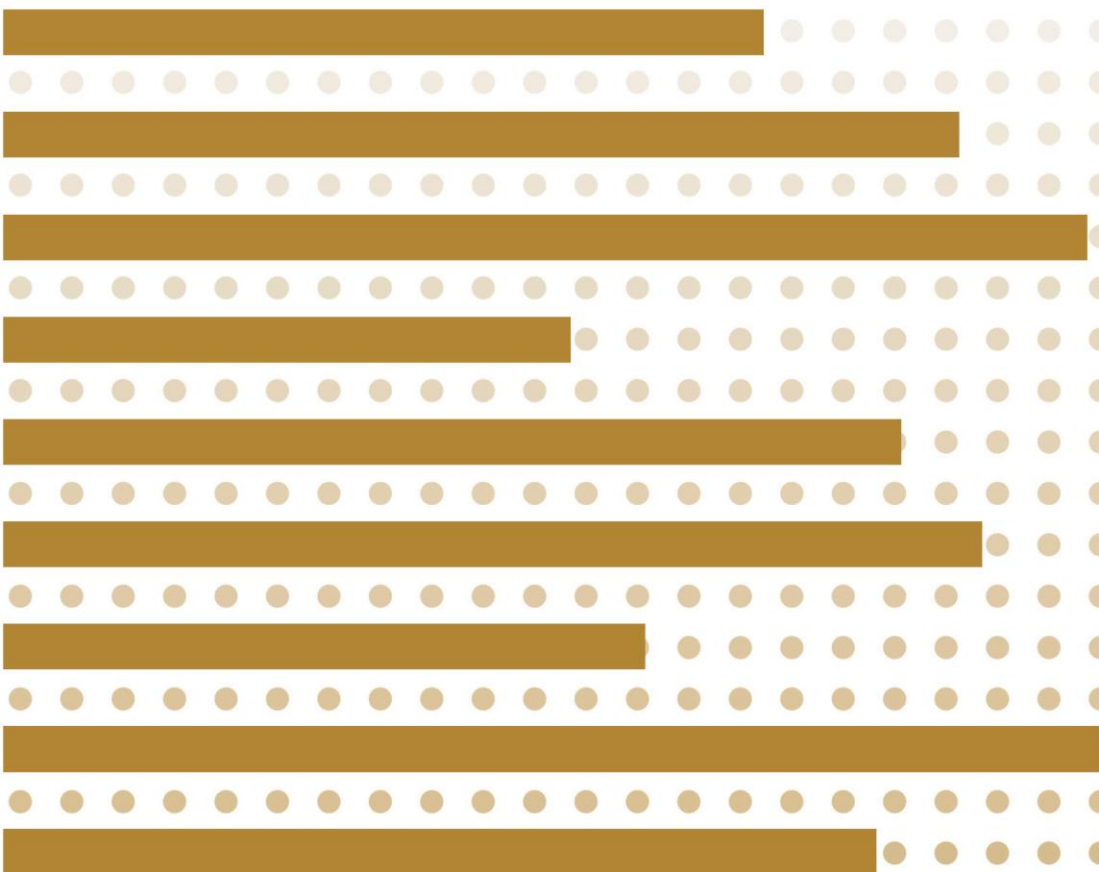


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Regional Business Survival in Portugal: Application of a Cox Proportional Hazard Model

Abstract

This paper addresses the post-entry performance of firms for seven regions in Portugal, at the NUT II level, by investigating the structural characteristics of survival, using a semi-parametric method, during the period 1985 to 2007. In order to approach the prevalence of some stylized facts and determinants of new firm survival, a new entrepreneurship database was produced following the application of the Eurostat/OECD methodology to *Quadros de Pessoal*. In the semi-parametric estimation survival is related with seven explanatory variables and sector and year dummies. The main contribution of this work is the application of an internationally comparable methodology to a linked employer-employee dataset, which provides a regional overview of firm and survival dynamics over an extended period of time, while guaranteeing regional, national and international comparability.

1. Introduction

Regional development has been a source of interest among academics and policymakers, especially in the context of endogenous growth theories and the new economic geography framework (see, for example, the work of Krugman 1998). Regional growth theory has become over the years an important branch of modern economic growth analysis. The knowledge society has brought about features such as innovation and creativity as the basis of regional dynamics and competitiveness. Business performance and the renewal of enterprises, which have been considered as engines of regional innovation, employment creation and growth, have thus aroused great interest.

The phenomena of enterprise birth, growth, contraction and death has become an important field of research in the so-called firm demographics (Bartelsman, Haltiwanger, and Scarpetta 2009; Bartelsman, Scarpetta, and Schivardi 2005; Colantone and Sleuwaegen 2007; Geroski 1995; Masso, Eamets, and Philips 2004; Robinson, O'Leary, and Rincon 2006; Sharpe and Currie 2008). The demography of firms approach is already a rather well established field of study for economic geographers and regional economists (Baptista, Escária, and Madruga 2008; Baptista and Carias 2007; Pellenbarg and Steen 2003; Van Dijk and Pellenbarg 2000). It has developed into a research field that has close links to industrial organisation and organisational ecology but also to the evolutionary approach of spatial-economic development (Nelson and Winter 2009; Boschma and Frenken 2002; Hannan and Freeman 1993).

Most empirical studies on regional variations in entry and exit rates at the international level are either based on survey data like the Global Entrepreneurship Monitor (Acs, Desai, and Klapper 2008), business registration data (Klapper, Lewin, and Delgado 2011; Klapper, Amit, and Guillén 2010; Sarmento and Nunes 2012), administrative data or a mix of the previous (Schrör 2009; Bartelsman, Haltiwanger, and Scarpetta 2009; Bartelsman, Scarpetta, and Schivardi 2005). In Portugal, extensive research has been done in firm dynamics using administrative data from a linked employer-employee micro-dataset known as *Quadros de Pessoal* (Nunes and Sarmento 2012; Baptista and Preto 2011; Baptista, Escária, and Madruga 2008; Jose Mata and Portugal 1994; José Mata, Portugal, and Guimaraes 1995; José Mata 1993). The diverse administrative regional breakdowns made possible by *Quadros de Pessoal*, rapidly made a stand in the field of regional economics. The possibilities of combining microeconomic data with more aggregate macroeconomic and regional data, helped regional economists to shed light onto the development of regional patterns in Portuguese regions. The work of Baptista, Escária, and Madruga (2007) and Sarmento and Nunes (2011) are examples of research work conducted on firm demography at a regional level. Still, the predominant orientation of new firm formation studies tends to neglect the spatial-temporal dynamics of incumbent firms, in particular their process of survival, growth and decline (Fischer and Nijkamp 2009)

This research work addresses the post-entry performance of new Portuguese firms by investigating the regional structural characteristics of the hazard and survival functions, by applying semi-parametric survival analysis to the active employer enterprises of *Quadros de Pessoal*. The main contribution of this work is the application of a recent internationally comparable methodology for entrepreneurship and the usage of this analytical arsenal to provide firm and survival disaggregation from a regional perspective, over a period of eighteen years. It is structured as follows. The next section introduces the data followed by a section that highlights some facts for the Portuguese main administrative regions (NUT II). The third section presents the semi-parametric survival methods, where estimations for the NUT II Portuguese regions survival determinants are provided. Finally, the last section concludes.

