Contingency factors and entrepreneurship:

Influence on business activity

Abstract

Purpose

The aim of this study is to analyse the determinants of the survival of Spanish companies.

Design/Methodology/Approach

Two approaches are used and they are complementary. The first approach analyses the determinants of survival probability. For this purpose, a binary choice model is built and estimated using a sample of companies from the main economic sectors taken from the SABI database. Likewise, the Blinder-Oaxaca decomposition is applied to quantify the difference between companies with employees and without employees and the proportion of this difference that owes to observed factors or unobserved factors. Finally, the second approach is a survival analysis carried out through the Cox proportional hazard model that identifies the determinants of the duration of business activity.

Findings

The results of the empirical analysis show that companies without employees present less favourable conditions for survival at all stages of their evolution than companies with employees.

Originality/Value

The contribution of this study to the empirical literature consists in analysing the difference between companies with and without employees. Due to the structure of Spanish companies, this aspect and the determinants of such difference are essential for policymakers to increase the survival for companies.

Keywords: Entrepreneurship, company survival, binary choice model, Blinder-Oaxaca decomposition, Cox proportional hazard model.

Classification JEL: C24, C25, C41 and M31

Introduction

Entrepreneurship is a professional career option and is vital to all aspects of economic growth (Markin *et al*., 2017; Emontspool and Servais, 2017). The Spanish economy is characterized by a strong presence of microenterprises, that is, companies with fewer than ten employees. Furthermore, a very high percentage of microenterprises do not have employees. The latest data on companies published by the INE (the Spanish National Statistics Institute), corresponding to the year 2016, indicate that the total number of companies in Spain amounted to 3,287,346, 55.5% of which (1,823,250) had no employees. Of the companies without employees, 65.8% were run by individuals or, in other words, by self-employed workers.

During the years following the economic crisis, the government encouraged self-employment as a means of incorporation into the labour market. However, such measures do not always have the desired effect, given that companies without employees have lower survival rates than companies with employees (Arrighetti *et al.*, 2016; Pérez, 2014). This study tests whether Spanish companies with and without employees have a different survival rate. Due to the structure of Spanish companies, analysing this aspect and the determinants of such differences is essential for policymakers to know what factors to foster to increase the survival of companies, thereby maintaining employment rates.

The concept of survival is not particularly well defined in the empirical economic literature. Survival is the opposite of failure, the latter being the preferred subject of research to date. Generally, the failure of a company can be understood as its exit from the market after its dissolution (DeTienne *et al*., 2008; Gimeno *et al*., 1997). However, some authors have a wider concept of failure and argue that business failure occurs when a company declares some form of bankruptcy (Watson and Everett, 1996) or is declared insolvent (Dimitras *et al*., 1996; Shepherd, 2003). Khelil (2016) extends the

understanding of entrepreneurial failure by examining the different factors associated with profiles of failing entrepreneurs. This study employs the wider definition of business failure, whereby the interruption of business operations occurs when the company has stopped operating, has dissolved, is in bankruptcy, in suspension of payments or has filed for bankruptcy. Companies that are not in any of the above situations and are maintaining their normal business activity are therefore considered active companies.

This study analyses the business characteristics that determine the survival of companies. The contribution to the empirical literature consists in researching the existence of differences in the survival rate of companies with and without employees and the factors that would explain that difference. To this end, a binary choice model is estimated to analyse the probability of business survival. To deepen this analysis, the Blinder-Oaxaca decomposition proposed by Yun (2004) is used to quantify the difference in the probability of survival between companies with and without employees. Also, this decomposition helps verify the proportion of this difference that is determined by observed factors, which can be influenced by economic policy measures, and the percentage explained by random factors, which cannot be altered.

Once the business characteristics that influence the probability of survival of companies are known, a duration analysis is carried out taking into account the factors that determine the time that elapses until the interruption of business operations occurs. These two approaches can be considered alternative approaches. However, given that each of them undertakes the analysis using different techniques (one gives the probability of survival while the other looks at the duration of the business activity), in this study both analyses are considered complementary. Furthermore, this procedure serves to analyse the robustness of the results. Thus, if both approaches yield similar results, their robustness is confirmed.

The article is divided into six sections. After this introduction, the second section discusses the possible determinants of business survival. The third section presents the methodology and the fourth section analyses the data used in the research. The fifth section shows the empirical results obtained and, finally, the last section includes the main conclusions of the research.

Theoretical framework

According to Bunn and Redwood (2003), who carry out a comprehensive review of the literature on the determinants of their conception of business failure, two research branches can be distinguished in the literature. One of them focuses on microeconomic factors, such as company characteristics, that reveal whether companies will fail or survive. The other branch considers that the business failure rate responds to aggregate determinants related to the business cycle (Bhattacharjee *et al*., 2009; Vlieghe, 2001; Wadhwani 1986). Macroeconomic variables, as predictors of business failure, were initially used by Foster (1986) and Rose *et al*. (1982). Another stream of research has focused on characteristics of entrepreneurs such as gender (Fellnhofer *et al.,* 2016) attitudes or behaviours (Corbett *et al.,* 2018), lack of training (Azeez 2017), obsessive entrepreneurial passion (Fisher *et al.,* 2018), the evolution of the cross-generational culture within a company (Scuotto *et al.,* 2017), social proactiveness and innovation (Goldsby *et al.,* 2018) or overconfidence (Simon and Kim, 2017) as determinants of business failure.

