Survival of entrepreneurship in Spain

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Abstract The aim of this paper is to analyse the determinants of survival in entrepreneurship in Spain. For this purpose, a Cox proportional hazard model is estimated, using information from the Continuous Working Life Sample. The results show that opportunity entrepreneurs have a higher probability of continuing their entrepreneurial activity than entrepreneurs motivated by other reasons. Moreover, women show a higher survival rate than men. In addition, a high educational level positively influences survival, whilst previous work experience increases the risk of not surviving. Finally, age, with a nonlinear influence, increases probability of survival but at a decreasing rate. The implications of these results are that it should not be encouraged entrepreneurship indiscriminately, and authorities should promote entrepreneurial training and help entrepreneurship of people under 30 and over 45–50 years.

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1 Introduction

Given the importance of entrepreneurial activity for economic growth (Wennekers and Thurik 1999; Acs and Storey 2004; Audretsch and Keilbach 2004; Van Stel et al. 2005; Wennekers et al. 2005), interest has been steadily growing in analysing entrepreneurship. Economic and social development needs entrepreneurial agents, hence a growing interest by public authorities with the aim of encouraging entrepreneurship. It is also a subject of great importance for researchers interested in learning more about this phenomenon.

Entrepreneurship is seen as the creation of businesses as well as the introduction of new products and processes within already existing businesses. This paper focuses on the study of the creation of businesses. According to Acs (2006), the creation of new businesses generates jobs, stimulates competition and promotes innovation. However, as important as it is to create new companies, it is even more important to ensure their continuation in order to guarantee the creation of work and wealth. So, knowing what the determinants of survival are for new businesses is crucial.

In this sense, Audretsch (1991) analyses the new-firm survival and concludes that it varies across a broad spectrum of manufacturing industries. However, the estimation of survival rates for aggregate industries precludes estimation of the hazard duration function and use of specific characteristics of new firms. Audretsch and Mahmood (1995), using a sample of 12,000 individual establishments in US manufacturing, estimate a hazard model and conclude that the likelihood of a new

business surviving is shaped by business-specific characteristics, such as ownership status and size.

The aim of this paper is to identify the determinants of survival in entrepreneurial businesses in order to understand which variables should be promoted by public authorities to ensure a business that lasts. To this end, a model proposed by Cox (1972) is used, called a proportional hazard model, which is ideal for analysing entrepreneurial survival. This paper uses a database which provides disaggregated information about entrepreneurs and allows personal characteristics, such as gender, nationality, age, education, having a young family, to be considered as well as working characteristics, such as the productive sector of their activity and the motivation for starting a new business.

The paper is divided into six sections. After the introduction, the second section discusses what factors may determine the business survival of new enterprises. The third section outlines the methodology used and then the fourth section analyses the data used. Section five shows the empirical results obtained and, finally, the last section contains the main conclusions of the work.

2 Theoretical framework

There are various socio-economic factors that the empirical literature considers as determinants for entrepreneurial survival. In this section, the factors which will be considered in this paper are presented.

Recent literature has, on the whole, looked at the age and gender of entrepreneurs as socio-demographic factors that could affect business survival (Fairlie and Robb 2009; Millan et al. 2014; Kalnins and William 2014). With regards to age, this could be considered a *proxy* of the human and financial capital and, in this sense, one might expect older individuals to have a higher accumulated human and financial capital and, therefore, be more likely to survive in their business venture. In terms of gender, Millan et al. (2012) consider that women form a minority among the self-employed but that once women have overcome the difficulties of becoming self-employed, there is no reason why their entrepreneurial survival rate should be any different to that of men. In this sense, Kalleberg and Leicht (1991), Brüderl and Preisendörfer (1998) and Oberschachtsiek (2008) show that gender has no significant effect on the survival of a business activity. Also, Giannetti and

Simonov (2004) show that the probability of maintaining self-employment is less in men than in women. However, in spite of the previous evidence, most literature shows survival rates for businesses created by men as higher than for those created by women. As such, papers by Georgellis et al. (2007), Fertala (2008), Block and Sandner (2009) and Millan et al. (2012), among others, demonstrate that men show a greater probability than women of business survival.

When looking at the impact of having young children on entrepreneurs, as highlighted by Millan et al. (2012), the survival rate of the business activity is not clear. On the one hand, having young children could suggest a distraction of time and resources that would reduce the probability of the business survival. However, on the other hand, it could act as a motivating factor to ensure business survival.

As far as nationality is concerned, many papers show that foreign workers are largely entrepreneurs (Borjas 1986; Clark and Drinkwater 2000, 2010; Lofstrom 2002; Schuetze and Antecol 2006; Fairlie and Lofstrom 2013). This greater propensity of foreigners to start businesses could be because of the difficulty of breaking into the job market, or the desire to return, as soon as possible, to their native country or the difficulties in co-validating qualifications. However, when comparing the survival rate of businesses between foreigners and nationals, the literature generally shows that the rate for immigrant workers is lower than for native workers (Lofstrom and Wang 2006; Fertala 2008; Andersson 2010).