2. Data

This work is based on the dataset *Quadros de Pessoal* (Employment Administrative Records), which is the main data source in Portugal for the universe of active employer enterprises. It has been subject to the application of the entrepreneurship definitions and methodology of the “Manual on Business Demography Statistics” (Eurostat and OECD 2007) from where a specific entrepreneurship database was derived. The *Quadros de Pessoal* is an annual survey conducted in Portugal by the Portuguese Ministry of Labour and Social Security (*Gabinete de Estratégia e Planeamento do Ministério do Trabalho e da Segurança Social*), which provides a rich and comprehensive longitudinal matched employer-employee dataset. It covers virtually all establishments with wage earners (that is, all businesses with paid employees who contribute and benefit from Social Security benefits), with exception made for public administration and non-market services, which are excluded, and agriculture, silviculture, hunting and fishing activities (in case the workers are not included in the “common” social security regime or in any other collective labour regulatory instrument). The target population excludes very small businesses with only one self-employed person (sole proprietors), unless they are formally registered in the Social Security system. It focuses on the formal sector of the economy and covers virtually all private businesses with at least one paid employee in Portugal (Figure 1).

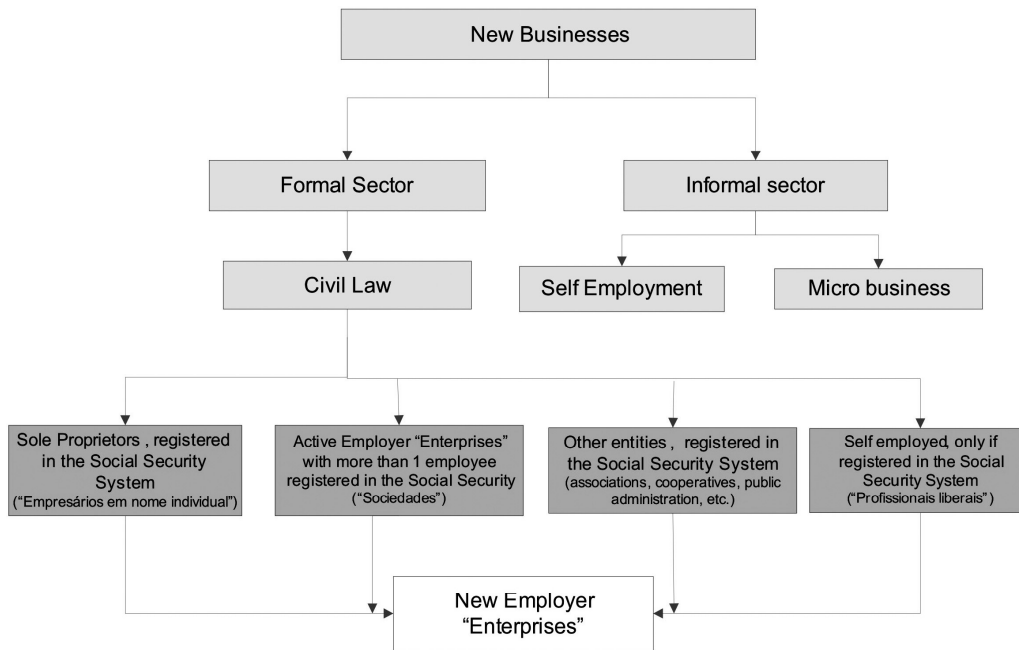


Figure 1 – Employer enterprises considered in *Quadros de Pessoal*, by legal form

Source: Own elaboration

The importance of *Quadros de Pessoal* derives not only from its national coverage and comprehensiveness at the microeconomic level, but also from the fact that it is the only linked data source in Portugal, thus allowing the matching, throughout time, of firms with their correspondent employees and the establishments where they are located. The empirical literature on entrepreneurship highlights the importance such a linked employee-employer database. Indeed, linked firm-level data is fundamental to answer questions about the relationships between entrepreneurial determinants and entrepreneurial performance, since it allows following individual firms for a particular period of time observing their overall characteristics and related changes. The availability of longitudinal datasets is also extremely relevant for a time-series analysis of entrepreneurship, in terms of the performance and survival of specific cohorts of newly created firms over time.

In the past, this dataset proved to be rich and flexible enough to be used in a great multiplicity of empirical applications. At the present, this dataset continues to respond well to the increasing needs in different areas of research, namely in regional entrepreneurship, not only in terms of performance but also of addressing its survival determinants.

The survival analysis provided in the fourth section, will take place over this new entrepreneurship dataset, where only active employer enterprises and real births and deaths are accounted for.

According to the Eurostat and OECD (2007) methodology, the core measure of births reflects the concept of employer enterprise birth. The employer enterprise birth rate is based on a ratio where the numerator follows the above definition for employer enterprise births, while the denominator is the population of active enterprises with one or more employees during the reference period. An employee enterprise death occurs when an employer enterprise stops having employees. Deaths do not include exits from the population due to mergers, take-overs, break-ups or restructuring of a set of enterprises. Moreover, deaths do not include exits from a sub-population if it results from a change of activity. The Eurostat and OECD manual recommends waiting for two years after the reference period to allow for reactivations, before deaths are calculated. This is the reason why, despite the availability of the data until 2007, deaths were only recorded until 2005. The employer enterprise death rate is based on a ratio where the numerator follows the above definition for employer enterprise deaths, while the denominator is the

population of active enterprises with one or more employees during the reference period. The churn rate is an indicator which is used for the measurement of turbulence. It is viewed as an economy's ability to expand and adjust its structure of production to the market's changing needs and is given by the sum of birth and death rates

The entrepreneurship database obtained from *Quadros de Pessoal*, after applying the Eurostat and OECD (2007) methodology, consists of an annual average of 215.903 active employer enterprises over the period 1985 to 2007, with an annual average of 36.803 births and 23.743 deaths.