Regarding business characteristics, the first seminal studies go back to Altman (1968) and Beaver (1968), who applied financial ratios to a discriminant analysis to study the bankruptcy of a company. Subsequently, binary choice models that included factors

that explained company failure began to be applied. More recently, survival analysis has been performed using duration models.

Traditionally, the economic performance of companies (Khyzer Bin Dost et al., 2018) has been considered one of the fundamental factors of their survival such that companies with low economic profitability end up leaving the market (Alchian, 1950; Friedman, 1953; Williamson, 1991; Winter, 1964). Bunn and Redwood (2003) find a negative relationship between profit and business failure but conclude that the relationship is not linear, since negative performance has a greater effect on the probability of failure.

On the other hand, as pointed out by Audretsch and Mahmood (1995), empirical studies on business dynamics show that the survival rate of companies is positively related to the size and age of the company. Many authors consider that business survival increases over time and with the size of the company (Dunne *et al*., 1989; Evans, 1987; Fariñas and Moreno, 2000; Hopenhayn, 1992; Jovanovic 1982; Preisendörfer and Voss, 1990). As indicated by Aldrich and Auster (1986), both new and small companies are at a disadvantage because of the absence of economies of scale, their lower profile in the market, their limited financial resources and their weak position when actively competing for work. Other company characteristics that have been considered determinants of business survival are liquidity, the capacity to generate resources and capitalisation (Bhattacharjee *et al.*, 2009; Bunn and Redwood, 2003; Geroski and Gregg, 1997; Lennox, 1999).

After analysing companies' bankruptcy situation, Lennox (1999) concludes that the most important determinants are liquidity, benefits, size, the capacity to generate resources, the industrial sector to which the company belongs and the economic cycle. Additionally, Geroski and Gregg (1997) and Bunn and Redwood (2003) find that the ratio

between debt and assets positively affects the probability of closure. Bhattacharjee *et al*. (2009) show that the cash flow, profit and size of the company reduce the probability of liquidation, while the economic cycle only affects companies that have been operating for more than five years.

Finally, Fritsch *et al*. (2006) analyse the effect that the productive sector and the location of the company have on survival rates. Kedmenec and Straŝek (2017) also concluded that some cultural aspects also influence the survival of businesses. For these authors, the survival rate is reduced in sectors with high competition. However, for Millán *et al*. (2012), a relationship between the productive sector and survival cannot be established *a priori*, given that the results obtained in the literature are very diverse and, therefore, not conclusive.

This literature review suggests that survival rate of companies depends on their characteristics, such as profitability, size, age, liquidity and financial structure. This paper focuses on analysing how business characteristics determine the survival of Spanish companies and whether there is a significant difference in the survival rate of companies with and without employees. Therefore, drawing on the theoretical framework discussed, the following hypotheses are presented:

Hypothesis 1: The survival rate of companies with employees is higher than that of companies without employees.

Hypothesis 2: The age, size, benefit, liquidity and productivity of workers positively affect the survival of companies.

Hypothesis 3: The volume of debt negatively affects the survival of the company.

Methodology

Binary choice models

Given that the endogenous variable of the analysis is a probability, the binary choice model is the appropriate tool. In order to select the determinants of business survival, this model is specified and estimated. In effect, discrete choice models can explain a qualitative variable, in general, or a dichotomous variable, in particular, through its defining traits. According to the chosen function, which relates the characteristics of the economic agent to the chosen option, different models are specified, the most popular being the Logit and the Probit models.

The economic literature offers different approaches to interpreting discrete choice models. The most common approach in economic analysis is the random utility theory, whereby the alternative selected by economic agents will be the one that maximizes its expected utility. In other words, an economic agent with a rational behaviour will choose the option – between two mutually exclusive alternatives, (1) or (0) – that will maximize its expected utility. The i-th agent will choose option (1) if its utility U_{i1} is greater than the utility provided by option (0), which is U_{i0}. This comparison, from the mathematical point of view, can be expressed through the following probabilistic inequality $Prob(U_{i1} > U_{i0})$. In our case, if the utility of maintaining business activity is higher than not maintaining it, the entrepreneur will opt to continue with the business.

The utility achieved is quantified by assigning a probability to rational decisions through the following equation:

$$P_i = Prob(Y_i = 1) = Prob(U_{i1} > U_{i0}) = F(X_i\beta)$$

where $F(X_i\beta)$ is the distribution function evaluated for each of the characteristics associated with the company (i). The vector of observations of the characteristics of the company is denoted by (X_i) while (β) is the vector of coefficients.

Thus, the following behaviour equation of the Logit model represents entrepreneurs' choice:

$$P_i = F(X_i\beta) = \frac{e^{X_i^{\beta}\,\beta}}{1+e^{X_i^{\beta}\,\beta}} = \varphi\left(Z_i^{\beta}\right) \quad (1)$$

The proposed model sets out to determine the relevance of the different factors that influence an entrepreneur's decision to maintain or stop business activity.

In this way, the Logit model specified is:

$$Y_i^{\beta} = \varphi\left(Z_i^{\beta}\right) + \varepsilon_i^{\beta} \quad (2)$$

where Y_i^{β} is a dichotomous variable that takes the value one if the entrepreneur continues with his/her business activity and zero if he/she does not, and Z_i^{β} is the index composed by the combination of the coefficients and the characteristics associated with the company *i*, such as economic profitability, size of the company or liquidity.