Human capital is also a factor considered a determinant of survival. Human capital can be thought of as the level of education of the entrepreneurs as well as the knowledge acquired through their previous work experience. Following Block and Sandner (2009), the effect of education on the probability of survival in self-employment is unclear. On the one hand, the theory of human capital would indicate that education has a positive effect on the probability of survival of the enterprise. However, on the other hand, entrepreneurs with high levels of education may have more opportunities for salaried employment than low-level entrepreneurs, and this may reduce their time spent in self-employment. This argument is also true when considering the level of previous work experience of the entrepreneurs.

Looking at results obtained in previous research studies, Haapanen and Tervo (2009), Block and Sandner (2009), Andersson (2010) and Millan et al. (2012)

reaffirm that education is a determinant variable in the duration of self-employment. Conversely, Georgellis et al. (2007) show that education is not a relevant factor. Finally, Nafzige and Terrell (1996), researching India, and Nziramasanga and Lee (2002), researching Zimbabwe, find a negative relationship between education and the duration of self-employment.

With respect to empirical evidence relating to previous work experience, Taylor (1999), Georgellis et al. (2007) and Millan et al. (2012) show that previous experience positively influences the survival rate. However, Brüderl et al. (1992) and Van Praag (2003) see no relationship between previous experience and business survival. Haapanen and Tervo (2009), using data from the economy of Finland, show that previous experience has a significantly negative effect on the duration of self-employment. Roberts et al. (2013) state that wide ranging experiences gathered from different organisations are associated with negative results in entrepreneurship. There is no reason to assume that working in a large number of companies would guarantee a higher level of knowledge and skills in the workers. Munsasinghe and Sigman (2004) show that the salaries of those workers who regularly change their workplace are systematically lower than more stable workers. This could be due to the lower quality of human capital of workers who constantly change their work. A constant change is probably associated with difficulties in adapting to the new job, a prerequisite essential for acquiring skills and knowledge that could be useful when starting a new business.

Fritsch et al. (2006) analyse the effect that the productive sector and the geographical area have on business survival rates. For these authors, the survival rate is reduced in sectors where there is greater competition. However, Millan et al. (2012) note that the results seen in the relevant literature are very diverse and inconsistent, and as such it is difficult to establish a priori a relationship between the productive sector and survival. In addition, regional characteristics could also play a determining role in the survival rate of new businesses.

Current literature also considers the type of motivation for becoming an entrepreneur and its impact on business survival (Block and Sandner 2009; Caliendo and Kritikos 2010; Muñoz-Bullón and Cueto 2011). Generally, companies created by entrepreneurs who could not find a salaried job have a lower survival rate than those companies created by entrepreneurs motivated by reasons other than simply employment.

In this sense, one should distinguish between what Schumpeter (1942) considers a business entrepreneur, capable of introducing innovations both in products and processes, and business manager who only deals with existing activities with the aim of pushing the market demand (Carree et al. 2002). The business entrepreneur or Schumpeterian is someone who sets up a business after detecting a gap in the market. However, business entrepreneurs make up a small proportion of those who start a business. Alongside these entrepreneurs, known as opportunity entrepreneurs, Amit and Muller (1995) call necessity entrepreneurs as those who lose their job and, faced with little possibility of finding another, decide to start their own business. According to Amit and Muller, opportunity entrepreneurs have a greater probability of success than those of necessity, and the empirical results corroborate it (Caliendo and Kritikos 2010). Carrasco (1999) and Muñoz-Bullón and Cueto (2011) show, for Spain, that survival of a self-employed person is negatively affected by the occurrence of previous episodes of unemployment, particularly long periods. However, Block and Sandner (2009), after allowing for the level of education of the entrepreneurs, do not find any difference between entrepreneurs of necessity and opportunity.

3 Methodology: the Cox proportional hazard model

Analysis of survival is seen as the analysis of the time that an event takes to happen, and this can be applied in different disciplines, such as medicine, biology, economy, engineering and sociology, to name but a few. Among the models in use for analysing survival, one of the most popular, is the Cox proportional hazard model (Cox 1972). The function of the Cox hazard 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 function without specification, common to all subjects of the sample, called the function of baseline hazard, and β is the vector of coefficients of the model. This model is semi-parametric given that it includes both a parametric and non-parametric part. The parametric part is expressed by the exponential function $e^{X_i\beta}$, where β are parameters to estimate by the maximization of the function of partial likelihood, as proposed by Cox. The function of

baseline hazard is the non-parametric part given that it is an arbitrary function and non-specific. In a second conditioned stage, the parameters β are estimated.