3. Regional business characteristics and dynamics

As the creation of enterprises is considered a primary indicator of the level of entrepreneurship at the regional level, its closing can also be considered a primary indicator of local firms' survival abilities. In Portugal, the regional distribution of deaths is relatively uneven across the seven NUT II regions. Norte is the region where more enterprise deaths occur, where 39% of total enterprises died in 2005 (34% in 1985), a higher proportion than the region's share of total active enterprises.

Portugal has had in the past high birth¹ and death rates, when compared to other countries (Sarmiento and Nunes 2012; Nunes and Sarmiento 2012; Schrör 2009; INE, 2009). Based on the cycles of enterprise birth and growth, observe four main distinct periods of enterprise creation: before 1989, from 1990 to 1994, 1995 to 1999 and the period following the year 2000. Four main "peaks" in enterprise creation are clearly observable in Portugal, 1989, 1994 (with a total growth rate of 57% and the highest birth rate throughout the period), 2000 (birth rate of 19.5%) and 2005 (birth rate of 16.1%). Death rates were the highest in 1993 (15.2%), when Portugal faced a negative GDP growth, in a setting characterised by a widespread international economic crisis and speculative currency attacks within the European Monetary System, and in 2000 (14%). From 2000 (a "peak" year for enterprise births and deaths), the country shows an overall trend of decelerating growth rates of the population of active employer enterprises, a phenomena extended to all NUT II regions. The same occurs for enterprise births² and deaths.

The last 25 years of the 20th century may be seen as a period of creative destruction, where the development of information and communication technologies and globalisation shaped the behaviour of firms. Carree et al. (2002) argue that at least in modern economies, the secular trend of decreasing business ownership rate and its rise during this period is an indication of development changes in the level of entrepreneurship. After the 1970s, industries such as textiles, machinery and automobiles have lost comparative advantage and have been confronted by a rise of new ventures in service and knowledge-intensive sectors. But globalisation is bringing an increasing level of risk, tougher competitive pressure and increasing barriers to entry the market for potential entrepreneurs (Colantone and Sleuwaegen 2007). These phenomena might have had a considerable impact in Portugal, particularly from the start of the new century, causing a smoothing of the rhythm of enterprise creation and bringing tougher survival for incumbent firms. Death rates are highly correlated with birth rates and have thus accompanied this trend (Sarmiento and Nunes 2012)

Table 1 sheds additional light onto the rhythm of growth of enterprises, its births and deaths, which has been clearly slowing down since the 2000 "peak". Most NUT II regions follow the country's general trend of decreasing birth and death rates (Sarmiento and Nunes 2012). The Algarve is the only region that manages to dispute this tendency and maintain a positive annual growth rate of enterprise births after

¹ Among the European countries, Portugal has one of the highest records of new firms relatively to the stock of existing enterprises, even when different universes and methodologies are considered (Sarmiento and Nunes 2012; Cabral 2007; Bartelsman, Scarpetta, and Schivardi 2005). The Structural Business Statistics data by Schrör (2009) shows that in 2005, Portugal had the second highest business entry rate among 20 countries. In 2006, within a panel of 16 countries, Portugal ranks the third highest, after Estonia and Romania (INE, 2009).

² There is an exception for year 2005, which we think is related to the start of the electronic delivery of *Quadros de Pessoal*. The year 2005 shows an increase in enterprise creation, 16 out of 100 were new Portuguese enterprises. In 2007, the birth rate was back to 2004's level (12,6%).

2000 (1%), as it also has the highest growth in active enterprises throughout the whole period. On the other hand, it also shows the highest annual average growth in enterprise closures (3,4%)³.

Norte has the greatest proportion of active firms in the country and the second greatest increase in active employer enterprises in the country between 2000 and 2007 (Table 1). It is also in the north of the country where the greatest share of business entries and closures occurred between 1985 and 2007, causing this region to exhibit a high level and turbulence (Table 2) and volatility⁴. Despite having the greatest share of active enterprises and the greatest amount of small enterprises in the country, the weight of small and medium firms is the highest in Algarve (mainly due to services and construction firms from 2000) and Alentejo (mainly in services, agriculture and fishing sectors) (Sarmiento and Nunes 2012).

Table 1 – Annual average growth rate of employer enterprises, births and deaths by NUT II

NUTII Regions	Active employer enterprises			Births		Deaths	
	1985-2007	1995-2000	2000-2007	1987-2007	2000-2007	1985-2005	2000-2005
Norte	6.2	7.1	4.4	4.3	-1.5	6.4	-1.0
Algarve	9.2	7.9	6.7	6.2	1.0	7.4	3.4
Centro	6.6	8.6	4.0	4.6	-5.3	6.3	1.3
Lisboa e Vale do Tejo	4.5	5.1	3.4	4.3	-1.1	4.8	0.8
Alentejo	5.8	8.3	3.1	3.1	-4.2	5.3	2.1
Açores	3.7	3.9	3.1	1.1	-1.0	0.4	-4.9
Madeira	6.4	7.1	4.4	4.9	-1.1	6.3	-3,3
Portugal	5.8	6.9	4.1	4.3	-2.3	5.7	0.2

Source: Own calculations based on *Quadros de Pessoal*.

Table 2 – Average churn rates of Portuguese NUT II regions

	1987-2005	1987-2000	2001-2005
Norte	29,9%	30,1%	29,4%
Algarve	32,5%	34,7%	29,4%
Centro	27,3%	28,8%	25,1%
Lisboa	26,8%	27,1%	26,2%
Alentejo	29,9%	31,8%	26,6%
Açores	27,1%	28,0%	25,5%
Madeira	28,6%	29,4%	27,3%
Portugal	28,5%	29,3%	27,3%

Source: Own calculations based on *Quadros de Pessoal*.

From 1985 to 2005, Algarve (32,5%), Alentejo and Norte (29,9%) are the regions with the greatest amount of births and deaths in the country. In the second sub-period, from 2001, Norte and Algarve (29,4%) maintain high levels of business turbulence, though below the previous period turbulence rates (1987-2000).