In short, the discrete choice model allows identifying the company characteristics that significantly influence the probability of keeping the company in operation.

Blinder-Oaxaca decomposition

After the estimation of the Logit model, the decomposition proposed by Yun (2004) is applied. The original approach of the variable decomposition method, proposed by Blinder (1973) and Oaxaca (1973), allows distinguishing between two groups or collectives in the endogenous variable and quantifying which part of that difference responds to each one of the two components considered by the researchers. The first component quantifies the difference between the two groups regarding the explanatory variables observed and the second component quantifies the difference regarding

unobservable characteristics, through the discrepancy in the response to the explanatory variables (parameters) of both groups. The unobservable factors make the collectives respond differently to the observable explanatory variables.

The decomposition method allows determining which part of the difference in success probability owes to the characteristics or the explanatory variables of both collectives, and which part owes to the consequences of these characteristics or to structural effects. The Blinder-Oaxaca method was designed for linear models but, lately, it has been used for non-linear models. In particular, the method proposed by Yun (2004) can be used for the decomposition of any type of functional relationship and for calculating the contribution of each variable.

In line with Yun (2004), the probability of maintaining business activity P_i, for a company *i*, through a Logit model, can be expressed as:

$$P_i = F(X_i\beta) \tag{3}$$

whereas the decomposition of the difference in success probability between the collectives formed by companies with employees (C) and companies without employees (S) can be expressed as:

$$\overline{P_C} - \overline{P_S} = \left(\overline{F\left(X_C\hat{\beta}_S\right)} - \overline{F\left(X_S\hat{\beta}_S\right)}\right) + \left(\overline{F\left(X_C\hat{\beta}_C\right)} - \overline{F\left(X_C\hat{\beta}_S\right)}\right) \tag{4}$$

The first equation identifies the difference explained by the differing characteristics of each group, given the same coefficients. The second equation indicates the unexplained difference, that is, the part corresponding to the different response given by the two groups with the same characteristics. Therefore, Yun's method allows the decomposition of the difference in the success probability of a company based on two

effects: the effect of the characteristics and the effect of the coefficients or structural effects.

In order to obtain the decomposition, Yun (2004) proposes a transformation in two stages. In the first one, the Logit model is estimated for the mean values of the regressors and, in the second, a first-order Taylor expansion is performed to linearise the effects associated with the characteristics and the coefficients around the mean, obtaining the following expression:

$$\overline{P_C} - \overline{P_S} = \sum_{j=1}^{k} W_{\Delta X}^{j} \left(\overline{F\left(X_C \hat{\beta}_S\right)} - \overline{F\left(X_S \hat{\beta}_S\right)} \right) + \sum_{j=1}^{k} W_{\Delta \beta}^{j} \left(\overline{F\left(X_C \hat{\beta}_C\right)} - \overline{F\left(X_C \hat{\beta}_S\right)} \right) \quad (5)$$

where the weights of each variable j on the differences in characteristics and coefficients, respectively, are:

$$W_{\Delta X}^{j} = \frac{\left(\overline{X}_C^j - \overline{X}_S^j\right)\hat{\beta}_S^j}{(\overline{X}_C - \overline{X}_S)\hat{\beta}_S} \quad (5a)$$

$$W_{\Delta \beta}^{j} = \frac{\left(\hat{\beta}_C^j - \hat{\beta}_S^j\right)\overline{X}_C^j}{(\hat{\beta}_C - \hat{\beta}_S)\overline{X}_C} \quad (5b)$$

and the sum of all the weights is equal to 1: $\sum_j^k W_{\Delta X}^i = \sum_j^k W_{\Delta \beta}^i = 1$

After analysing the characteristics that determine the probability of maintaining business activity, the duration of the company is analysed through the Cox proportional hazard model.

The Cox proportional hazard model

Survival analysis looks at the time an event takes to occur. This statistical technique has been applied to different fields of knowledge such as medicine, biology, economics, engineering and sociology. One of the main theoretical contributions that allowed applying survival models to economics is Lancaster's (1979) seminal work.

One of the most popular models used for survival analysis is the Cox proportional hazard model (Cox, 1972). The risk function of the Cox model is given by the following equation:

$$\lambda_i(t) = \lambda_0(t)e^{X_i\beta}$$

where $\lambda_o(t)$ is a non-negative and unspecified function, common to all the subjects in the sample, called the base risk function and β is the coefficients vector of the model.

This model is semiparametric because it includes a parametric part and a nonparametric part. The parametric part corresponds to the exponential function $e^{X_i\beta}$, where β are parameters to be estimated by maximizing the partial likelihood function, as proposed by Cox. The base risk function is the nonparametric part, since it is an arbitrary function and is not specified. This function is estimated in a second stage conditioned by the estimation of the parameters β.

The partial likelihood function is called partial because it only takes into account the observations for which the event has occurred (in our case, termination of the business activity) and does not include censored observations (when the event has not occurred by the time the observation of the sample is completed). However, when calculating the probability of survival all observations are considered.