The partial likelihood function is called partial because it only takes into account those observations relating to the event (in our case, the cessation of a business) and does not include censored observations (where the event has not occurred on finishing the sample observation). However, when calculating the probability of survival, all observations are taken into account.

A key assumption of the Cox model is risk proportionality, which assumes that the risk ratio 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 several ways of checking whether 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 graphical test of the survival curve can be used. If the hazard proportionality assumption is satisfied, 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 appropriate if the number of categories is very high or variables are continuous. In this case, the statistical contrasts based on Schoenfeld residuals can be used to check the proportionality of the risk. Schoenfeld residuals exist for each variable and for each observation and take zero value for incomplete or censored observations. The Schoenfeld residuals chart only includes the observations relevant to the event occurring, in our case, the non-survival of the company or closure of the business. If the proportionality of the hazard is met, the Schoenfeld residuals are randomly grouped on both sides of the zero value of the ordinate axis. In the statistical contrast based on the Schoenfeld residuals, the null hypothesis establishes that the risks of the population are proportional at least against the hypothesis that one population does not present proportional hazard to the others. With the software Stata, it is possible to make such a contrast for each of the factors considered and to verify which are the causes of non-compliance with non-proportionality.

4 Data

The data used in this paper come from the Continuous Working Life Sample (CWLS). It is a database with individual information on more than one million workers and pensioners in Spain, drawn from the administrative records of the Social Security, the Continuous Municipal Register and the Tax Agency. The CWLS is a representative sample of all persons who were connected with Social Security in a given year,[1] in our case, 2013. In addition to working life, provided that it has been carried out within Spain, the CWLS contains personal data on the individual, such as date of birth, address, gender, nationality and province of residence. Related to working life, information is available on social security regime, start date and finish date of the contract, type of contract, working regime, contribution bases, reason for stopping and type of economic activity related to the work.

For the purpose of this study, entrepreneurs are considered as those self-employed workers who started their activity in 2011 and continued until 2013. This way of proceeding reflects the fact that, normally, from the third year onwards of self-employment, one can no longer be described as an entrepreneur, but rather as a consolidated company. The endogenous variable is defined as the time that passes from the moment a company establishes itself in the market until the cessation of the same or until the end of the sample period chosen, in our case the year 2013.

The variables or characteristics used to explain the survival of entrepreneurship are the following:

1. Personal characteristics: age, gender, nationality, educational level, number of children under 12 years old and the Autonomous Community of residence.
2. Work characteristics: productive sector of their activity and work experience.
3. Economic characteristic of the entrepreneur: Social Security contribution bases.
4. GDP per capita of the autonomous community of residence.

With regards to the measurement of variables, nationality has been collected through a dummy variable

[1] The CWLS has been produced since 2004. Each year, new people who are first-time contributors or pensioners are added to those who were already in the sample.

that takes value one if the worker is Spanish and zero if it is of another nationality. The gender of the workers has been quantified through a dichotomous variable that takes a value of one if it is a man and zero if it is a woman. For the variable work experience, the experience of the worker as self-employed and as employee has been considered. Regarding the productive sector, eleven productive branches have been considered: agriculture, industry, construction, commerce, transport, hospitality, finance, professional activities, education, health and other productive sectors. Finally, four levels of studies have been considered: pre-primary, primary, secondary and higher.

In addition, entrepreneurs of opportunity will be identified, since it could be a determinant in the survival of the business. Following the example of Block and Sandner (2009), self-employed workers are classified according to how they finished their previous salaried employment. Opportunity self-employed workers would be those who voluntarily left their jobs to set up a business.

The availability of information on the previous trajectory of the entrepreneurs helps us to find out the time that has elapsed since their previous activity ceased, and they became unemployed, as well as whether the termination of their position was voluntary or not and therefore which workers are entrepreneurs of opportunity. Opportunity entrepreneurs are considered those workers who

1. Make a direct transition from employment to self-employment (within a maximum period of 180 days), having voluntarily ceased their employment.
2. Start a business activity whilst developing a salaried job.

The final sample used includes 49,130 workers who were self-employed during the period 2011–2013. Of these, 70.08% maintained their business activity in early 2014. The sample was made up of 59.92% men and 40.08% women. By nationality, of the total sample, 86.56% are Spanish and the rest are of other nationalities.

4.1 Descriptive analysis of the data

Table 1 shows the descriptive statistics of the data used, both for the complete sample as well as by worker gender.

