Classification and Analysis of Criteria Used in the Due Diligence Process

Ma Camino Ramón-Llorens

Department of Financial Economics and Accounting

Technical University of Cartagena

Calle Real, 3 – 30201 Cartagena, Murcia, Spain

Tel: 34-868-071-045   E-mail: camino.ramon@upct.es

Ginés Hernández-Cánovas (Corresponding author)

Department of Financial Economics and Accounting

Technical University of Cartagena

Calle Real, 3 – 30201 Cartagena, Murcia, Spain

Tel: 34-968-325-761   E-mail: gines.hernandez@upct.es

Abstract

This paper uses a survey dataset of 51 Venture Capital Companies to address a segmentation of the venture capital industry. Our paper yields two specific contributions. First, we analyze in a Continental European bank-based system the most important investment criteria identified by previous empirical literature. Second, we show that existing differences in the use of the investment criteria depend on the existence of asymmetric information problems associated to specific characteristics of the venture capital companies. Knowing what investment criteria are the most important for venture capitalists might help both entrepreneurs to elaborate better proposals, and venture capitalists to improve their decision process and achieve better survival rates.

Keywords: Venture capital, Cluster analysis, Screening criteria, Decision-making

1. Introduction

Variation in the use of the investment criteria across venture capital companies has received a great deal of attention in recent empirical research. One line of research shows that the use of investment criteria and their relative importance depend on the existence of asymmetric information problems (Barry, 1994; Fried and Hisrich, 1994). A related line of literature suggests that asymmetric information problems as well as the ability and incentives of venture capitalists to overcome those problems are related to characteristics such as the origin of the resources, the use of intuition or the investment strategy (Carter and Van Auken, 1994; Leleux and Surlemont, 2003; Zacharakis and Shepherd, 2001).

One direct implication of the above studies is the existence of a link between the characteristics of the venture capital company and the investment criteria applied during the due diligence. The analysis of this link by classifying venture capital companies according to any specific characteristic imposes an a priori limitation that assumes standard behaviour of venture capitalists just because their companies share one attribute. Instead, we think that investment criteria depend on a wide range of factors which are difficult to control for even if we try to do so in a regression model. In addition, a priori classifications limit the possibility of uncovering associations which are not obvious, but that can be helpful once found, and restrict the analysis to one investment criterion at the time, while venture capitalists combine them in the due diligence.

To overcome these problems, in this paper we use cluster analysis to classify venture capitalists in homogeneous groups depending on which factors provide the most important decision making criterion when evaluating new proposals. Our results show the existence of three groups of venture capital companies whose differences in the use of the investment criteria are significantly associated with their characteristics. In addition, the sense of the link supports the idea that the existence of asymmetric information problems might elucidate on such differences.

We find that intuitive venture capitalists working in private companies tend to be more demanding in the application of the screening criteria during the due diligence. The strength of the screening process might arise due to increased incentives and knowledge of venture capitalists in private VC to obtain the information as well as higher abilities of intuitive venture capitalists to interpret qualitative information.

We use a survey dataset of 51 Spanish venture capital companies, which suits perfectly our purpose for two reasons. First of all, the heterogeneity of the Spanish venture capital sector (Carzorla et al., 1997) might give rise to differences in asymmetric information problems across venture capital companies. Second, the survey asks venture capitalists the importance they give to the most common investment criteria identified in the literature regarding the (1) entrepreneur personality and experience, (2) the characteristics of the product or service of the venture, and (3) the market of the venture.

Our paper yields two specific contributions. First, we perform a segmentation of the venture capital industry in a Continental European bank-based system. Related evidence analyzes US samples, while financial intermediation literature shows the existence of differences between the Anglo-Saxon and the Continental models in the way resources are channelled (Mayer, 1994) and the behaviour of financial intermediaries (Hernández-Cánovas and Martínez-Solano, 2010). Second, we investigate whether the existing differences in the use of the investment criteria depend on the existence of asymmetric information problems linked to specific characteristics of the venture capital companies. If the screening process is dependent on the nature of the venture capital company, it means that the same business proposal might obtain different decisions depending on the venture capital company that the entrepreneur approaches.

The paper proceeds as follows. Section 2 discusses previous research. Section 3 presents the data and method. Section 4 presents the results, and section 5 concludes.

