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CONTINGENCY FACTORS AND ENTREPRENEURSHIP: INFLUENCE IN BUSINESS ACTIVITY

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Abstract

The aim of this paper is to analyse the factors that determine the survival of Spanish companies with special emphasis on the difference between companies with and without employees. The two different approaches used in this research can be considered as complementary. The first one analyses the factors that determine the probability of survival. For this purpose, a binary choice model is specified and estimated using a sample taken from the SABI database on companies from the main economic sectors. The binary choice model enables us to check how some company characteristics such as the size, age, profitability and financial structure of the companies affect their probability of survival. Likewise, the Blinder-Oaxaca decomposition, proposed by Yun (2004) is applied in order to quantify the difference between companies with employees and without employees and what proportion of this difference is due to observed factors, which can be affected by economic authorities, or unobserved or random factors. Finally, the second approach is a survival analysis carried out through the Cox proportional hazard model which enables us to analyse the factors that determine the duration of business activity.

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

Classification JEL: C24, C25, C41 and M31

1. Introduction

Entrepreneurship is a professional career option and vital to all aspects of economic growth (Markin *et al*., 2017). It is a known fact that the profile of Spanish businesses is characterized by a strong presence of microenterprises, i.e., companies with less than ten employees. Furthermore, a very high percentage of microenterprises do not have employees. The latest data of companies published by the INE[i], corresponding to the year 2016, indicate that the total number of companies in Spain amounted to 3,287,346 of which 55.5% (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. It is a fact that during the years following the economic crisis, the government encouraged self-employment as a means of incorporation into the labour market. However, such measures to promote self-employment do not always have the desired effect, given that companies without employees have lower survival rates than companies with employees (Pérez, 2014; Arrighetti *et al.,* 2016). This paper tries to test if the Spanish companies with and without employees have different survival rate. Due to the structure of Spanish companies, analyze this aspect and the factors that explain the differences in survival between them, is essential to know what factors must act the authorities to increase the survival of companies and, thereby, maintain employment.

The concept of survival is not particularly well defined in the empirical economic literature. Survival is the opposite of failure, the latter being the subject that research has tended to focus on to date. Generally, the failure of a company can be considered as its exit from the market after its dissolution (Gimeno *et al*., 1997, DeTienne *et al*., 2008). There are authors, however, who 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 bankrupt or insolvent (Dimitras *et al*., 1996; Shepherd, 2003). Khelil (2016) extends the understanding of entrepreneurial failure by examining the different configurations that can occur and the associated profiles of failing entrepreneurs. In this paper, we have opted for the wider definition of business failure where 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 business activity normally are therefore considered active companies.

This paper analyses the business characteristics that determine the survival of companies. Our contribution to the empirical literature is to check if there are differences in the survival rate between companies with and without employees and the factors that would explain, if applicable, that difference. To this end, a binary choice model is estimated that analyses the probability of business survival. Following this, to then develop the analysis further, the Blinder-Oaxaca decomposition proposed by Yun (2004) is applied, which enables us to quantify the difference in the probability of survival between companies with and without employees. Also, this decomposition helps verify what proportion of this difference is determined by observed factors, which can be influenced by economic policy measures, and what percentage by random factors, which cannot be affected.

Once the business characteristics that influence the probability of survival of companies are known, a duration analysis is carried out that takes into account the factors that determine the time that elapses until the event "interruption of business operations"

occurs. These two approaches can be considered as 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 have been carried out as complementary approaches. Also, this way of proceeding gives us an analysis of the robustness of the results. Thus, if both approaches reach similar conclusions, it can be concluded that they are robust.

The paper is divided into six sections. After this introduction, the second section discusses what factors determine business survival. The third section presents the methodology and then 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.

2. Theoretical Framework

According to Bunn and Redwood (2003), who carry out a comprehensive review of the literature on the determinants of what they call business failure, two branches can be distinguished in the literature. One of them focuses on microeconomic factors, or characteristics at the company level, 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 (Wadhwani, 1986, Vlieghe, 2001, Bhattacharjee *et al*., 2009). Macroeconomic variables, as predictors of business failure, were initially used by Foster (1986) and Rose *et al*. (1982). Another stream of papers has focused on studying different characteristics related to entrepreneurs to explain the failure of the business such as gender (Fellnhofer, *et al.,*2016) attitudes or behaviors (Corbett *et al.,* 2018) lack of training (Azeez, 2017) obsessive entrepreneurial passion (Fisher *et al.,* 2018) or overconfidence (Simon and Kim, 2017).