The first three quarters of the 20th century are often characterized as a period of declining small firm presence in most industries (Carree et al. 2002). But in more recent decades, this has stabilized or has even been reversed, with the revival of small businesses in many industries of the industrialized world (Storey 2016; Schrör 2009; Bartelsman, Haltiwanger, and Scarpetta 2009; Cabral 2007; Núñez 2004; Thurik 1999; Loveman and Sengenberger 1991). After the 1970s, older and larger enterprises especially located in manufacturing sectors have lost ground to new smaller, more entrepreneurial and innovative

³ Algarve also has high volatility in active employer enterprises growth over time (e.g. from 27,7% of growth in 1989 to a low of 2,6% in 1990).

⁴ Norte shows the highest volatility of all regions (particularly from 1993 to 1998), when measured through the standard deviation.

counterparts. The increasing weight of services in most developed economies, which are characterized by smaller average sizes, contributed sharply to the decreasing average size of firms. In Portugal, the growing importance of services cannot be overlooked influencing the already small sized entrepreneurial fabric and the creation of new enterprises. Over a period of more than 20 years, Sarmiento and Nunes (2012) find an overall decreasing average size for employer enterprises in Portugal, which is extended to all broad sectors, NUT II regions, entrants and exiters in the market.

By combining the geographical with the size class dimension, Sarmiento and Nunes (2012) observe the predominance of small firms births in most regions, in particular in Algarve (above 98.1% of enterprises are born with fewer than 20 employees throughout the period), Alentejo (97.7%), Centro (97.2%) and the Açores. Over the period, Norte is the region where relatively fewer firms are born with less than 20 employees.

The average firm size of entrants, which is considered to influence growth and survival has been decreasing throughout the country's regions, except for size class of 20-49 employees which, despite the natural fluctuations over the period, has been able to show systematic recoveries and maintain its average range between 25 and 31 employees throughout the period. Until 2003, the Açores had the smallest sized enterprises, in the size class one to four employees (1.8 employees on average). From 2005, it was overthrown by Norte (1.6 employees on average). On the other hand, Lisbon has the biggest sized enterprises in the country in the size class of over 250 employees, although average firm size has been decreasing considerably in recent years (1 645 employees on average in 1989, 2 628 in 2000 and 624 in 2007), followed by Centro and Norte, which recovers in 2007, the second place in this size class.

In higher birth rate years in Portugal, it is possible to observe an overall increase in firm dimension, with some heterogeneity throughout the Portuguese regions, in particular during the "peak" years of enterprise creation of 2000 to 2002. The year of 1994, also characterised by a sharp increase in birth rates, shows a more homogenous regional impact on average enterprises' size (except for Centro and the Açores), compared to the "peak" of 2000 to 2002, which had a more localised impact in respect to firm size increase in Lisbon, Açores and Madeira.

4. A semi-parametric survival analysis

Both seminal and the most recent literature agrees that size affects the survival rates of new firms (García and Puente 2006; Farinas and Moreno 2000; Mata, Portugal, and Guimaraes 1995; Mata and Portugal 1994). This generated one of the most striking stylized facts in the literature of industry dynamics (Bartelsman, Haltiwanger, and Scarpetta 2009; Sharpe and Currie 2008; Robinson, O'Leary, and Rincon 2006; Bartelsman, Scarpetta, and Schivardi 2005; Audretsch and Mahmood 1994). The fact that small firms are less likely to survive and that tend to grow faster than their large counterparts (once survival bias has been controlled for) has already been confirmed by empirical evidence in different countries.

Several studies have reported that the probability of firms exiting the market decreases with initial size. According to the literature, there are several reasons behind the importance of initial size for survival. The most prevalent relate to the efficient scale needed to operate efficiently in a market, to the capital intensity production technology, to the firms' capacity to access financial markets and to the "inferior" management ability of small entrepreneurs. Regarding the first reason, Audretsch and Mahmood (1994) have considered that larger firms are more likely to be closer to the necessary minimum efficient scale to operate efficiently in a market. Even if larger firms find themselves to be less efficient than they had expected, they may become smaller before they exit the market (Mata and Portugal 1994). Additionally, larger firms diversify more than smaller ones, enabling them to better adjust to fluctuations in the demand for individual products (von Ungern-Sternberg 1990), which also contributes to reduced market risks. Thus, diversification as well as flexibility can both be expected to raise the probability of survival.

Moreover, the stock of capital accumulated by firms should also be considered. Small firms are less capital intensive, so variable costs represent a larger share of capital costs. Thirdly, internal financial constraints and internal capital markets imperfections are also commonly pointed out as reasons for the smaller size of entrants. Firms enter small, not because they choose to, but because new firms under invest as they are financially constrained, which leads to a negative impact on firms' survival probabilities (García and Puente 2006). Lastly, the entrepreneur's management ability. Being an entrepreneur has higher opportunity costs when the economy's wages grow, and lower quality managers are more likely to miscalculate their true value label (Mata and Portugal 1994).

Mata, Portugal and Guimarães (1995) and (Geroski, Mata, and Portugal 2010) stress the previous observations concerning to the importance of initial firm size in explaining the survivor probability of firms. However, they argue that current size is a better predictor of failure than initial size. After controlling for initial size, measuring current size amounts to measuring firm performance. According to them, the fact that a firm has grown in the past, signals that it has been performing well and therefore its probability of exit is low. Moreover, Mata, Portugal and Guimarães's (1995) findings indicate that after controlling for size differences, past growth does matter for survival, suggesting a partial adjustment process of firm size in the post-entry period. Although accepting their arguments López-García and Puente (2006) highlight the fact that current size could be endogenous to the firm dynamics, since firms that are about to abandon the market, grow smaller before exiting and vice-versa. Considering Spanish manufacturing firms, Fariñas and Moreno (2000) conclude that there is a downward trend in the failure rate as firm size increases and that there are significant differences in failure rates across size, age and interactions of size on age.