2. Literature review

In an attempt to reduce the negative effects of the asymmetric information problems, venture capitalists screen out ex ante unprofitable new venture proposals applying an intensive due diligence and evaluation process (Barry, 1994; Fried and Hisrich, 1994). Existing literature suggest that asymmetric information problems as well as the ability and incentives of venture capitalists to overcome those problems are related to characteristics such as the investment strategy, the public or private origin of the resources, and the reliance on the venture capitalist intuition to evaluate the investment.

Information asymmetries confronted by public and private venture capital firms might be different for two reasons. First, Cumming and MacIntosh (2006), Brander et al. (2009) and Munari and Toschi (2010) show that unlike private venture capital funds, public ones, limited by statutory constraints, undertake projects where the main objective is to foster the economic development rather than to obtain a high profitability. Second, Lerner (2002), Leleux and Surlemont (2003) and Mason (2009) suggest that public venture capitalists are, compared to private venture capitalists, lacking in the knowledge and experience required in the screening process and due diligence of the companies. All the differences between them suggest private sector venture capitalists might be more demanding in their valuation process relative to their public counterparts.

Zacharakis and Shepherd (2001) show that intuition plays an important role when evaluating and selecting new proposals. The evaluation of soft information gathered during the due diligence makes venture capitalist's intuition a key factor of success in their decision process (Khan, 1987; MacMillan et al., 1987; Zacharakis and Shepherd, 2001; Beim and Lévesque, 2004). Intuition, which is a result of past experiences (Zacharakis and Shepherd, 2001), should increase the ability of venture capitalist to make a more demanding and complex screening process. Therefore, the consideration of a higher number of qualitative variables allows venture capitalists to reduce the asymmetric information problems (Ray, 1991; Ray and Turpin, 1993).

Existing literature suggests that differences in information asymmetries across venture capital companies are dependent on their investment strategy, i.e., the stage of development of the projects where they prefer to invest (Robinson, 1987; Florida and Kenney, 1988a, 1988b; Sapienza and Timmons, 1989; Fried and Hisrich, 1991; Bygrave and Timmons, 1992; Elango et al., 1995). Venture capital companies face higher adverse selection problems when they fund businesses in early stage of development because the firm is not consolidated and there is not verifiable and testable information about it (Ramón et al., 2007; Ferrary, 2010). As a consequence, venture capitalists evaluating projects in early stage of development are expected to be more demanding in the application of the investment criteria.

We hypothesize that the number of investment criteria and their relative importance increase with the importance of asymmetric information problems confronted by venture capitalists evaluating projects in early of

development, with the incentives and knowledge of venture capitalists in private companies to overcome informational asymmetries, and with the ability of intuitive venture capitalists to interpret the information gather throughout the due diligence.

3. Data and method

3.1 Data

Data were obtained by means of a postal survey addressed to the 63 venture capital companies registered in the ASCRI (Asociación Española de Entidades de Capital Riesgo) in March, 2001. The design of the questionnaire benefited from valuable contributions provided by prestigious economists specialized in financial risk assessment and particularly related with the valuation of ventures. The final design of the survey was improved using interesting observations of several venture capitalists. Finally, we made a pre-test sending the questionnaire to four venture capital firms. Before sending the questionnaire we contacted the venture capital firm by telephone and identified the person in charge of the decision process. The reception of surveys was until June, 2001. We obtained 51 valid answers, which represents a response rate of 80.952%.

The survey collects information about the most common selection criteria identified by previous empirical literature, representing several attributes related with three dimensions: (1) the entrepreneur personality and experience, (2) characteristics of the product or service and (3) characteristics of the market. We measure these variables using a five-point scale (1=little important; 5=very important). Table 1 shows that out of the ten most valued variables, eight are in the entrepreneur dimension, being their honesty and integrity (4.843) and their knowledge of the sector (4.745) the most valued variables. The other two factors in the top ten are the high growth rate of the market (4.451) and the market acceptance of the product (4.440). These data are shown in the table 1.

In order to characterize our sample the questionnaire collects information regarding general characteristics of the venture capital companies. Table 2 shows that out of the 51 respondents in our sample, 17 (33.333%) are "Venture Capital Firm", 18 are (35.294%) "Venture Capital Management Company", 7 (13.726%) are "Society of Industrial and Regional Development", and 9 (17.647%) are classified as "other". The capital is private in 34 venture capital companies and public in 17. 25.490% of funds in our sample prefer the investment in early stages of development (seed or start-up financing), whereas 74.510% show a clear preference for late stages of development (post-creation or expansion financing).