Regarding the business characteristics, the first seminal studies go back to Altman (1968) and Beaver (1968) who, through discriminant analysis, used financial ratios to study the bankruptcy of a company. Subsequently, binary choice models began to be applied which included factors that explained the failure of firms. More recently, survival analysis has been used through duration models.

Traditionally, the economic performance of companies 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; Winter, 1964; Williamson, 1991). 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 regarding 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 with age and with the size of the company (Jovanonic, 1982; Evans, 1987; Dunne *et al*., 1989; Preisendöfer and Voss, 1990; Hopenhayn, 1992; Fariñas and Moreno, 2000). 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 as determinants of business survival are liquidity, the capacity to generate resources and capitalization (Geroski and Gregg, 1997; Lennox, 1999; Bunn and Redwood, 2003; Bhattacharjee *et al.*, 2009).

Lennox (1999), analysing the bankruptcy situation in companies, 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. 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 has an impact on companies who 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.

The literature review allows concluding that survival rate of companies depends on their characteristics, such as profitability, size, age, liquidity and financial structure. These concepts will be defined later in data section.

Based 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 indebtedness negatively affects the survival of the company.

3. Methodology

3.1. Binary choice models

Given the fact that the objective of the work is to study the different characteristics that influence the probability of survival of companies, the appropriate models, when the endogenous variable is a probability, are the binary choice models.
In order to select the variables or characteristics that determine business survival, we specify and estimate a binary choice model. In effect, discrete choice models can explain a qualitative variable, in general, or a dichotomous variable, in particular, through the different characteristics that define it. According to the chosen function, which relates the characteristics of the economic agent with the chosen option, different models are specified; the most popular being the Logit and the Probit models.

In economic literature, there are different approaches to the interpretation of discrete choice models. The approach most used in economic analysis is the random utility theory where the alternative selected by economic agents will be the one that maximizes the expected utility of these alternatives. With this approach, an economic agent with a rational behaviour will opt for the decision that allows him/her to choose between two mutually exclusive alternatives, (1) or (0), which will maximize the expected utility provided by each of the alternatives. 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 way to quantify the utility achieved is by assigning a probability to rational decisions. This can be done 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, modelling the choice made by entrepreneurs can be done through the following behaviour equation of the Logit model:

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

The proposed model sets out to determine the relevance of the different factors that influence a company when it comes to deciding whether to maintain its business activity.

In this way, the Logit model specified is:

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

where $Y_i^{\square}$ 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 $Z_i^{\square}$ 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 and liquidity, among other things.

In short, the discrete choice model enables the selection of those company characteristics that significantly influence the probability of keeping the company in operation.

3.2. Blinder-Oaxaca decomposition

After the estimation of the Logit model, the decomposition proposed by Yun (2004) is applied. The original approach of the method of decomposition of a variable, proposed by Blinder (1973) and Oaxaca (1973), allows the difference in the endogenous variable between two groups or collectives to be determined as well as quantifying which part of that difference responds to each one of the two components considered by these authors.

The first component includes the difference in the explanatory variables observed between the two groups and the second component includes the difference in unobservable characteristics, quantified by 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 reason for using the decomposition method is to determine which part is due to the differences in the explanatory variables of both collectives, and which part to the differences in the repercussions that these characteristics have on the endogenous variable. The Blinder-Oaxaca method was designed for linear models but, latterly, 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 of the probability of success 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 of the two groups with the same characteristics. Therefore, Yun's method will allow the decomposition of the difference in the probability of success from two effects: the effect of the characteristics and the effect of the coefficients.

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

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

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

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

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

and the sum of all the weights is equal to 1[ii].

Once the characteristics that determine the probability of maintaining the economic activity of the company are analysed, the duration of the company is analysed through the Cox proportional hazard model.

3.3. The Cox proportional hazard model

Survival analysis looks at the time an event takes to occur. This statistical technique has been applied in different fields of knowledge, such as medicine, biology, economics, engineering and sociology, among others. One of the main theoretical contributions that made it possible to assimilate survival models to the field of economics was the seminal work of Lancaster (1979).

Among the different models which are used for the analysis of survival, one of the most popular 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 since 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 to the estimation of the parameters β.