Table 1 Descriptive analysis of the data

	Total	Men	Women
Number of observations	49,130	29,441	19,690
Percentage	100.00	59.92	40.08
Non-categorical variables (average)			
Survival duration (days)	594	577	620
Age (years)	38	38	38
Contribution base (euros)	10,295	10,657	9,755
Previous work experience (number)	9	9	7
Previous self employment (number)	1	1	1
Categorical variables (percentages)			
Survival	70.08	68.64	72.24
Opportunity entrepreneur	10.74	10.48	11.13
Nationality			
Spanish in %	86.56	86.12	87.21
Foreign in %	13.44	13.88	12.79
Live in towns with > 40 mil inhabitants	50.83	50.01	52.07
Age by group			
Less than 25 years old in %	9.97	10.37	9.37
From 25 to 34 years in %	32.53	30.88	35.00
From 35 to 44 years in %	32.38	32.89	31.62
From 45 to 54 years in %	18.62	19.32	17.60
From 55 to 65 years in %	6.49	6.54	6.41
Previous work experience			
Only employed work in %	30.55	29.18	32.60
Only self-employed work in %	6.26	5.33	7.65
Employed and self-employed work in %	58.88	61.06	53.80
Without previous experience in %	5.07	4.46	6.24
Education			
Pre-primary school in %	17.46	19.47	14,46
Primary school in %	12.14	12.83	11.12
Secondary school in %	52.41	53.46	50.83
Higer education in %	17.99	14.24	23.59
Productive sector			
Agriculture in %	3.75	4.24	3.00
Industry in %	5.96	6.78	4.71
Construction in %	12.90	19.84	2.50
Commerce in %	25.25	22.78	28.93
Transport in %	4.20	5.97	1.55
Hostelry in %	14.68	13.29	16.76
Finance in %	4.35	4.59	4.11
Professional activities in %	13.54	12.44	15.18
Education in %	3.95	2.81	5.65
Health in %	3.18	1.53	5.64
Public administration in %	0.01	0.01	0.01
Other productive activities in %	8.25	5.73	11.97

Source: Self-made from CWLS

As far as the gender of entrepreneurs is concerned, the figures corroborate what is generally expressed in the empirical literature, that is, the percentage of male entrepreneurs is higher than that of women.

Regarding the origin of entrepreneurs by nationality, the percentage of foreigners who are entrepreneurs is 13.44%, with no significant differences regarding nationality between men and women. With respect to age, the average age of an entrepreneur is 38 years old, with no significant difference in the average age of men and women. However, differences can be seen in the distribution of entrepreneurs by age groups.

About 10% of entrepreneurs can be considered entrepreneurs of opportunity in the strict sense. As we have seen, these are entrepreneurs who voluntarily leave their job to establish an activity on their own or who start a business before leaving their job. It should be noted that the remaining 90% cannot all be considered entrepreneurs of necessity since there are other motivations that lead to entrepreneurial activities: improving income, continuing the family business, improving work reconciliation etc.

With regards to education level, half of the entrepreneurs possess secondary education and, furthermore, the percentage of women with higher education is greater than men.

Regarding previous work experience, the majority of entrepreneurs have experience although women seem to have had less work experience than men before starting their own business. However, both men and women entrepreneurs demonstrate a greater percentage of having previous work experience both as an employee and as being self-employed.

The distribution of entrepreneurs between the various productive sectors shows different behaviour of men and women in some sectors. The sectors of construction and transport show a greater percentage of male entrepreneurs than female, whilst female entrepreneurs are more prevalent in the sectors of education, health and others. This evidence is generally supported across the literature related to entrepreneur gender.

Regarding the percentage of entrepreneurial survival, 72.24% of women survive compared to 68.64% of men, a statistically significant difference. Similarly, the average duration of a business for women from the sample shows 620 days, compared to 577 days for men, again a statistically significant result.

Finally, Social Security contributions base show a higher level for male entrepreneurs compared to female entrepreneurs.

5 Empirical results

In researching entrepreneurial survival, with the Cox proportional hazard model, the dependant variable is the time that passes from the start of the business activity until the moment it ceases or until the end of the sample period. These last observations are considered censored.

The Cox model is interpreted in terms of the level of risk, or *hazard ratio*, so that values less than one suggest a reduction in risk and therefore an increase in the business survival rate, giving them negative coefficients and factors with a positive influence on survival. For values above one, the reverse is true, with high risk factors, positive coefficients and therefore variables that negatively affect the business survival.

In Fig. 1, for the whole of the sample, the survival curve of Kaplan-Meier shows a steeper incline for the first year, becoming less so after this period. Similarly, around 25% of businesses do not survive longer than a year. When gender is taken into account, as in Fig. 2, the survival curve for women is higher than that for men. Fig. 3 shows the difference between opportunity and non-opportunity entrepreneurs, where for the first 1.5 years, the curves are practically the same but thereafter the survival rate is greater for the former.

Finally, Fig. 4 shows the survival curves for gender and reason for starting a business. It shows that female opportunity entrepreneurs have the highest survival rate whilst male non-opportunity entrepreneurs show the lowest survival rate.