3.2 Method

Statistical analysis is conducted using both factorial and cluster analyses, and the results are supported by means of discriminant analysis.

3.2.1 Factor analysis

We conduct a factor analysis in order to reduce the number of variables without loss of important information (Note 1). Table 3 shows how each of the three dimensions (entrepreneur, product and market) has been separately analyzed in order to reduce the number of variables in each one. Factors have been extracted through principal analysis and rotated by means of Varimax, with Kaiser Normalization, when it is possible. An Eigenvalue of more than 1 is used as a condition for extract factors. A correlation matrix for the factors is provided in Appendix.

The 16 variables in the entrepreneur dimension are reduced into 3 factors. The first factor, which we call entrepreneur´s skills, is made up of 7 variables describing entrepreneur abilities such as attention to detail, communication skills and career in the company. The second factor, entrepreneur´s personality, includes 6 variables and proxies personal characteristics of the entrepreneur such as honesty and integrity, wish to make money, and physical and mental health. In the last factor, entrepreneur's experience, among its 3 variables we highlight professional experience and knowledge of the sector.

In the product factor, which integrates the 8 variables of that dimension, the highest loadings are for the variables identification with company standards, lifecycle, and marketing strategy. As for the market factor, made up of 6 variables, we stress the importance of the variables large potential market, little early threat of competition, and market leader.

3.2.2 Cluster analysis methodology

Cluster analysis is a multivariate statistical method that allows us to classify our sample by reducing the data into groups with a maximal homogeneity of firms within the group, while simultaneously having a maximum heterogeneity between the groups (Hair et al., 2006). This way we are able to identify and analyze different

classes of venture capitalists depending on the screening criteria they use to evaluate new venture investment proposals. As active variables, which are those directly involved in the formation of groups, we use the rotated factors resulting from the above factor analysis.

Following both Milligan and Sokol (1980) and Punj and Stewart (1983), we increase the stability and validity of our solution by performing a combination of cluster analysis methodologies (Hair et al., 2006).

Firstly, we use the Ward method of minimum variance, which is a hierarchical-agglomerative approach, to obtain a preliminary solution that creates the most homogeneous clusters (Bergs, 1981). In our sample, three clusters appear to be the appropriate solution.

Secondly, the k Means procedure is a non-hierarchical, iterative partitioning method which begins with partitioning the objects into the number of clusters given by the Ward method and subsequently, reassigning the objects to the clusters until a predetermined decision rule stops the process (Bühl and Zöfel, 2005). In our study the number of members in cluster 1 is 13 (32.50% of the sample), 15 (37.50%) in cluster 2 and 12 (30%) in cluster 3.

4. Results

In this section, we first assess the internal validity of our cluster solution and next we characterize and describe each cluster.

4.1 Validation of the cluster solution

To assess the validation of our cluster solution, we perform a discriminant function analysis to show the existence of differences across clusters and whether the clustering factors are able to differentiate between the three groups (Morrison, 1969).

In this study, we use multivariate Wilks´ lambda to evaluate the statistical significance of both the discriminant functions and the discrimination between the groups (Note 2). Wilks´ lambda can take on values between zero and one (Huberty, 1994), where measures close to zero (one) are highly (low) significant. Wilks´ lambda test statistic shows a value of 0.081 and, thus, high significance ($p < 0.001$) is achieved for the discriminant functions. Therefore, we can say that the cluster solution is not random and that the data can be classified into the specified groupings to a highly significant degree by the discriminant functions.

Next, when testing for the discriminatory significance of each factor in Table 4, the discriminant function analysis shows that four out of five factors (80% of them) significantly discriminate between the clusters. The entrepreneur's personality factor with the highest F-value (37.260) is the most capable of dividing the data into the three cluster solution; followed by the Entrepreneur's skills factor with a F-vale of 33.620.

4.2 Description of cluster solution findings

Table 5 displays the results obtained by applying ANOVA (analysis of variance).