4.1. Modeling with the Cox Proportional Hazard Model

The statistical representation of the relation between the survival time of a firm and specific variables is known as the hazard rate model of the duration of the life of a firm. According to the model a given firm j faces a hazard rate h_j that is a function of a baseline hazard rate h_0 , which all firms face, transformed by a set of explanatory variables X through a vector of parameters β . The hazard rate model can be written in the form: $h_j(t) = f(h_0(t), \phi(X, \beta))$

In this model, two firms with the same birth date will face a different hazard function if, and only if, their other characteristics are different. By definition, the model seems a natural solution to understand the temporal pattern of survival and to identify the covariates that could be related significantly to survival. Additionally, it is also a good solution for working with longitudinal datasets, characterized by right censored data and other types of selection issues. An empirical application of the model implies the specification of a functional form for the hazard function. One of the most common options is the proportional hazard model, given by: $h_j(t) = h_0(t)\phi(X, \beta)$

The name derives from the fact that the hazard that a firm faces is proportional to the baseline hazard. In other words, the shape of the hazard function is the same for all individuals, and variations in the explanatory variables will translate into parallel displacements of this function, thereby affecting only the scale of the hazard function and not its shape. Given the fact that the hazard is a conditional probability and, therefore, must be positive, a convenient functional form for $\phi(X, Y)$ is exponential. Hence the hazard a subject j faces is written in the following form: $h_j(t) = h_0(t)e^{(X \cdot \beta)}$

Note that this particular functional form offers the advantage of a very convenient interpretation of the estimated coefficients, since $\beta = \frac{\partial \ln \phi(X, \beta)}{\partial X}$. This means that the coefficient of one explanatory variable is the constant proportional effect of a unit increase of this variable on the conditional probability of exiting.

The assumption made for the functional form of $\phi(X, Y)$ is widely accepted, while it is not so for the functional form of the baseline hazard, since different parametric specifications of the hazard function display different duration dependence behaviors. Positive (negative) duration dependence implies that the

likelihood of failure at time t , conditional on the duration up to t , is increasing (decreasing) in t . *A priori* it is not obvious which distribution is most appropriate even when economic theory provides some clues concerning the way the baseline hazard varies over time. In case of doubt, one line of action to consider is to make no assumption about the functional form of the baseline hazard. Such a method was first suggested by Cox (1992) and the resulting models are called semi-parametric. Cox also suggested that the proportional hazard model could be easily extended to account for time varying covariates. This is what we will approach next.

The model incorporates the main features of discrete duration models, as described by Lancaster (1992) where the logarithm of the probability that a firm exits at time t given that it survived in $t-1$ is explained by a series of explanatory covariates X_{t-1} plus a set of parameters identifying the baseline hazard function, according to the following specification: $\log h(t | x_t, x_0) = \lambda_t + \beta x_t + \gamma x_0$, for $t = 1, \dots, k$

The use of the partial likelihood function does not require that $h_0(t)$ must be specified, which allows the estimation of β and γ and avoids the risk of misspecifying the baseline hazard function. The model described previously, considers two types of heterogeneities that may cause exit, and that need to be considered: current heterogeneities between firms, that is heterogeneities based on differences that exist in period t , and heterogeneities that occur from differences that existed in the moment when firms were created ($t=0$). Heterogeneities due to differences in founding conditions include those conditions that are cohort specific, i.e., which take a common value for all firms in the same cohort, such as macroeconomic or industry-wide factors and those which are firm-specific. In our case the survival is a continuous phenomenon, but the available information is reported annually in the month of October, transforming time in a discrete variable. To circumvent this, we have grouped the data, by creating 11 interval specific dummy variables (one for each spell year at risk) and will be using a discrete hazard model. The most common discrete time representation of an underlying continuous time Cox proportional hazard model is the complementary log-log (cloglog model), which is what will be used in the following estimations. The major advantage of using the hazard model is that each firm contributes several times to the likelihood function, each time it is at risk.

4.2. Explanatory Variables

We have considered seven explanatory variables for the semi-parametric approach, beyond sector and year dummies (Table 3), which will be briefly described next.

Table 3 – Definition and measurement of the explanatory variables considered in the model

Variable	Definition	Measurement
Start-up Size	Number of employees at the birth year of the firm.	Logarithm of the number of employees.
Current Size	Number of employees at the current year.	Logarithm of the number of employees.
Industry Entry Rate	Industry entry rate calculated for sectors defined at a 2-digit CAE level.	Logarithm of the industry entry rate, defined as the number of entrants divided by the total number of firms in industry.
Concentration (HHI)	Herfindhal-Hirschman Index (HHI) calculated for industries at a 2-digit CAE level.	Logarithm of the HHI .

→

←

Variable	Definition	Measurement
Growth	Logarithmic difference of industry employment in two consecutive periods.	Logarithm of the number of employees at year t minus the logarithm of the number of employees at year $t-1$.
Entry Rate x Growth	Interaction variable, defined as the product of entry and growth.	Product of logarithms.
Turbulence	Sum of entry and exit rates calculated for sectors defined at a 2 -digit CAE level.	Sum of logarithms of the industry entry rate with the industry exit rate.
Sector Dummies	Dummies for 4 broad sector s: Agriculture, Construction, Manufacturing and Services.	
Regional Dummies	Dummies for 7 NUTII regions: Norte, Centro, Lisboa e Vale do tejo, Alentejo, Algarve, Açores and Madeira	
Year Dummies	Dummies for each current year.	

Note: * The literature has shown that there is a non linear effect of the start-up size on survival, which is normally accounted for via a log transformation. The specification is reasonable given that the value of the likelihood increases.

Source: Own calculations based on *Quadros de Pessoal*.

The first explanatory variable is the firm start-up size. It is measured by the logarithm of the number of employees at the firm's year of birth. A negative influence on the hazard rate is expected, i.e., larger start-ups should face a reduced risk of survival. The second variable relates to the number of employees reported at the year of measurement. Besides these two firm characteristics, the specific conditions of the industry are likely to affect firm survival (García and Puente 2006). Among the measures of firm dynamics is important to control for industry entry and growth rate and its degree of competition. Thus, the third variable has to do with the firm's entry rate. New firms are more likely to live longer if they enter expanding industries or industries with low entry activity (Mata, Portugal, and Guimaraes 1995)

Another important industry characteristic is the degree of competition, which is measured through the Herfindhal-Hirschman Index (HHI). Highly concentrated industries may allow suboptimal scale of new firms and therefore give some room for survival after entry. On the other hand, according to the industrial organization literature, highly concentrated industries might as well represent a higher potential for incumbent's collusion and therefore a more aggressive behaviour towards new entries (Mata and Portugal 1994; García and Puente 2006).

By definition, at start-up there is no post-entry growth. The effect of growth can only be perceived as firms' age and current size shifts from initial size. At any time after start-up, current size can be viewed as initial size plus the change in size which occurred. As size is measured in logs, this change is the cumulative growth rate since start-up. Therefore after controlling for the effect of start-up size, the coefficients associated with the current provides an estimate of the effect of the post-entry growth (Mata, Portugal, and Guimaraes 1995). A positive correlation between firm size and survival is expected, as predicted by the learning literature (Ericson and Pakes 1995) and shown by empirical evidence (Fornielles and Rubio 2009).