A key assumption of the Cox model is the proportional hazard, which means that the quotient between the risk for two subjects with the same vector of variables is constant over time:

$$\frac{\lambda_i(t)}{\lambda_j(t)} = \frac{\lambda_o(t)e^{X_i\beta}}{\lambda_o(t)e^{X_j\beta}} = \frac{e^{X_i\beta}}{e^{X_j\beta}}$$

There are various ways of checking whether the data meet this assumption (Therneau *et al*., 1990). When working with qualitative variables and if the number of categories is not very large, a graphic test of the survival curve can be used. If the assumption of proportional hazard is met, the logarithmic transformation of the survival curves of each category should be separated from each other at a constant distance (parallel survival curves). This method is not useful if the number of categories is very high or the variables are continuous. In this case, to verify the proportional hazard assumption, statistical contrasts based on Schoenfeld residuals are used. The Stata econometric program facilitates checking each of the factors considered and, therefore, helps verify which factors cause rejection of the proportional hazard assumption.

Data and variables

The data used in this research comes from the Iberian Balance Sheet Analysis System (SABI) database, which provides information on the economic and financial accounts of Spanish and Portuguese companies.

This study includes information on companies from the following four economic sectors: industry, construction, trade and hospitality. The 2009 CNAE codes selected are the following: **Industry**: 10 (Food), 11 (Manufacture of beverages), 24 (Metallurgy) and 25 (Manufacture of metallic products); **Construction:** 41 (Construction of buildings), 42 (Civil engineering) and 43 (Specialized construction activities); **Trade:** 45 (Sale and repair of motor vehicles and motorcycles), 46 (Wholesale) and 47 (Retail trade); and **Hospitality industry**: 55 (Accommodation services) and 56 (Catering services).

As the Central Directory of Companies (DIRCE) classifies companies into four sectors, this study also collects a representative sample of these sectors. Furthermore, the food and metallurgical industries are selected because they are the two most important industries within the Spanish industrial sector. Likewise, given the wide variety of industries that the service sector covers, the most important one for the Spanish economy is selected: the hospitality industry. Specifically, the sample comprises companies that were formed during the period 2009–2015. At the end of December 2016, the status of each of the companies is analysed and a binary variable is generated that takes value one if the company remains active and zero otherwise. In addition, the duration or number of years that companies have remained active is calculated. Thus, the variable duration includes the number of years from the formation of the company until December 2016, or until the company ceases to be active.

When choosing the sample, two filters are set: the data must correspond to Spanish companies and they must not have negative equity. Likewise, companies with an atypical behaviour, outliers, are eliminated from the sample. After eliminating observations that do not provide information on any of the variables considered, the sample size amounts to 50,593 companies. The information obtained from SABI for each of the companies in the sample includes the number of employees, sales, assets, liquidity or cash flow, level of debt, financial leverage and economic profitability.

The sectorial distribution of the companies in the sample, shown in Table 1, indicates a clear predominance of the companies belonging to the trade sector, followed by the construction and hospitality sectors, with the minority sector being the industrial sector.

The theoretical framework suggests that companies' survival rate depends on their characteristics: profitability, size, age, liquidity and financial structure. Before introducing them in the models, these concepts are defined in the following paragraphs.

First, company size may be classified according to different criteria. Many studies have measured company size through its total assets. Other studies consider the criterion of volume of sales. This study uses the first criterion, the total assets of the company, as an indicator of company size.

Second, the profitability of the companies has been measured through the Return on Assets (ROA), which is defined as the quotient between the profit before interest and taxes (BAI) and the total assets of the company. In order to collect the different response of survival probability to profitability, as pointed out by Bunn and Redwood (2003), a dichotomous variable is generated; it takes value one if the ROA of the company is positive and zero otherwise.

Table 1. Sectorial distribution of the sample.

	Number of Companies	Percentage
Industry	3433	6,79
Construction	12849	25,40
Trade	26376	52,13
Hospitality	7935	15,68
Total	50593	100,00

Source : Compiled by the authors

Third, the company's financial structure has been measured through the variable debt, defined as the quotient between total liabilities and net worth.

Fourth, company age refers to the number of years from the formation of the company to the end of the period under analysis, in this case, December 2016, or to the

time of interruption of the company's operations in the event that they cease their activity. This variable coincides with the period during which the company is active and is the endogenous variable in the Cox proportional hazard model.

Fifth, the productivity of the company is quantified by the logarithm of the quotient between sales and number of employees. Another aspect is financial leverage, which is the effect that using funds or external debt produces on the profitability of owned funds (financial profitability). If the financial leverage is positive, financial profitability can be increased by increasing the debt. The necessary condition for positive financial leverage is that the economic profitability of the investments is greater than the financial cost of the debt.

Finally, the cash flow, from a financial point of view, is the difference between the collections and the payments of the company during a fiscal year; from an economic point of view, it is the sum of the benefit and expenses of depreciation and provisions. This cash flow indicates the capacity of the company to generate resources to self-finance. If cash flow is zero or negative, the company has no capacity to deal with its debts, based on the results of the year. Thus, a dichotomous variable is generated that takes value one if the company presents positive cash flow and zero if it is zero or negative.

By way of summary, Table 2 includes the definition and expected sign of each the variables considered on the probability of survival based on the Logit model, and on the risk of interruption of business activity based on the Cox model. In addition, Table 3 presents the descriptive statistics of the selected variables for all the companies in the sample, distinguishing between active companies, companies with employees and companies without employees.