Table 2 shows the estimations corresponding to the Cox *hazard ratio* model. Firstly, it is important to point out that the contrast of risk proportionality rejects the hypothesis of proportionality, on which the model is based. For this reason, the stratified Cox model is used. As such, the stratification of the sample is obtained using all the variables that impact on the model in order to group the observations into eight strata or categories and to then be able to estimate the Cox stratified model.

From the estimation results of the model, men have a greater risk than women of ceasing their business activity. Specifically, men present non-survival risk of 1.10 times higher than women (10.13% higher). In

Fig. 1 Estimated levels of survival, using Kaplan-Meier

Kaplan–Meier survival estimate
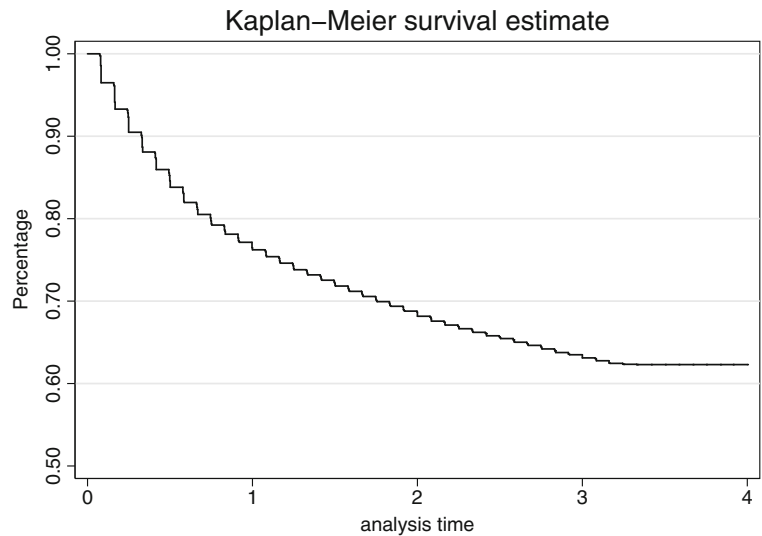
other words, the collective of men is more likely to fail than women. Also, Spanish entrepreneurs have a lower risk of their business failing than foreigners.

Opportunity entrepreneurs have a level of risk 9.2% less than those who start a business motivated by other reasons. With regards to age, this increases the survival probability but at a decreasing rate, as is deduced from the value greater than the unit of the coefficient of age squared. Entrepreneurs with children under 12 years of age have a reduced risk of their business not surviving, 0.057 times lower than those who do not have young children in their care. In terms of location, in municipalities with more than 40,000 inhabitants, entrepreneurship is more likely to fail than in smaller municipalities.

With regards to the role of the level of instruction (education) in the survival of an entrepreneurial activity, it is worth pointing out that the higher the level of instruction, the more likelihood the entrepreneurial activity has of surviving. In other words, an entrepreneur that only has a basic education at primary level is more likely to fail in business than those who have an education level higher than this.

Regarding economic factors, starting a business during an expansive phase of the economic cycle and making higher social security contributions indicate reduced risk of the business closing.

Furthermore, previous work experience, measured by the number of jobs held prior to the entrepreneurial

Fig. 2 Estimated levels of survival based on gender, using Kaplan-Meier

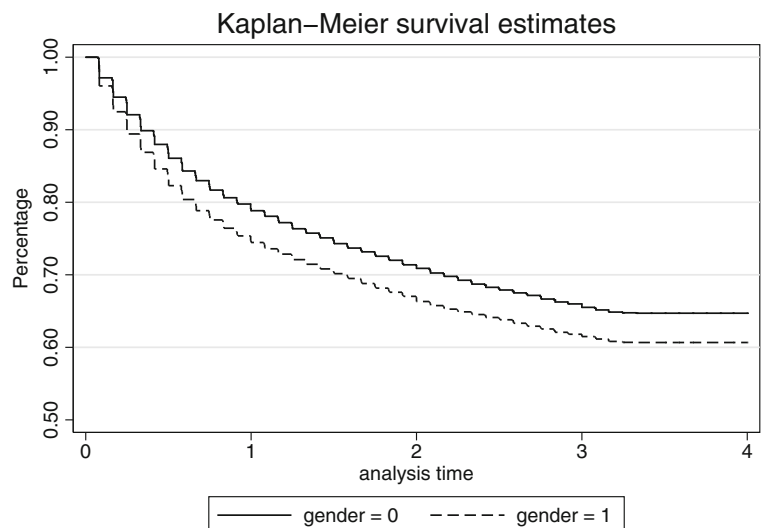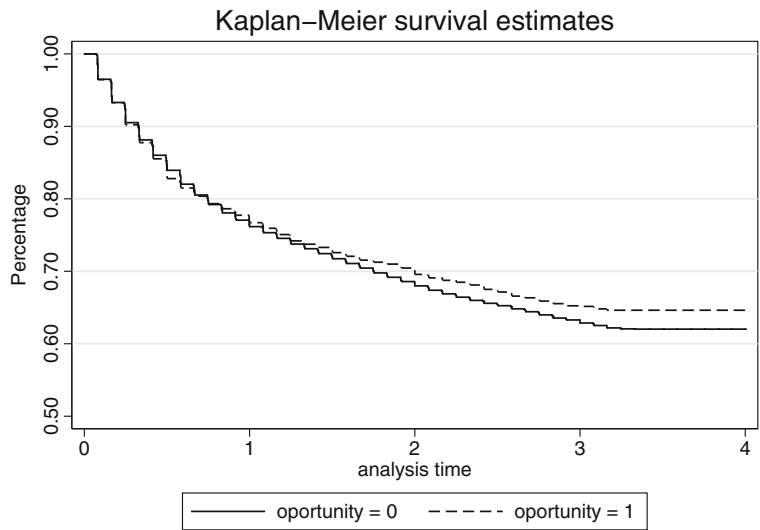Kaplan–Meier survival estimates