The partial likelihood function is called partial due to the fact that 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 taken into account.

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 if the data meet this assumption of the Cox model (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 at a constant distance from each other

(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 can be used. The Stata econometric program facilitates the contrast for each of the factors considered and, therefore, helps verify which factors cause rejection of the proportional hazard assumption.

4. Selection of 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.

In this study, information has been selected on companies from the following four economic sectors: industry, construction, commerce and hospitality[iii]. As the Central Directory of Companies (DIRCE) classifies companies into four sectors, this study also sets out to collect a representative sample of these sectors. Furthermore, from the industry sector, we select the food and metallurgical industries since they are the two most important within the Spanish industrial sector. Likewise, given the wide variety of industries that the service sector covers, we focus on the most important one for the Spanish economy; the hospitality industry. Specifically, a sample is extracted of companies that were formed during the period of 2009 to 2015. At the end of December 2016[iv], 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. Also, 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 up until the point in time being considered, which in this study is December 2016, or up 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 elimination of 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. These concepts must be defined in order to introduce in the models.

Regarding to the size of the company, there are different criteria for classifying it. Many studies have measured the size of a company through its total assets. Other studies consider the criterion of volume of sales. In this paper, we have chosen to use the first criterion, the total assets of the company, as an indicator of the size of the companies.

The profitability of the companies has been measured through the ROA, which is defined as the quotient between the profit before interest and taxes (BAI) and the total assets of the company. With the objective of collecting the possible different response of the probability of survival to profitability, as pointed out by Bunn and Redwood (2003), a dichotomous variable is generated that takes value one if the ROA of the company is positive and, if not, zero.

[HERE TABLE 1]

With respect to the financial structure of the company, this has been measured through the variable debt, defined as the quotient between total liabilities and net worth.

The age or longevity of the company is the number of years from the formation of the company to the final period considered, 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 duration or period of time in which the company remains active and is the endogenous variable in the Cox proportional hazard model.

The productivity of the company is quantified by the logarithm of the quotient between sales and number of employees. A further aspect is the financial leverage, which is the effect produced on the profitability of own funds, or financial profitability, as a consequence of using funds or debt from exterior sources. If the financial leverage is positive, it means that 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.

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 and, from an economic point of view, 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 it 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 of the variables considered and the expected sign, for each of them, 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 variables taken into consideration for all the companies in the sample, distinguishing between active companies, companies with employees and companies without employees. As can be observed through the descriptive statistics, the data of the assets of the companies, sales and profitability present a high dispersion. Especially high is the dispersion of sales in companies with employees.

As regards the longevity of the companies, there are no significant differences between the average values of the companies with employees and the group of companies without employees.

In relation to the size of the company, as would be expected, companies without employees have an average size, quantified through assets, which 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 as an alternative measure of business size. Here, the average volume of sales of companies without employees is lower than that of companies with employees and they also show less dispersion.

In terms of profitability, as expected, active companies have an average profitability higher than that of all companies. When comparing the average profitability of companies with and without employees, the difference in average profitability is very small. However, 77% of the companies in the sample show a positive economic return.

[HERE TABLE 2]

The average debt, which would reflect the financial structure of the company, is higher in the group of companies with employees than without employees, perhaps because the larger size of the former allows them greater access to external financing.

Finally, it should be noted that around 86% of the companies in the sample remain active. In addition, the percentage of companies in the sample that survive is slightly higher in companies with employees than without employees. Finally, it is worth highlighting the fact that the percentage of companies without employees that show positive leverage and positive cash flow is lower than that of companies with employees.

In summary, companies with employees and without employees have some significant differences, depending on their size. In addition, companies without employees have a lower level of debt and a smaller percentage of companies with liquidity and positive leverage compared to companies with employees

[HERE TABLE 3]

[HERE FIGURE 1]

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 companies with employees survive to a greater extent than companies without employees. The high survival rate of companies set up in the last few years of the sample is surprising as it does not truly reflect what happens in reality, where around 20% of companies disappear in the first few years of life[v]. The reason for this discrepancy is that official statistics register the start-up and cessation of companies, but SABI takes the data from the Mercantile Registers where insolvent companies, who should register their cessation, fail to provide their accounting data to the Mercantile Registry and so these observations are lost from the SABI database.

