specific human capital ("industexp" and "entrepexp") with the use of medium/long-term outside financing in the initial capital structure of the innovative firm, were not confirmed. In summary the study supports hypothesis 2 but does not support hypotheses 1, 3 and 4.

TABLE 2

Results of Logistic Regression Analyses (Use of Outside Financing)

	B	S.E.	Wald	df	Sig.	Exp(B)
Maneducation	-1.004	.896	1.256	1	.262	.366
Funcdivers	2.331	.999	5.446	1	.020*	10.289
Industexp	-1.270	.844	2.262	1	.133	.281
Entrepexp	-.188	.690	.074	1	.785	.829
Planning	2.429	.871	7.781	1	.005*	11.345
Startupcapital	-.394	.839	.221	1	.639	.674
Constant	-1.647	.907	.3296	1	.069	.193
Model chi-square	23.248					
	(.001)					
df	6					
Nagelkerke R ²	0.433					
Hosmer & Lemeshow test	3.739 (0.880)					
df	8					
% correct predictions	76.2%					

a Variable(s) entered on step 1: Manducation, Funcdivers, Industexp, Entrepexp, Planning, Startupcapital.

* p<.05

DISCUSSION

The results obtained in our study referring to formal education suggest that only knowledge resulting from the wide-ranging professional experience of the nascent entrepreneur is positively related to the indicator we selected to assess the use of external funding in the initial capital structure. The variable referring to “post-graduate education in the area of management” is not positively related to the indicator we selected to assess the use of external funding in the initial capital structure. Previous studies on the influence of the nascent entrepreneur’s generic human capital on the initial capital structure are scarce, do not allow comparison (they do not use the same methodology and variables or do not refer to the date of creation of the firm), or relate the human capital of the founder only to the leverage / kind of financing. Even so, we can say that our findings are similar to those of Cassar (2004), who concluded that the level of education does not lead to different options with regard to the initial capital structure, and they are different from those of Bates (1990), who found a positive relation between the level of education of the founder and the leverage of the start-ups. The conclusions

of Scherr *et al.* (1993) and Cassar (2004) stating that professional experience is negatively correlated to the amount of initial bank financing should not be compared with the results of our study, which used access to outside financing as a dependent variable.

The results obtained concerning the level of specific human capital did not confirm a positive relation between previous start-up experience and use of outside financing, countering the hypotheses raised after analysing the theoretical contributions on the relation between the specific human capital of the founder and the financing of the firm, which highlighted the particular importance of this aspect in the negotiating process for financing, access to social networks or assessments made by creditors and investors. Previous studies by Westhead and Wright (1998), Carter *et al.* (2003), Hustedde and Pulver (1992), and Hogan and Hutson (2005) concluded that there was no positive relation between previous start-up experience and partial components of outside financing (medium/long-term debt, venture capital). This study confirmed this evidence concerning the use of outside financing.

In the case of experience in industry, we do not confirm a positive relation with the use of outside financing, which we suggested when we established the hypotheses.

IMPLICATIONS, LIMITATIONS AND FUTURE RESEARCH

Implications

In analysing the influence of the nascent entrepreneur's human capital on the initial capital structure, our study focussed on an explanation that had received little consideration in previous research on capital structure. The results obtained indicate that research into capital structure should also take into account human capital when it seeks to justify differences in the initial capital structure of innovative firms. Our study also makes a contribution to the literature on entrepreneurial finance in terms of methodology. In view of the problems related to the constitution of the sample (survivorship bias and memory decay) that we identified in the previous research, we implemented an unprecedented methodology to obtain the data. We identified nascent entrepreneurs and monitored them throughout the start-up process, obtaining data referring to the initial capital structure as near as possible to the date of creation of the firm. As such, it was possible to improve the representation in the sample of the firms created by not restricting the sample to the surviving ones, as in previous studies.

Knowledge by the nascent entrepreneur of the value that certain variables of human capital have to predict the use of outside financing in the initial capital

structure can lead to better chances of obtaining outside financing. Knowledge of these variables is equally useful for government agencies, which can take into consideration these results when drawing up their support programmes.

Limitations and future research

The results obtained refer specifically to a given context (Portugal). To ascertain whether our conclusions can be generalised to other contexts further research is necessary in other countries to validate our results.

The sample comprises nascent entrepreneurs identified from contests held for innovative business ideas. On the date of this identification there may have been significant differences among the nascent entrepreneurs as regards the time spent in preparing their businesses. In future research an effort can be made to identify a random sample with greater homogeneity in relation to the time dedicated by the nascent entrepreneur to the creation of the business.

The size of the sample does not allow it to be divided. An effort to identify and monitor a sample of sufficient size that can be divided (e.g. between nascent entrepreneurs with radical innovations and nascent entrepreneurs with incremental innovations) is another suggestion that we put forward for future work.

Only the direct effects were studied, and other variables that were more difficult to assess were not included. Another limitation of this study is linked to the relatively rudimentary way (binary) that the dependent variable referring to the initial capital structure was incorporated into the model. Future studies can study the indirect effects, use more refined measures for the dependent variable relative to the initial capital structure and incorporate other explicative variables that the theory suggests may be related to the initial financing of the firm (e.g. personal wealth or guarantees that the nascent entrepreneur may provide).

We hope that the results obtained in our study, albeit with the obvious limitations entailed in any research, can encourage undertaking of the future work needed in this field.

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