Firstly, the descriptive statistics indicate a high dispersion of the data on companies' assets, sales and profitability. The dispersion of sales in companies with

employees is especially high. Secondly, no significant differences exist between companies with and without employees as regards company age. Thirdly, regarding company size, as expected, companies without employees have an average size based on assets that is much lower than that of companies with employees. They also present a smaller dispersion. This is also observed with the sales variable, which has traditionally been considered an alternative measure of company size. Here, the average sales volume of companies without employees is lower than that of companies with employees and their dispersion is lower. Fourthly, as expected, active companies' average profitability is higher than that of all companies in the sample. When comparing the average profitability of companies with and without employees, the difference is very small. However, 77% of the companies in the sample show a positive economic return.

Table 2. Definition of the explicative variables and expected sign of their coefficients.

			Expected sign	
Variable	Name	Definition	Cox Model	Logit Model
Size	SIZ	Total assets (neperian logarithm)	-	+
Profitability	ROA	ROA	-	+
Positive profitability	PEP	ROA greater than zero	-	+
Debt	DEB	Passive*100/Net equity	+	-
Age	AGE	Number of years active up until the end of the sample period		+
Productivity	PRO	Sales/Employees	-	+
Positive leverage	PLE	Value 1 if the leverage is positive and 0 if the leverage is null or negative	-	+
Positive cash flow	PCF	Value 1 if the cash flow is positive and 0 if it is null or negative	-	+
Without employees	WEM	Value 1 if the companies do not have employees and 0 if they do	+	-

Source: Compiled by the authors in a theoretical framework

Fifthly, the average debt, which would reflect the financial structure of the company, is higher in the group of companies with employees than in the group of companies without employees, perhaps because the larger size of the former grants them greater access to external financing. Finally, around 86% of the companies in the sample

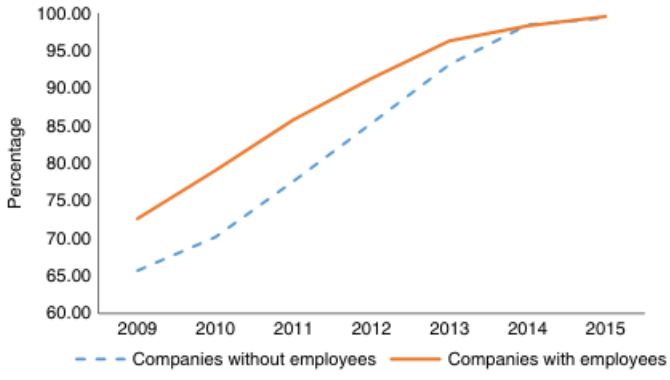
remain active. In addition, the percentage of surviving companies is slightly higher in companies with employees than without employees. On the other hand, the percentage of companies without employees that show a positive leverage and positive cash flow is lower than that of companies with employees.

In summary, companies with employees and without employees differ significantly on size. In addition, companies without employees have a lower level of debt and the percentage of companies with liquidity and positive leverage is smaller compared to companies with employees.

Table 3. Descriptive statistics of the data of the sample.

	Total companies	Active companies	Companies without employees	Companies with employees
Number observations	50593	43716	11688	38905
percentage	*100,00*	*86,41*	*23,10*	*76,90*
Longevity (years)				
Average	4,80	4,76	4,67	4,83
Midpoint	4,72	4,65	4,58	4,76
Deviation	1,70	1,74	1,73	1,70
Coefficient of Variation	0,36	0,37	0,37	0,35
Credit (thousands of euros)				
Average	1207,44	1212,73	394,94	1450,64
Midpoint	191,29	200,71	90,26	232,07
Deviation	24251,38	23815,57	4206,08	27554,53
Coefficient of Variation	20,08	19,64	10,65	18,99
Economic profitability (%)				
Average	4,83	6,61	4,77	4,84
Midpoint	3,35	3,95	3,00	3,46
Deviation	23,73	20,89	26,79	22,73
Coefficient of variation	4,92	3,16	5,61	4,69
Debt (%)				
Average	71,94	70,49	68,03	73,12
Midpoint	78,32	76,98	75,84	79,03
Deviation	30,16	29,24	29,09	30,37
Coefficient of Variation	0,42	0,41	0,43	0,42
Employees (number)				
Average	7,42	7,44	-	9,35
Midpoint	3,00	3,00	-	5,00
Deviation	45,51	36,98	-	51,74
Coefficient of Variation	6,13	4,97	-	5,53
Sales(thousands of euros)				
Average	1863,38	1951,94	457,73	2285,67
Midpoint	431,27	456,94	150,98	525,30
Deviation	55805,49	59300,96	1444,46	63627,63
Coefficient of Variation	29,95	30,38	3,16	27,84
Survival (%)	0,86	-	0,83	0,88
Positive profitability (%)	0,77	0,80	0,72	0,78
Positive leverage (%)	0,63	0,65	0,52	0,66
Positive *Cash Flow* (%)	0,82	0,85	0,77	0,83

Source: Compiled by authors from SABI



Source: Compiled by the authors based on SABI

Figure 1 shows the evolution of the survival rate of the companies in the sample. The survival rate is the percentage of companies that remain active from the total number of companies set up each year. This graph shows that survival of companies with employees is higher than that of companies without employees. The high survival rate of sample companies set up in the last few years is surprising because it does not accurately represent reality, where around 20% of companies disappear in the first few years of life. The reason for this discrepancy is that official statistics register the foundation and cessation of companies, but SABI takes the data from the Mercantile Registers. Insolvent companies, who should register their cessation, fail to provide their accounting data to the Mercantile Registry and so these observations are missing from the SABI database.