5. Results

A Logit model is specified and estimated in which the probability of survival of companies is determined by the following characteristics: size, age, economic profitability, debt, productivity and whether they present a positive profitability, positive leverage and positive cash flow[vi].

Table 4 shows the results of the estimation of three Logit models[vii]; one for all companies in the sample, another for companies without employees and the last for companies with employees. The objective is to compare the results obtained for the different types of companies.

[HERE TABLE 4]

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 first hypothesis, The survival rate of companies with employees is higher than that of companies without employees, is supported. The size, longevity, profitability and the productivity of the workers positively affect the probability of staying operational and the hypothesis 2 is satisfied. Furthermore, the more in debt a company is, the lower its probability of survival, as established in hypothesis 3. It should be noted that profitability as well as debt have a reduced marginal effect. Companies with positive economic returns have 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, it should be noted that there are no significant differences between the different sectors once survival is controlled by the characteristics of the companies. For this reason 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), it can be seen that size has a marginal effect in companies without employees more so than in companies with employees. Likewise, there is a big difference in the differential effect of positive profitability in companies with employees 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 in companies with employees; in particular, the marginal effect is double compared to 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 lead us to conclude that although the probability of survival of companies with and without employees is determined by the same factors, the effects of these on probability are not the same.

In order to look further at the comparison between companies with and without employees, the statistical decomposition technique of Blinder-Oaxaca is applied. This methodology enables the verification of the existence of a 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 is due 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, the fact of presenting a positive economic return, a positive *cash flow* and positive leverage would also reduce the difference in the probability of survival between the two groups of companies. Profitability would not affect the difference in probability between the two groups.

[HERE TABLE 5]

[HERE FIGURE 2]

Figure 2 confirms that companies without employees have a lower probability of survival than companies with employees but, in the early years, the difference is minimal with the gap widening with time. At the end of the sample period they converge again but because, in this case, it is the end of the sample period. In order to better analyse the differences between companies with and without employees, we need to differentiate between newly established companies and consolidated companies. The results of the Blinder-Oaxaca decomposition are shown in Table 6. For companies without employees, the difference between consolidated and newly established companies is 20.5 percentage points and the most striking feature is that 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 less than they actually have. Finally, as would be expected, consolidated companies with employees have a probability of survival (0.825) higher than consolidated companies without employees (0.751). These results show that companies with employees have, at all stages of their evolution, survival rates higher than those presented by companies without employees.

[HERE TABLE 6]

The results in Table 6 and the idea of the life expectancy of companies 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 less if they had the weaker characteristics of new-borns.

After analysing the probability of business survival, we look at what factors affect the duration of the business. In the Cox proportional risk model, the time taken into account is that which 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*, such that 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. On the contrary, values higher than one suppose 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[viii] model. 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, it should be noted that hypothesis of proportional hazard is rejected for the variables without employees and positive leverage. Possible solutions to avoid the risk not being proportional in these variables are: to estimate the model for each one of the categories; to estimate an extended Cox model in which the factors are time dependent; or, to estimate a stratified Cox model in which case the effect of the factors is being implicitly considered as the same for the different categories. This last alternative is the one included in Model (2) of Table 7. Likewise, the stratified Cox model[ix] with interaction (Model (3)) has also been estimated which enables us to check whether the interactions of the dichotomous variable without employees (WEM) with the rest of the factors are significant or not. 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, which indicates that there are differences in the impact that the characteristics of companies with and without employees have on the duration of the business activity.

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), it can be seen that the debt of the companies, although a statistically significant factor, is neutral since its *hazard ratio* takes a value close to one, indicating that this variable does not affect the 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 and for both variables the reduction in the risk of closure is greater in companies with employees. 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 has to be stratified by this variable. In the study of how this variable influences the survival rate, the Kaplan-Meier survival curve is estimated for the two collectives of companies and for the two categories of the variable financial leverage. As can be seen from Figure 3, 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.

[HERE TABLE 7]

[HERE FIGURE 3]

The results of the estimates of the Logit model and the Cox duration model lead us to conclude that the results are robust. It can be deduced from both models that size, longevity, productivity, financial leverage, positive profitability and liquidity positively affect the survival of companies. Profitability and the level of debt do not seem to have an influence on survival, which can be deduced from the reduced marginal effect shown in the estimation of the Logit model and from the fact that the *hazard ratio* of the Cox duration model is unitary. However, both models suggest that there are 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 while productivity, positive profitability and financial leverage have more effect on companies with employees.