Turbulence is a natural consequence of the chase for new business opportunities as resources are rapidly reallocated from unsuccessful to successful enterprises and to growing areas of business, therefore being considered a natural source of dynamism. These firm dynamics, that is, the pace at which firms are

starting up and closing down is a commonly used measure of the level of entrepreneurial activity in an economy. The sum of birth and death rates (Eurostat and OECD 2007) is the chosen indicator for the measurement of turbulence.

There may well be differences in survival rates between industries over and above those captured by the industry-specific variables mentioned above. For this reason industry dummy variables are also included in the analysis. Finally, since the overall state of the economy has long been indicated as an important force driving firms out of business, we include year dummies, to proxy the moment of the cycle and, therefore, control for the macroeconomic environment (García and Puente 2006; Mata, Portugal, and Guimaraes 1995)

4.3. Estimation Results for the Portuguese Regions

The same cloglog regression estimation process was conducted for Portugal and for its seven NUT II regions, for the period 1995 to 2005⁵. The determinants considered for explaining regional survival behavior are the variables described in the previous section. All the models control for structural effects, through industry dummies and for macroeconomic effects, through year dummies⁶.

The values presented in Table 4 correspond to the hazard ratios, that is, the ratio of hazard rate when the variable increases by the one unit. A hazard ratio over one implies that an increase in the given explanatory variable increases the probability of exit and, correspondingly, a hazard ratio below one means that an increase in the variable decreases the hazard. Since the number of firms in each region is quite diverse, ranging from 164.599 firms in the Norte to 7.523 firms in Açores, the conclusions are not straightforward when we take into consideration the absolute values of the coefficients. Therefore, the analysis must rely more on the overall results than on the absolute values of the hazard coefficients.

Table 4 – Estimation Results for the Total Economy and for each one of the seven Portuguese NUT II Regions

Variables	Portugal	Regions						
		Norte	Centro	Lisboa	Alentejo	Algarve	Açores	Madeira
Log of start-up size	1.334*** (0.007)	1.310*** (0.011)	1.342*** (0.016)	1.414*** (0.014)	1.250*** (0.023)	1.286*** (0.028)	1.139*** (0.041)	1.267*** (0.044)
Log of current size	0.459*** (0.002)	0.479*** (0.004)	0.418*** (0.005)	0.463*** (0.004)	0.451*** (0.008)	0.444*** (0.009)	0.501*** (0.018)	0.440*** (0.014)
Industry (2 digit) start-up entry rate	1.24*** (0.018)	1.233*** (0.028)	1.181*** (0.038)	1.160*** (0.032)	1.515*** (0.077)	1.290*** (0.08)	1.429*** (0.152)	1.613*** (0.164)
Start-up industry HHI (2 digit)	0.988*** (0.001)	0.986*** (0.002)	0.986*** (0.003)	0.992*** (0.003)	0.988** (0.005)	0.997 (0.006)	1004,0 (0.011)	0.975*** (0.009)
Turbulence rate	5.29*** (0.222)	11.444*** (0.791)	3.664*** (0.344)	3.406*** (0.336)	1.698*** (0.22)	3.574*** (0.699)	1.285 (0.341)	14.441*** (4.792)
Industry Growth (log)	1.122*** (0.018)	1.087*** (0.029)	1.140*** (0.044)	1.159*** (0.036)	1.144** (0.065)	1.113* (0.07)	1.326** (0.146)	1.036 (0.104)
Growth x Entry rate	1.082*** (0.017)	1.069** (0.028)	1.116*** (0.042)	1.091*** (0.033)	1.083 (0.061)	1.015 (0.065)	1.272** (0.141)	1.033 (0.109)
Sector dummies								
Agriculture	0.612*** (0.01)	0.443*** (0.016)	0.706*** (0.024)	0.643*** (0.033)	0.795*** (0.034)	0.823* (0.069)	1.178* (0.11)	0.841 (0.156)
Construction	0.895*** (0.009)	0.858*** (0.012)	0.931*** (0.021)	0.919*** (0.023)	1.155*** (0.049)	1.013 (0.616)	1.742*** (0.18)	1.343*** (0.116)
Manufacturing	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)
Services	0.705*** (0.006)	0.631*** (0.007)	0.770*** (0.015)	0.799*** (0.017)	0.884*** (0.032)	0.869** (0.048)	0.905 (0.077)	0.792*** (0.062)

→

⁵ The regional disaggregation is only provided after 1995 due to the introduction of the System of European Accounts in 1995 and up to 2006 due to the problems of compatibility with the Portuguese Classification of Economic Activities (CAE Rev. 3) after 2007.

⁶ The year dummies values have been introduced but the values are not shown, as no clear pattern is discernible from the estimated coefficients, as is usually the case (Mata, Portugal, and Guimaraes 1995).

Variables	Portugal	Regions						
		Norte	Centro	Lisboa	Alentejo	Algarve	Açores	Madeira
Regional dummies								
Norte	(a)	----	----	----	----	----	----	----
Centro	0.847*** (0.006)	----	----	----	----	----	----	----
Lisboa	1.027*** (0.007)	----	----	----	----	----	----	----
Alentejo	0.926*** (0.01)	----	----	----	----	----	----	----
Algarve	0.939*** (0.011)	----	----	----	----	----	----	----
Açores	0.942*** (0.02)	----	----	----	----	----	----	----
Madeira	1.014 (0.019)	----	----	----	----	----	----	----
Year dummies		Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of firms	447772	164599	97606	109405	33692	25802	7523	9140
LR X2 (34) / LRX2 (28) for regions	47329.9***	17871.03***	10705.95***	11192.01***	3695.93***	2698.05***	860.98***	1421.47***
Log likelihood	-422915.7	-152494.34	-91424.886	-106768.52	-33112.584	-23204.949	-6.744.716	-8283.6

Notes: (a) refers to the reference sector; The year dummies “yes” means that they have been included in the estimation; Standard deviation is shown in brackets and *, **, *** means, respectively, 10, 5 and 1% level of significance.

Source: Own calculations based on *Quadros de Pessoal*.