Results and discussion

A Logit model is specified and estimated to determine companies' survival probability based on size, age, economic profitability, debt, productivity and whether they present a positive profitability, positive leverage and positive cash flow, stratified by the variable positive leverage. As indicated by Bunn and Redwood (2003), the marginal effects associated with these temporal dummies are close to the effect generated by the economic cycle.

Table 4 shows the results of the estimation of three Logit models: one for all companies in the sample, another for companies without employees and the last one for companies with employees. The models show standard deviations of robust estimators with heteroscedasticity. The objective is to compare the results obtained for the different types of companies.

Table 4. Estimation of Logit model

	Model (1) Total sample		Model (2) Companies without employees		Model (3) Companies with employees	
Variables	Coefficient	*Statistic z*	Coefficient	*Statistic z*	Coefficient	*Statistic z*
Constant	-0,96	*-2,92*	-0,92	*-1,87*	-1,16	*-2,67*
WEM	-0,27	*-6,04*	-	-	-	-
SIZ	0,15	*9,28*	0,19	*5,78*	0,14	*7,23*
AGE	2,86	*65,89*	2,87	*34,75*	2,86	*55,90*
ROA	0,00	*3,52*	0,00	*1,91*	0,00	*3,09*
PEP	0,59	*10,18*	0,38	*3,47*	0,65	*9,70*
DEB	-0,01	*-13,67*	-0,01	*-8,50*	-0,01	-10,49
PRO	0,14	*7,67*	0,09	*2,83*	0,19	*7,91*
PLE	0,42	*10,90*	0,50	*6,76*	0,39	*8,54*
PCF	0,38	*6,66*	0,30	*2,84*	0,43	*6,30*
Number of observations	50593		11688		38905	
Log. of likelihood	-10963,59		-2931,98		-8008,94	
McFadden R-Squared	0,45		0,46		0,45	
Prediction R-Squared	93,58		92,49		94,00	

The results for the complete sample, collected in Model (1) of Table 4, indicate that the group of companies that do not have employees show a negative differential effect on the probability of remaining active compared to the group of companies with employees. The results support the first hypothesis: the survival rate of companies with employees is higher than that of companies without employees. The size, longevity, profitability and their employees' productivity positively affect the probability of staying operational, thus supporting hypothesis 2. Furthermore, the higher a company's debt is, the lower its probability of survival, as established in hypothesis 3. Nevertheless, profitability and debt have a reduced marginal effect. Companies with positive economic returns experience a positive differential effect with respect to unprofitable companies.

Companies with positive leverage, that is, with the ability to improve their financial results by increasing their debt, have a higher probability of survival than those without leverage. On the other hand, companies with positive cash flow are more likely to generate funds to finance themselves than companies with a zero or negative cash flow.

With regard to the productive sectors, no significant differences exist between the different sectors once survival is controlled by the characteristics of the companies. Therefore, the dummy variables that represent the different productive sectors have not been included in the final specified model.

When estimating the Logit model for companies without employees and those with employees (see Models (2) and (3) of Table 4), size has a much more marginal effect on companies without employees than on companies with employees. Likewise, the differential effect of positive profitability in companies with employees is much more significant than in companies without employees. The differential effect in the former is double that of the latter. On the other hand, productivity has a greater influence on the probability of survival of companies with employees; in particular, the marginal effect is double that of companies without employees. The differential effects of positive leverage and positive cash flow between companies with and without employees do not coincide. Finally, the marginal effects of longevity and the level of debt are very similar between the two groups of companies. Therefore, these results indicate that, although the survival probability of companies with and without employees is determined by the same factors, their effects on probability are not the same.

In order to compare companies with and without employees further, the statistical decomposition technique of Blinder-Oaxaca is applied. This technique confirms the difference of 5 percentage points between companies with and without employees in the probability of remaining active. Although the difference is not excessively high, it is

statistically significant. Likewise, it has been quantified that 71.14% of this difference is explained by observed factors (See Table 5). The remaining percentage owes to random or unobserved factors. If the companies without employees had the same characteristics as the companies with employees, they would see their probability of survival increase by 3.5 percentage points. Among the observed factors that would increase the probability of survival of companies without employees, size and longevity are highlighted as the two factors with the highest coefficient. Likewise, a positive economic return, a positive cash flow and positive leverage would also reduce the difference between the two groups of companies regarding company survival. Profitability would not affect that difference.

Table 5. Blinder-Oaxaca decomposition Logit model

	Probability	*Stadistic z*	*Percentage*
With employees	0,876	*284,030*	-
Without employees	0,826	*131,420*	-
Difference	**0,050**	*7,290*	100,00%
Observed component	**0,035**	*4,060*	71,14%
Unobserved component	**0,014**	*2,730*	28,76%

	Observed component		**Unobserved component**	
Variables	Coefficient	*Statistic z*	Coefficient	*Statistic z*
SIZ	0,020	*7,330*	*-0,017*	*-1,500*
AGE	0,049	*7,410*	-0,002	*-0,080*
ROA	0,000	*0,250*	0,000	*0,220*
PEP	0,003	*3,370*	0,011	*2,050*
DEB	-0,006	*-6,530*	0,009	*1,510*
PRO	-0,004	*-2,500*	0,024	*2,540*
PLE	0,007	*6,080*	-0,004	*-1,200*
PCF	0,002	*2,800*	0,005	*0,970*
Temporal dummies	-0,037	-	0,000	-
Constant	-	-	-0,013	*-0,360*