6. Conclusions

One of the aims of this paper was to analyse the factors that indicate the survival of Spanish companies. After applying two different but complementary methodologies, the results obtained are robust and lead us to conclude that size, longevity, productivity, financial leverage, positive profitability and liquidity positively affect the survival of companies. Profitability and the level of debt do not seem to have an influence on the survival rate.

Also, a further aim of the paper was to verify that the probability of survival and the duration of business activity among companies with employees and without employees differ and to identify which factors are those that determine this difference. The reason for setting this objective is that the profile of Spanish businesses shows that companies without employees predominate and, therefore, it would be useful to know the factors on which governing bodies can act with the aim of extending business survival and thereby employment.

The results of the empirical analysis have shown that companies without employees present less favourable conditions for survival such that their probability of survival at all stages of their evolution is lower than that of companies with employees.

From the results obtained, it can be concluded that authorities could take steps to increase business survival on a general level, and specifically for companies without employees, by promoting measures that help them increase their size, their worker productivity and leverage. They could increase size through merger or acquisition or by subsidising employment costs. Promoting innovation and internationalization of the companies also increase size and productivity. Moreover, it should be important to avoid regulations that discourage companies grow over some thresholds. In this sense, the World Bank Report (2015) identifies fiscal, administrative and regulatory barriers that set thresholds for the growth of Spanish companies.

The data used in this work have not allowed to take into account the socioeconomic context in which the companies are developing, which implies a limitation of the work. Therefore, a future research could extend the analysis to the importance of the regulatory differences as well as considering the socioeconomic context of the regions in which the companies are developing.

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.

Promote courses of entrepreneurship to workers or the unemployed interested in starting a business to make them aware of the need to research the market thoroughly. This training could be promoted by the Chambers of Commerce or another specified agency. Once established, the organisation could also advise entrepreneurs about making

investments, expanding the company or taking on debt. These advisory practices do not necessarily have to be free but could be financed through progressive fees in line with business results.

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[i] www.ine.es
[ii] $\sum_j^k W_{\Delta X}^i = \sum_j^k W_{\Delta \beta}^i = 1$
[iii] 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), **Hospitality industry**: 55 (Accommodation services) and 56 (Catering services).
[iv] The year 2016 is chosen so that companies that were set up in 2015 present at least one year of business activity.
[v] www.ces.es/documents/10180/3557409/Inf0316.pdf
[vi] The model includes temporal control variables. 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.
[vii] The models show standard deviations of robust estimators with heteroscedasticity.
[viii] Like the Logit model, the Cox proportional risk model also includes temporal control variables.
[ix] Stratified by the variable positive leverage.

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.

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

Variable	Name	Definition	Expected sign Cox Model	Expected sign Logit Model
Size	SIZ	Total assets Naperian 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 negati	-	+
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	+	-

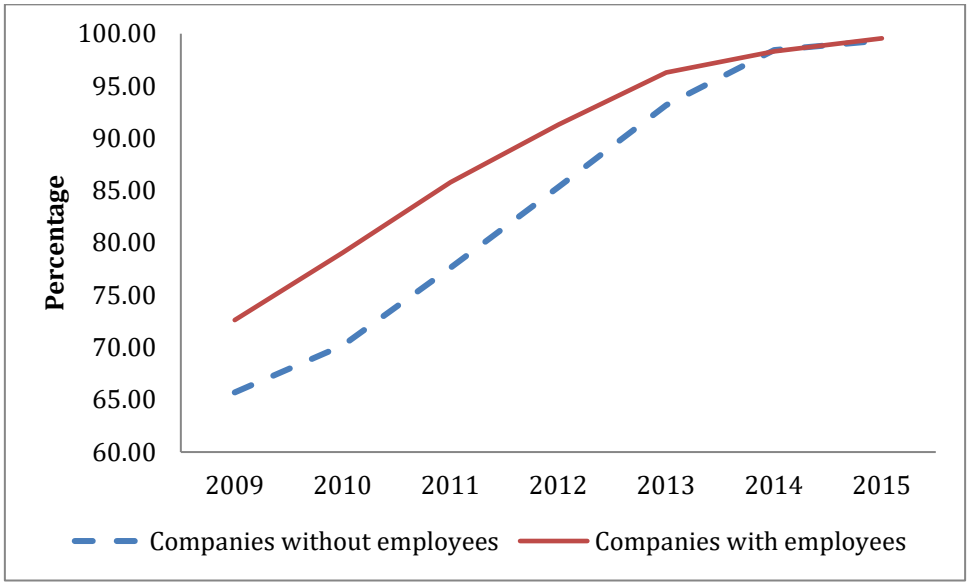
Source: Compiled by the authors in a theoretical framework

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 autors from SABI

Figure 1. Evolution of the survival rate of companies in the sample.