Fig. 3 Estimated levels of
survival according to the type of
motivation, using Kaplan-Meier

activity, increases the likelihood of the business not
surviving. However, there are differences according to
whether the previous work experience was as employee
or self-employed. In the former, the risk is only 1.01
times higher compared to that seen for an entrepreneur
without previous experience, whilst in the latter, the risk
is 1.17 times higher between an entrepreneur with pre-
vious experience compared to an entrepreneur without
experience.

Looking at the productive sectors and their influence
on survival, it is noted that the sector where there is more
likelihood of success is in the health sector, whilst the
sector showing the highest probability of failure is the
construction sector.

Given that the collectives formed by women and men
present significant differences, two runs of the Cox
stratified model are estimated, one for each collective
(see Table 2). Specifically, the ultimate aim of this
analysis is to study whether differences exist between
collectives and to what degree they affect the proposed
factors that might influence the likelihood of a business
failing.

As for personal characteristics, such as being of
Spanish nationality, being an entrepreneur of oppor-
tunity, age and having children less than 12 years old,
all have a positive influence on the survival of com-
panies in both groups. Only in the case of women, the
location of the company in municipalities with more

Fig. 4 Estimated levels of
survival according to gender and
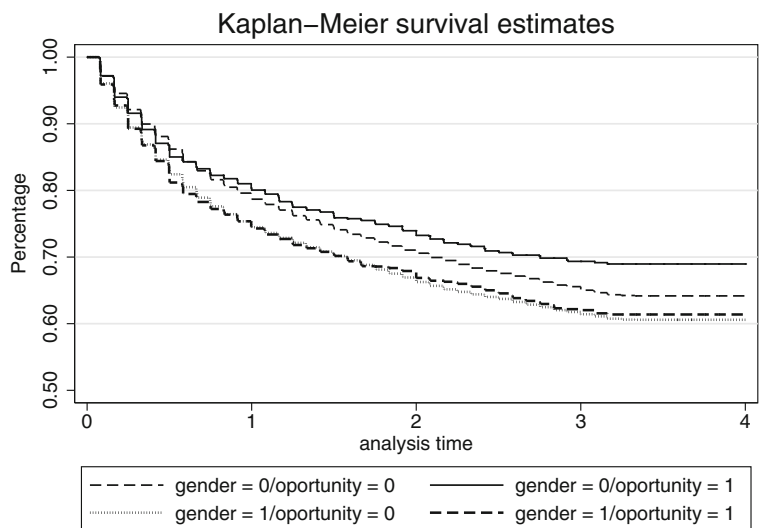type of motivation for starting the
business, using Kaplan-Meier

Table 2 Estimation of Cox proportional hazard model

Variables	Model (I) Sample total		Model (II) Men		Model (III) Women	
	Hazard ratio	Statistic z	Hazard ratio	Statistic z	Hazard ratio	Statistic z
Personal characteristics						
Gender[a]	1.10	5.24	–	–	–	–
Nationality[b]	0.66	−17.86	0.67	−13.36	0.62	−12.16
Opportunity entrepreneur[c]	0.91	−3.50	0.91	−2.70	0.90	−2.32
Age	0.94	−11.17	0.95	−7.77	0.92	−9.37
Age squared	1.00	6.99	1.00	4.87	1.00	6.37
Children under 12 years	0.94	−5.29	0.96	−3.20	0.92	−4.80
Live in cities with population > 40,000	1.05	2.84	1.03	1.32	1.10	3.23
Education[d]						
Less than primary	1.07	2.23	1.16	3.45	0.96	−0.76
Primary	1.01	0.22	1.13	2.55	0.85	−3.00
Secondary	0.96	−1.55	1.04	1.02	0.85	−4.06
Economics						
Contribution base	0.61	−68.99	0.61	53.87	0.60	−42.34
GDP of Autonomous region residence	0.97	−2.59	0.95	−3.06	0.98	−0.87
Previous work experience[e]						
As employee	1.02	46.88	1.01	36.16	1.02	25.40
As self employed	1.17	75.34	1.17	57.38	1.19	46.95
Productive sector[f]						
Agriculture	0.94	−0.89	1.03	0.34	0.78	−1.87
Construction	1.60	10.76	1.68	9.84	1.00	0.00
Commerce	1.01	0.33	1.06	1.06	0.96	−0.63
Transport	1.02	0.28	1.05	0.65	1.03	0.20
Hostelry	1.12	2.62	1.10	1.73	1.13	1.70
Finance	1.22	3.59	1.22	2.79	1.20	1.98
Professional activities	1.15	3.02	1.19	2.93	1.07	0.91
Education	1.12	1.84	1.13	1.50	1.02	0.19
Health	0.87	−1.75	0.84	−1.25	0.80	2.17
Others	1.11	2.09	1.22	2.96	1.03	0.40
V. Control						
Dummies Regions	Yes		Yes		Yes	
Number of observations	49,130		29,441		19,689	
Log Likelihood	−121,852.49		72,252.11		−39,898.48	