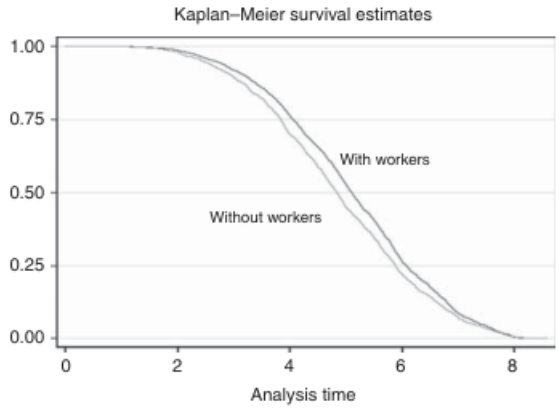


Figure 2 confirms that companies without employees have a lower probability of survival than companies with employees: In the early years, the difference is minimal, with the gap widening over time. An improved analysis of the differences between companies with and without employees requires distinguishing between newly established companies and consolidated companies. In this sense, Table 6 presents the results of the Blinder-Oaxaca decomposition. For companies without employees, the difference between consolidated and newly established companies is of 20.5 percentage points. Interestingly, if the consolidated companies had the characteristics of those newly established companies, they would present a probability 27.5 percentage points lower than their actual score. In the case of companies with employees, if the consolidated companies presented the characteristics of newly established companies, they would have a probability of 17.7 percentage points lower than their actual score. Finally, as expected, consolidated companies with employees have a higher probability of survival (0.825) than consolidated companies without employees (0.751). These results show that companies with employees have higher survival rates than companies without employees at all stages of their evolution.

Table 6. Decomposition by type of company of the Blinder-Oaxaca Logit Model

	Companies without employees		Companies with employees	
	Probability	*Statistic z*	Probability	*Statistic z*
Recently formed	0,957	*311,320*	0,972	*694,440*
Consolidated	0,751	*151,960*	0,825	*356,380*
Difference	**0,205**	*35,290*	**0,148**	*54,530*
Observed component	**-0,275**	*-19,870*	**-0,177**	*-22,350*
Unobserved component	**0,480**	*31,400*	**0,325**	*37,540*

The results in Table 6 and the idea of companies' life expectancy can be interpreted in a similar way to that of people. When a child is born, their life expectancy increases and decreases with age. Adults have a shorter life expectancy than children, but it would be even lower if they had the weak characteristics of new-borns.

After analysing the probability of business survival, the factors influencing companies' life expectancy are analysed. The Cox proportional risk model employs the amount of time that elapses from the start of the business activity to its cessation, or until the end of the sample observation period. These last observations are considered censored.

The Cox model is interpreted in terms of the level of risk, or hazard ratio; thus, values lower than the unit imply a reduction in risk and, therefore, an increase in the business duration, corresponding to negative coefficients. In this case, the factors have a positive influence on the duration. Conversely, values higher than one imply risk factors, positive coefficients and, therefore, variables that negatively affect business duration.

Table 7 shows the estimates corresponding to the hazard ratio of the Cox model. Like the Logit model, the Cox proportional risk model also includes temporal control variables. Model (1) of Table 7 shows that companies without employees have a risk of not surviving that is 1.15 times higher than that of companies with employees (15.5% higher). However, the hypothesis of proportional hazard is rejected for variables without employees (WEM) and positive leverage (PLE). Possible solutions to avoid risk not being

proportional in these variables include (1) estimating the model for each category, (2) estimating an extended Cox model in which the factors are time-dependent or (3) estimating a stratified Cox model, in which case the effect of the factors is implicitly considered the same for the different categories. This last alternative is the one included in Model (2) of Table 7. Likewise, the stratified Cox model with interaction, which is stratified by the variable positive leverage, (Model (3)) has also been estimated, thus allowing to check the significance or lack thereof of the interactions between the dichotomous variable without employees (WEM) and the rest of the factors. If they are not significant, the stratified model will be correct. The result of the likelihood test shows that the interactions are statistically significant and, therefore, the stratified model, Model (2), is not correct. This result indicates a difference as regards the effects of the characteristics of companies with and without employees on business activity duration.

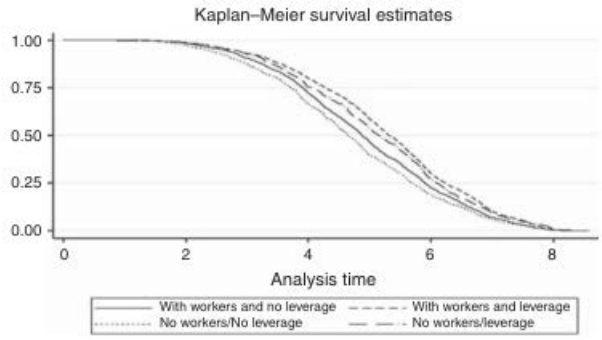
Finally, for the positive financial leverage dichotomous variable, a stratified Cox model has been estimated for companies with and without employees. Focusing on Models (4) and (5), the debt of the companies is neutral despite being statistically significant, because its hazard ratio takes a value close to one. This result indicates that companies' debt does not affect risk rate. On the other hand, size reduces the risk of closure and this effect is greater in companies without employees. Positive cash flow and positive profitability reduce the risk of closure; in this case, the reduction in the risk of closure is greater in companies with employees for both variables. Finally, productivity does not affect the duration of business activity in companies without employees, but it reduces the risk of closure in companies with employees.