We observe the existence of differences across clusters in the use of the selection criteria. All significant factors have negative coefficients in cluster 1, with the entrepreneur´s personality and the market showing the lowest values among all clusters. The application of the entrepreneur´s skills and the product characteristics are specially relaxed by firms in cluster 2, while they seem to value the entrepreneur´s personality more than members of cluster 1. Finally, compared to the other groups, all significant factors have the highest coefficients in cluster 3.

Next we assess whether there are cluster specific characteristics that might help us to understand the origin of the above differences in the use of the selection criteria. Characteristics such as the use of intuition, the origin of the resources and the investment strategy might influence the importance of asymmetric information problems and, therefore, explain the observed differences in the screening process.

Table 6 shows the existence of significant variations in the origin of the resources and the use of the intuition across our cluster solutions. These results seem to suggest that the application of screening criteria during the due diligence increases with the use intuition and private resources.

Firms in cluster 1, which have the most relaxed screening process, are the weakest pronounced in the use of intuition and show the highest presence of public resources. The softening in the screening process might arise due to reduced incentives to obtain the information and limited abilities to interpret it. Investments by public companies don´t need to apply strict screening process to overcome asymmetric information problems because they pursue nonfinancial objectives such as political and employment goals. The lack of intuition and experience could result in uncompleted screening process due to reduced ability to interpret the information coming from

the due diligence process.

On the contrary, cluster 3 combines the highest use of intuition with an above average presence of private resources, resulting in the most complete due diligence. It seems that skilful venture capitalists together with higher corporate incentives to gather information drive firms in this group toward more strict screening process.

Halfway between the above groups we have cluster 2, with the highest presence of private resources and a below average use of intuition, where firms apply an intermediate number of screening criteria.

5. Conclusions

This study examines the investment process of a sample of 51 venture capital firms in order to perform a segmentation of the venture capital industry on the basis of the most important selection criteria identified by previous empirical literature. Our results reveal the existence of a relationship between the investment criteria used in the evaluation of new business proposals and the existence of asymmetric information problems linked to the specific characteristics of the venture capital company. We find that the application of screening criteria during the due diligence increases with the use intuition and private resources. The strength of the screening process might arise due to increased incentives of private VC companies to obtain the information and demonstrated abilities of intuitive venture capitalists to interpret it.

This study provides a better insight into the screening process of venture capitalists and the results have clear implications for entrepreneurs and venture capital companies. Knowing what investment criteria are the most important for venture capitalists might help both entrepreneurs to elaborate better proposals, and venture capitalists to improve their decision process and achieve better survival rates.

There is one note of caution with regard to our results. Qualitative information about venture capital firms is difficult to obtain and often has to come from survey data, like in our sample. We recognize that survey data might create potential biases and possible measurement problems (Zacharakis and Meyer, 1998). However, we believe that our sample is large enough that, although cautiously, valid conclusions can be drawn.

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Notes

Note 1. Backhaus et al. (2006) recommend conducting a factor analysis prior to the cluster analysis in order to verify the variance of the data. The correlation matrix, the anti-image correlation matrix, and the Kaiser-Meyer-Olkin criteria are all indicators for the applicability of factor analysis in our data set.

Note 2. Multivariate Wilks' lambda applies when there are more than two clusters to validate.

Table 1. Mean and standard deviation of selection criteria

	N	Overall mean	Standard Deviation
Entrepreneur			
Honesty and integrity	51	4.843	0.367
Knowledge of the sector	51	4.745	0.440
Professional experience	51	4.686	0.547
Capacity for reaction and risk assessment	50	4.580	0.575
Management team organization	51	4.490	0.579
Attitude of entrepreneurship and leadership	50	4.420	0.673
Familiarity with company objectives	50	4.360	0.663
Capacity for intense effort	50	4.240	0.771
Compatibility with venture capitalist	50	4.200	0.926
Analytical ability	48	3.937	0.809
Physical and mental health	49	3.959	0.889
Career in the company	49	3.898	0.822
Wish to make money	48	3.792	0.921
Attention to detail	49	3.367	0.809
Communication skills	48	3.250	0.838
Search independence	48	2.937	1.079
Product or service			
Market acceptance	50	4.440	0.760
Lifecycle	49	4.143	0.736
Marketing strategy	50	4.000	0.728
Patent ownership	50	4.000	0.990
Functioning prototype	46	3.891	1.016
Identification with company standards	49	3.816	0.950
Potential overseas market	51	3.667	0.816
High tech	49	2.857	1.155
Market			
High growth rate	51	4.451	0.577
Entry barriers	49	4.122	0.927
Market leader	51	3.980	0.761
Large potential market	51	3.961	0.799
Venture capitalist's market knowledge	49	3.388	0.975
Little early threat of competition	49	3.224	0.872