Source: Compiled by the authors based on SABI

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 R2	0,45		0,46		0,45	
Predicton R2	93,58		92,49		94,00	

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. Survival curve of Kaplan-Meier for companies with and without employees.

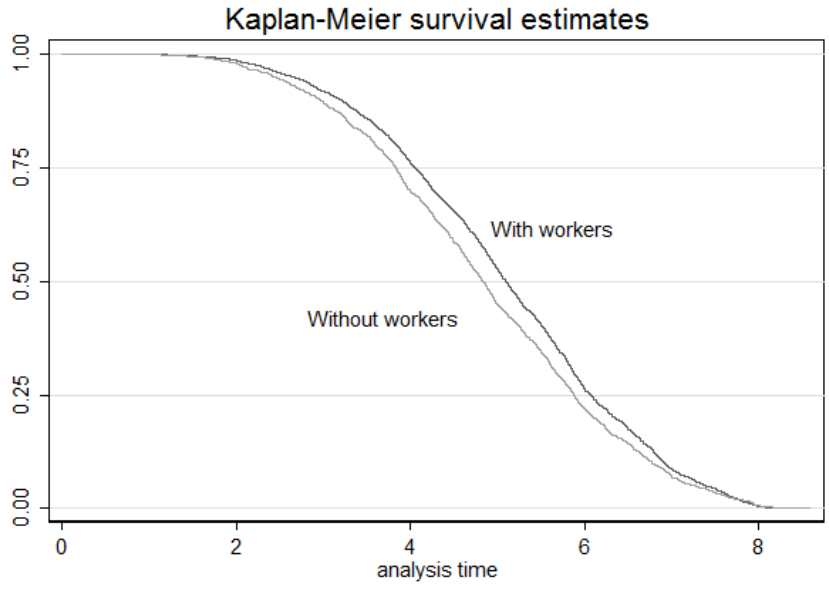


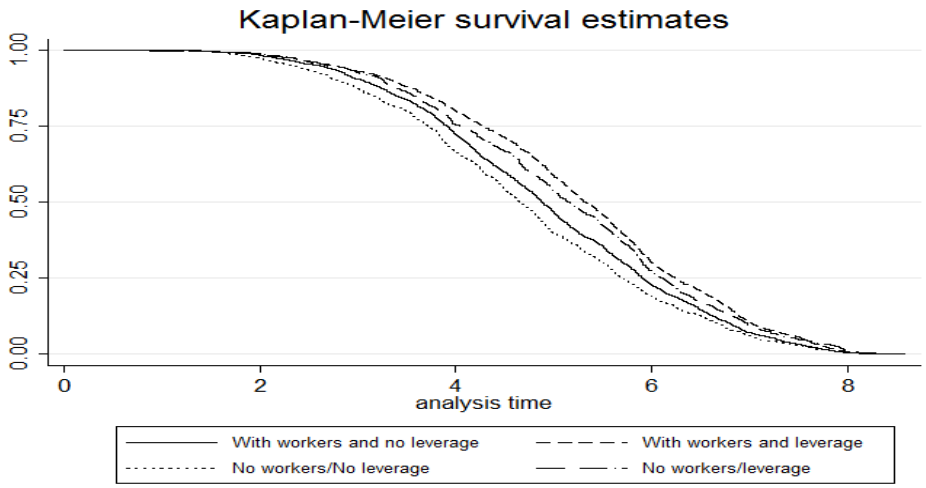
Table 6. Decomposition by type of company of the Blinder-Oaxaca Logit Model

	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*

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 'ompanies without employe		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	

Figure 3. Survival curve of Kaplan-Meier for the two collectives of companies and the two categories of financial leverage.


Kaplan-Meier survival estimates
1.00
0.75
0.50
0.25
0.00
0
2
4
6
8
analysis time
With workers and no leverage
With workers and leverage
No workers/No leverage
No workers/leverage