As shown, the assumption of proportional hazard is rejected for the positive leverage variable, which means that the model must be stratified by this variable. In the study of how positive leverage influences the survival rate, the Kaplan-Meier survival

curve is estimated for the two collectives of companies and for the two categories of the financial leverage variable. As Figure 3 shows, companies with employees and with positive financial leverage have a higher survival rate than companies without employees and with positive leverage. The companies with the lowest probability of survival are the companies without employees and with no leverage.

Table 7. Estimation of the Cox proportional hazard model.

	Model (1) Cox Model Total sample		Model (2) Cox Model Stratified Total sample		Model (3) Stratified with interraction Total sample		Model (4) Cox Model Stratified Companies without employees		Model (5) Cox Model Stratified Companies with employees	
Variables	*Hazard Ratio*	*Statistic z*	*Hazard Ratio*	*Statistic z*	*Hazard Ratio*	*Statistic z*	*Hazard Ratio*	*Statistic z*	*Hazard Ratio*	*Statistic z*
WEM	1,16	*4,96*	-	-	-	-	-	-		
SIZ	0,86	*-13,16*	0,86	*-13,24*	0,90	*-8,70*	0,81	*-9,59*	0,88	*-9,69*
ROA	1,00	*-8,13*	1,00	*-8,05*	1,00	*-8,77*	1,00	*0,06*	1,00	*-7,85*
PEP	0,60	*-13,45*	0,60	*-13,46*	0,57	*-12,48*	0,68	*-5,43*	0,57	*-9,69*
DEB	1,00	*18,58*	1,00	*18,53*	1,00	*14,82*	1,01	*11,88*	1,00	*14,26*
PRO	0,93	*-5,78*	0,93	*-5,76*	0,90	*-7,15*	0,97	*-1,44*	0,89	*-8,00*
PLE	0,63	*-17,50*	-	-	-	-	-	-	-	-
PCF	0,69	*-9,70*	0,69	*-9,73*	0,68	*-8,49*	0,75	*-4,17*	0,67	*-8,86*
SIZ*WEM	-	-	-	-	0,86	*-6,83*	-	-	-	-
ROA*WEM	-	-	-	-	1,01	*5,23*	-	-	-	-
PEP*WEM	-	-	-	-	1,19	*2,10*	-	-	-	-
DEB*WEM	-	-	-	-	1,01	*9,25*	-	-	-	-
PRO*WEM	-	-	-	-	1,06	*2,59*	-	-	-	-
PCF*WEM	-	-	-	-	1,07	*0,88*	-	-	-	-
Number observations	50593		50593		50593		11688		38905	
Log. of likelihood	-65335,48		-56484,86		-60523,11		-15122,36		-41266,44	



The results of the estimates of the Logit model and the Cox duration model confirm the robustness of the results. Both models suggest that size, longevity, productivity, financial leverage, positive profitability and liquidity positively affect company survival. Profitability and the level of debt do not seem to affect survival, as judged by the reduced marginal effect shown in the estimation of the Logit model and the fact that the hazard ratio of the Cox duration model is unitary. However, both models indicate differences between companies with and without employees in how these

variables influence their survival. Thus, the size of the company has a greater effect on companies without employees, whereas productivity, positive profitability and financial leverage have a greater effect on companies with employees.

Conclusions

This study analyses the determinants of the survival of Spanish companies. After applying two different but complementary methodologies, the results obtained are robust and indicate that size, longevity, productivity, financial leverage, positive profitability and liquidity positively affect company survival. Profitability and the level of debt do not seem to affect company survival rate.

Furthermore, the study verifies the difference in probability of survival and duration of business activity between companies with employees and without employees and identifies the determinants of such difference. The rationale behind this aim is the predominance of companies without employees in the Spanish economy. Thus, the results would allow the governing bodies to legislate to foster the factors that increase company survival and hence employment.

The results of the empirical analysis show that companies without employees present less favourable conditions for survival in that their probability of survival at all stages of their evolution is lower than that of companies with employees. These results imply that authorities could favour an increase in business survival in general, but specifically for companies without employees, by promoting measures that help companies increase their size, their employee productivity and leverage. Companies could increase their size through merger or acquisition or by accessing subsidies for employment costs. Promoting innovation and company internationalization would increase size and productivity. Moreover, policymakers should avoid regulations that

discourage companies from growing over some thresholds. In Spain, when companies have 50 employees or more, fiscal regulation is different; therefore, 50 companies is a threshold. In this sense, the World Bank Report (2015) identifies fiscal, administrative and regulatory barriers for the growth of Spanish companies.

With regard to increasing leverage, more financial help could be given to small and medium-sized companies, provided that their economic profitability exceeds the cost of the debt, and that increases in financial profitability are guaranteed. Another feasible action would be offering entrepreneurship courses for workers or the unemployed interested in starting a business to make them aware of the need to research the market thoroughly beforehand. This training could be promoted by the Chamber of Commerce or another specialised organism. Once established, this organism could also advise entrepreneurs on making investments, expanding the company or taking on debt. These advisory practices do not have to be free necessarily but could be financed through progressive fees in line with business turnover.

Regarding limitations, the data used in this work does not allow to take into account the companies' socioeconomic context. Therefore, future research could extend the analysis to the importance of the regulatory differences as well as the influence of the socioeconomic regional context of companies.

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