Categories of reference:

[a] Female

[b] Foreigner

[c] No opportunity

[d] Higher Education

[e] Without experience

[f] Industry

than 40,000 inhabitants is more at risk of closure than in the smaller municipalities. The greatest differences between the groups of men and women are seen in education. Whilst for men, basic education (lower than primary and primary studies) increases the risk of the business closing compared to those with secondary and higher education; in women, having primary or secondary education reduces the risk of failure compared to having lower than primary education and/or a higher education. For male entrepreneurs, starting a business during an expansive phase of the economic cycle reduces the risk of closure whilst it does not affect women. Furthermore, the level of contribution to social security affects both groups equally. Finally, the risk of not surviving in business in the construction, professional, financial and other sectors is greater than in the industry (reference category) in the case of men, whilst the other sectors do not affect the result as they are not statistically significant. On the other hand, in the group of women, the risk of closure is lower in agriculture and in health compared to industry with only the finance sector presenting a risk higher than the reference category, whilst the other sectors have coefficients not significant enough to be relevant.

With the aim of analysing the sensitivity of the model coefficients, estimations were carried out again, for four productive sectors: industry, construction, commerce-transport and other services. The results, shown in Table 3,[2] indicate that differences exist in the responses from the productive sectors, in relation to education level, age and previous work experience. Specifically, in the case of the industrial sector, age seems to have less effect on survival compared to the rest of the sectors whilst education level and previous work experience as an employee have a greater negative effect on the chances of survival. Regarding the construction sector, it seems age does not play a part in the survival rate but previous work experience and education level do, reducing the risk of not surviving in comparison to other sectors. In the case of the commercial- transport sector, no significant differences are seen. However, in the sector of other services, age has a greater negative effect on survival whilst education level and previous work experience have a lesser effect compared to the rest of the sectors.

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[2] In Table II, instead of showing the hazard ratios, the coefficients are shown, as the comparison was easier.

6 Conclusions

This paper empirically analyses the determinants of the survival of entrepreneurs in Spain. For this purpose, the Cox proportional hazard has been estimated, which enables analysis of the duration of survival. One of the strong points of this paper is the database used. This database provides much disaggregated information about specific characteristics of entrepreneurs and allows the analysis of whether there are differences in survival depending on gender, nationality and the previous work experience of the owners of new firms.

The main results of the work are detailed below. First, unlike many studies, the sample used shows that women are more likely than men to remain in their entrepreneurial activity. Given that there are fewer women than entrepreneurial men, this shows that women find it harder to make the decision to start a business, but once this decision has been made, they are more likely to consolidate the business. With respect to the nationality of entrepreneurs, companies run by Spaniards present a greater survival probability than that of foreigners. In relation to the motivation of entrepreneurship, opportunity entrepreneurs present a lower risk of closing their business than those who start for other reasons. Regarding the age of the entrepreneur, it has been found to have a non-linear effect on the probability of survival in that this probability increases with age but it does so at a decreasing rate. Work experience prior to entrepreneurial activity increases the risk of not surviving, and education positively affects the probability of business success. Finally, it is shown that some differences exist in the responses from different companies, mainly with regards to education level and work experience.

There are a number of implications to be taken from these results in terms of guidance for new businesses to ensure their survival. One of them would be to not encourage entrepreneurship indiscriminately. It would be better to encourage entrepreneurial activities of opportunity rather than encouraging those who simply want a way out of unemployment. This is a complicated action but organizations that are involved in studying business plans could be better trained to advise potential entrepreneurs.