As argued in the literature and mentioned previously, the start-up size of a firm improves the chances of survival. These results show hazard ratios which are greater than one, not only for the total economy but also for each region, as the model does not isolate the effects of initial firm size from the effects of current firm size. When the hazard ratios for the variable that proxy's current size are considered, the effect of a firms' current size seems to be predominant. This effect can not be observed in the table, since it does not detail the common cloglog estimators, but only the hazard ratios. However, when introducing the sum of the start-up and the current size (by denoting S_0 and S_t the initial and current size, respectively, and α and β the correspondent coefficients, the effect of size is expressed by $\alpha S_0 + \beta S_t$), it becomes evident that the current size improves the chances of survival and that the initial size does not. This effect is observed for all Portuguese regions and is consistent with the results of Mata, Portugal and Guimarães (1995). According to the previous authors, firms that have started smaller and have experienced faster post-entry growth, do face a higher probability of survival.

International studies also indicate that in industries characterized by high entry rates at the moment of birth, post-entry survival becomes harder. Firms that experience more competition from entrants, have a higher probability of failure. This is also observed for Portugal and for the country's NUT II regions. However, this is particularly enhanced in regions where the entrepreneurial background is not as developed as those of other regions⁷ (Açores) and in those dominated by sectors which do not pose high entry barriers to new firms, such as services (Madeira, Algarve and Lisboa). From 2000 to 2007, Algarve (6,7%) and Madeira (4,4%) displayed the greatest annual average growth rates in active employer enterprises (Table 1). Algarve is also systematically the region with the highest birth rates in Portugal⁸ and Madeira is within the three regions with the highest birth rates throughout the period. Moreover, Madeira, Algarve and Lisboa are regions where service firms are relatively more predominant.

⁷ It is a widely held belief that urban settings and metropolitan areas offer more favourable incubator conditions for the emergence of creative entrepreneurs, as there are more favourable conditions for human resource training and management and better labour recruitment (Davelaar 1989).

⁸ The Algarve is systematically the region with the highest birth rates in Portugal. In 2007, this region had a birth rate of 15,3%, compared to a national birth rate of 12,6% (in 2001 there was a 4,3 p.p. difference relatively to the national average). On the other hand, the Açores archipelago has had smaller birth rates than the country's average over this period (Sarmiento and Nunes 2012).

A high entry rate combined with fast growth rates for any given industry generates, in general, a shorter duration of firms (Mata, Portugal, and Guimaraes 1995; Gort and Klepper 1982). This somehow expected piece of evidence can also be drawn from these results, even if statistical significant estimators are not obtained for some of regions (Algarve, Alentejo and Madeira). It might seem easier to enter the market in earlier stages of the product life-cycle, when markets are expanding, but it becomes particularly difficult to survive. It is particularly so in the Açores archipelago, in Centro, Lisboa and Norte. HHI estimation results for concentration influence on survival probabilities do not provide very disparate conclusions at the regional level, except for the Açores, where the small entrepreneurial fabric in terms of number and firm average size, might be relatively more susceptible to firm concentration.

These results have stressed the literature's conclusions so far. However, the effect of industry growth is at odds with the mainstream results in the literature. One would expect that firms operating in industries with faster growth would suffer from a smaller probability of failure, since they can penetrate the market without harming the competitors, but the estimation results show otherwise. In order to help shedding light over this result, it should be pointed out that industries in the early stages of their life-cycles usually register high rates of entry and exit (Baptista and Karaöz 2007; Agarwal and Gort 1996). In general, industries with higher than average entry rates also exhibit higher than average exit rates (Cabral 2007), due to birth and death rates being highly correlated across industries, corroborating the idea that "entry barriers are exit barriers" (Mata, Portugal, and Guimaraes 1995). The combined effect of entry and growth can explain this unexpected effect of industry growth on survival probabilities. Industries experiencing higher growth rates are also more turbulent, registering high rates of entry and also of exit (the "revolving door" at work), thus decreasing the likelihood of survival.

Turbulence rate exhibits the most significant effect when considering other determinants in the model, such as firm and market characteristics. For all the regions, with the exception the Açores, where there is no statistical significance, those that have the highest record of firm turbulence, also display the lowest business survival probabilities. Turbulence decreases severely the survival probabilities of firms located in Madeira and Norte and to a lesser extent in the Algarve. The hazard ratios obtained range from around 14.5 % in Madeira to 1.2% in Açores. The Açores display a lower entrepreneurial turbulence than the country's average for most of the years up to 2005 (GEE, 2010b) and the lowest regional churn rates, factors accruing to explaining the lowest regional hazard ratio. From 1987 to 2005, the Algarve shows the greatest churn rate (32.5%) in the country, followed by Norte (29.9%). Norte has the highest hazard rate within the continental regions (11,5%) and possesses clear regional specificities. Turbulence is in fact the most significant determinant in the survival probabilities of Portuguese firms in all regions, notably in the Norte.

A known stylized fact is that turbulence is usually higher in services than in the manufacturing sector (Bartelsman, Scarpetta, and Schivardi 2005). For the period 2005 and 2006 it is observed that birth (and death) rates are significantly higher in the service sector for the vast majority of countries. This is also the case in Portugal⁹ (Sarmiento and Nunes 2012). Despite this fact, manufacturing is the sector whose firms have the biggest probability of exiting from the market. Concerning the model's sector dummies, all regions, with the exception of the archipelagoes of Madeira and Açores, show similar results. Norte shows a lower hazard probability rate relatively to manufacturing, when compared to the remaining regions, indicating lower survival chances for industrial firms, already diagnosed by the non-parametric analysis and by the firm demography analysis (Sarmiento and Nunes 2012). Manufacturing is in fact, the sector where firms are more likely to abandon the market in general, but in particular in the north of the country.

In the estimation of the regional components for the total economy, we can observe disparities among regions. When compared to firms in the Norte, only firms located in Lisbon show a higher probability of exiting the market.

⁹ Manufacturing churn was 28.4% in 2000 and 18.5% in 2006 and Services churn was 32.4 % in 2000 and 25.7% in 2006.

5. Final remarks

Entrepreneurship has acquired a greater level of importance among the critical success factors that shape regional economic change. Regional growth is very much a product of its human capital, R&D, knowledge-spillovers, networks, industrial culture and last but not least, smart public policy. But it is no less a product of entrepreneurial activity and firm ability, in which the entry of newly created firms results in increased innovation, competition and job creation and the growth of surviving of firms assures a stable pool of employment and value added generation.