Table 2. Venture capital firms characteristics

	n	%
Type of entity		
Venture Capital firm	16	31.372%
Venture Capital Management Company	18	35.294%
Regional/Industrial Development Society	7	13.726%
Others	10	19.608%
Origin of the resources		
Public	17	33.333%
Private	34	66.667%
Intuition in decision making		
Little	17	34.694%
A lot	32	65.306%
Development stage		
Early	13	25.490%
Late	38	74.510%

Table 3. Loadings of factor analysis

Panel A. Factor loadings of variables in the entrepreneur dimension			
	Entrepreneur´s factors		
Variable	Skills	Personality	Experience
Career in the company	0.767		
Communication skills	0.799		
Management team organization	0.625		
Attention to detail	0.801		
Attitude of entrepreneurship and leadership	0.606		
Search independence	0.505		
Familiarity with company objectives	0.442		
Honesty and integrity		0.641	
Wish to make money		0.694	
Physical and mental health		0.593	
Compatibility with venture capitalist		0.549	
Analytical ability		0.385	
Capacity for intense effort		0.369	
Professional experience			0.809
Knowledge of the sector			0.667
Capacity for reaction and risk assessment			0.478
Panel B. Factor loadings of variables in the product dimension			
Variable	Product characteristics		
Identification with company standards	0.596		
Lifecycle	0.552		
Marketing strategy	0.542		
Market acceptance	0.342		
High tech	0.332		
Potential overseas market	0.312		
Patent ownership	0.296		
Functioning prototype	0.295		
Panel C. Factor loadings of variables in market dimension			
Variable	Market characteristics		
Large potential market	0.635		
Little early threat of competition	0.582		
Market leader	0.556		
Entry barriers	0.328		
Venture capitalist's market knowledge	0.328		
High growth rate	0.104		

Table 4. Univariate discriminatory contribution of the clustering variables

	F	Sig.
Entrepreneur		
Entrepreneur's skills ***	33.620	0.000
Entrepreneur's personality ***	37.260	0.000
Entrepreneur's experience	1.699	0.197
Product		
Product characteristics ***	7.797	0.001
Market		
Market characteristics ***	9.295	0.000
Statistical significance at the 10%, 5%, 1% level is indicated by *, **, ***, respectively		

Table 5. Active variables means by cluster

	Mean	C1	C2	C3
Entrepreneur				
Entrepreneur's skills ***	-0.078	-0.331	-0.731	1.011
Entrepreneur's personality ***	-0.027	-1.087	0.464	0.505
Entrepreneur's experience	0.013	0.226	-0.323	0.203
Product				
Product characteristics***	0.016	-0.171	-0.367	0.698
Market				
Market characteristics ***	0.037	-0.517	0.075	0.588
Statistical significance at the 10%, 5%, 1% level is indicated by *, **, ***, respectively				

Table 6. Passive variables by cluster

	1	2	3	4	5
1. Entrepreneur's skills	1				
2. Entrepreneur's personality	0.099	1			
3. Entrepreneur's experience	0.035	0.001	1		
4. Product characteristics	0.483***	0.204	0.297*	1	
5. Market characteristics	0.432***	0.428***	0.073	0.165	1
Statistical significance at the 10%, 5%, level is indicated by *, **, respectively					

Appendix. Correlations of the factors

	N	Cluster 1	Cluster 2	Cluster 3
Origin of the resources*				
Public	10 (25%)	6 (46.154%)	1 (6.667%)	3 (25%)
Private	30 (75%)	7 (53.846%)	14 (93.333%)	9 (75%)
Intuition in decision making*				
Little	12 (30.769%)	6 (50%)	5 (33.333%)	1 (8.333%)
A lot	27 (69.231%)	6 (50%)	10 66.667%)	11 (91.667%)
Development stage				
Early	9 (22.50%)	3 (23.077%)	3 (20%)	3 (25%)
Late	31 (77.50%)	10 (76.923%)	12 (80%)	9 (75%)
Statistical significance at the 10%, 5%, 1% level is indicated by *, **, ***, respectively				