Another policy implication would be to promote entrepreneurial training. This benefits of this action are two-fold: on the one hand, to improve qualifications, which will increase the probability of survival, and, on the other hand, to ensure the enterprise is considered as

Table 3 Estimation of Cox proportional hazard model by productive sectors

Variables	Model (I)		Model (IV) Industry		Model (V) Construction		Model (VI) Commerce-transport		Model (VII) Other services	
	Coefficient	Statistic z	Coefficient	Statistic z	Coefficient	Statistic z	Coefficient	Statistic z	Coefficient	Statistic z
Personal characteristics										
Gender[a]	0.096	5.24	0.098	5.34	0.096	5.19	0.095	5.18	0.098	5.32
Nationality[b]	−0.421	−17.86	−0.422	17.88	−0.433	−18.36	−0.421	−17.84	−0.424	−17.98
Opportunity entrepreneur[c]	−0.097	−3.50	−0.089	−3.21	−0.104	−3.75	−0.098	−3.55	−0.095	−3.46
Age	−0.061	−11.17	−0.064	−11.61	−0.067	−11.30	−0.060	−9.25	−0.050	−7.00
Age squared*	0.048	6.99	0.52	7.48	0.054	7.15	0.047	5.81	0.036	4.01
Children under 12 years	−0.059	−5.29	−0.058	−5.20	−0.058	−5.22	−0.060	−5.35	−0.059	−5.26
Live in cities with population > 40,000	0.050	2.84	0.052	2.91	0.057	3.19	0.050	2.81	0.054	3.05
Education[d]										
Less than primary	0.072	2.23	0.056	1.70	0.008	0.23	0.079	2.12	0.245	4.66
Primary	0.008	0.22	−0.020	−0.55	−0.028	−0.74	−0.004	−0.12	0.174	3.15
Secondary	−0.042	−1.55	−0.060	−2.18	−0.082	−2.92	−0.028	−0.93	0.100	2.03
Economics										
Contribution base	−0.495	−68.99	−0.495	−68.76	−0.498	−69.12	−0.496	−68.99	−0.495	−68.74
GDP of Autonomous region residence	−0.033	−2.59	−0.031	−2.45	−0.031	−2.45	−0.033	−2.63	−0.034	−2.71
Previous work experience[e]										
As employee	0.015	46.88	0.015	46.07	0.015	41.40	0.015	40.85	0.016	36.80
As self employed	0.159	75.34	0.159	73.32	0.157	69.28	0.160	66.71	0.168	55.72
Interaction productive sector with age										
Age	–	–	0.050	3.07	0.024	1.73	−0.004	−0.37	−0.023	−2.11
Age squared*	–	–	−0.064	−2.96	−0.019	−1.1	0.040	0.27	0.024	1.82
Interaction productive sector with education										
Less than Primary	–	–	0.316	2.00	0.683	5.10	−0.051	−0.68	−0.296	−4.33
Primary	–	–	0.508	3.02	0.567	4.10	0.134	0.17	−0.271	−3.71
Secondary	–	–	0.393	2.73	0.648	5.00	−0.071	−1.07	−0.200	−3.37
Interaction productive sector with experience										
As employee	–	–	0.008	3.11	0.003	2.93	−0.008	−1.20	−0.002	−2.86
As self employed	–	–	0.005	0.50	0.044	7.03	−0.004	−0.87	−0.013	−3.36
V. Control										

Table 3 (continued)

Variables	Model (I) Coefficient	Statistic z	Model (IV) Industry Coefficient	Statistic z	Model (V) Construction Coefficient	Statistic z	Model (VI) Commerce-transport Coefficient	Statistic z	Model (VII) Other services Coefficient	Statistic z
Dummies regions	Yes		Yes		Yes		Yes		Yes	
Dummies productive sectors	Yes		Yes		Yes		Yes		Yes	
Chi square (df)	10,736.94 (39 df)		10,786.22 (46 df)		10,884.85 (46 df)		−10,743.43 (46 df)		10,798.07 (46 df)	
Number of observations	49,130		49,130		49,130		49,130		49,130	
Log Likelihood	−121,852.49		−121,827.85		−121,778.53		121,849.25		−121,821.93	

df degrees free

Categories of reference:

[a] Female

[b] Foreigner

[c] No opportunity

[d] Higher education

[e] Without experience

[f] Industry

*Coefficient multiplied by 100

an opportunity. This would mean that even in periods of recession, individuals would feel sufficiently self-motivated to start a business rather than see it as just a way out of unemployment.

Additional help should be given to young people (under 30 years of age) and older entrepreneurs (over 45–50 years of age). As has been shown, the relationship of age with the probability of survival is in the form of an inverted 'u', and so, help should be directed towards those people at the extremes of this scale. Help could come in the form of easier access to finance or payments for the social security for any workers employed as well as subsidizing Social Security payments for entrepreneurs themselves during their first year of activity.

In order to consolidate the conclusions made, it would be necessary to use another database to corroborate the stylized facts presented here and also include other factors such as the financial structure or the size of the company.

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