Regions face two main imperatives in a globalised and market-driven society, the increase of social welfare through job creation and economic development, brought about by structural change and productivity improvements. As there are usually large sectoral and geographical variations among the success and survival rates of new firms, entrepreneurial adjustment as a consequence of the cycles of enterprise birth, growth and survival is of decisive importance to structural change and for the triggering of converging or diverging patterns in regional ecosystems. The last decades of the 20th century were characterized by a period of creative destruction in Portugal. In particular, regions such as Norte, Algarve and Madeira show the highest growth rates in enterprise births and deaths and naturally firm churn. After 2000, a new tendency seems to emerge, where both births and deaths of employer enterprises are relatively less turbulent. The decreasing average size of entrants and exiters in the market occurring during this two decades, can also be considered a major factor hindering firm survival in Portugal, especially in sectors more exposed to international competition.

In line with the literature, we find that firms that start small and experience faster post-entry growth, face a higher probability of survival. Firm's current size dimension is extremely important in determining the probability of survival, particularly in the Norte and Açores. In industries characterized by high entry rates at the moment of a firm's birth, post-entry survival becomes harder. This happens mostly in the south and in the Portuguese archipelagoes, the regions with the lowest number of active employer enterprises. A higher entry rate combined with fast growth rates for any given industry also generates a shorter duration of firms. It might seem easier to enter the market in earlier stages of the product life-cycle, when markets are expanding, but it becomes particularly hard to survive. Firms that experience more competition from entrants, also face higher probabilities of failure. However, we observe a different result from the literature, for the effect of industry growth in survival rates. Firms operating in industries which are growing faster seem to suffer from a higher probability of failure. The combined effect of entry and growth helps clarifying this unexpected effect of industry growth on survival probabilities. It is related to turbulence and the high rates of entry and exit verified in most the Portuguese regions throughout this period. Turbulence is in fact the most significant determinant of survival probabilities of Portuguese employer enterprises, particularly in the north of the country. Manufacturing is the sector where more firms are more likely to abandon the market, particularly in the regions of Madeira and Norte.

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Bibliography

- Acs, Zoltan J., Sameeksha Desai, and Leora F. Klapper. 2008. "What Does 'entrepreneurship' data Really Show?" *Small Business Economics* 31 (3): 265–81. doi:10.1007/s11187-008-9137-7.
- Agarwal, Rajshree, and Michael Gort. 1996. "The Evolution of Markets and Entry, Exit and Survival of Firms." *The Review of Economics and Statistics*. JSTOR, 489–98.

- Audretsch, David B, and Talat Mahmood. 1994. "The Rate of Hazard Confronting New Firms and Plants in US Manufacturing." *Review of Industrial Organization* 9 (1). Springer: 41–56.
- Baptista, Rui, and Cristina Carias. 2007. "Job Creation and Destruction by Small Businesses in the Portuguese Regions." *IV+*, Presented at the European Regional Science Association, ERSA.
- Baptista, Rui, Vítor Escária, and Paulo Madruga. 2007. "Entrepreneurship, Regional Development and Job Creation: The Case of Portugal." *Small Business Economics* 30 (1): 49–58. doi:10.1007/s11187-007-9055-0.
- . 2008. "Entrepreneurship, Regional Development and Job Creation: The Case of Portugal." *Small Business Economics* 30 (1): 49–58. doi:10.1007/s11187-007-9055-0.
- Baptista, Rui, and Murat Karaöz. 2007. "Turbulence in High Growth and Declining Industries."
- Baptista, Rui, and Miguel Torres Preto. 2011. "New Firm Formation and Employment Growth: Regional and Business Dynamics." *Small Business Economics* 36 (4): 419–42. doi:10.1007/s11187-009-9254-y.
- Bartelsman, Eric, John Haltiwanger, and Stefano Scarpetta. 2009. "Measuring and Analyzing Cross-Country Differences in Firm Dynamics." In *Producer Dynamics: New Evidence from Micro Data*, 15–76. University of Chicago Press.
- Bartelsman, Eric, Stefano Scarpetta, and Fabiano Schivardi. 2005. "Comparative Analysis of Firm Demographics and Survival: Evidence from Micro-Level Sources in OECD Countries." *Industrial and Corporate Change* 14 (3): 365–91. doi:10.1093/icc/dth057.
- Boschma, Ron, and Koen Frenken. 2002. "Why Is Economic Geography an Evolutionary Science?" Louvain-la-Neuve: European Regional Science Association (ERSA).
- Cabral, Luís M B. 2007. "Small Firms in Portugal: A Selective Survey of Stylized Facts, Economic Analysis, and Policy Implications." *Portuguese Economic Journal* 6 (1): 65–88. doi:10.1007/s10258-007-0018-9.
- Carree, Martin, Andre Van Stel, Roy Thurik, and Sander Wennekers. 2002. "Economic Development and Business Ownership: An Analysis Using Data of 23 OECD Countries in the Period 1976–1996." *Small Business Economics* 19 (3). Springer: 271–90.
- Colantone, Italo, and Leo Sleuwaegen. 2007. "ENTRY AND EXIT OF FIRMS IN A GLOBAL ECONOMY." Citeseer.
- Cox, David R. 1992. "Regression Models and Life-Tables." In *Breakthroughs in Statistics*, 527–41. Springer.
- Davelaar, Evert Jan. 1989. "Incubation and Innovation: A Spatial Perspective." VU Interne Huisdrukkerij.
- Ericson, Richard, and Ariel Pakes. 1995. "Markov-Perfect Industry Dynamics: A Framework for Empirical Work." *The Review of Economic Studies* 62 (1). Oxford University Press: 53–82.
- Eurostat, OECD. 2007. "Eurostat-OECD Manual on Business Demography Statistics." Luxembourg: Office for Official Publications of the European Communities.
- Farinas, Jose C, and Lourdes Moreno. 2000. "Firms' Growth, Size and Age: A Nonparametric Approach." *Review of Industrial Organization* 17 (3). Springer: 249–65.
- Fischer, M, and Peter Nijkamp. 2009. "Entrepreneurship and Regional Development in Handbook of Regional Growth and Development Theories." Edward Elgar Publishing Limited.
- Fornielles, María R Callejón, and Vicente Ortún Rubio. 2009. "The Black Box of Business Dynamics." *Documentos de Trabajo (XREAP)*, no. 7. Xarxa de Referència en Economia Aplicada (XREAP): 1.
- García, Paloma López, Sergio Puente, and Banco de España. 2006. *Business Demography in Spain: Determinants of Firm Survival*. Banco de España.
- Geroski, Paul A. 1995. "What Do We Know about Entry?" *International Journal of Industrial Organization* 13 (4). Elsevier: 421–40.
- Geroski, Paul A, José Mata, and Pedro Portugal. 2010. "Founding Conditions and the Survival of New Firms." *Strategic Management Journal* 31 (5). Wiley Online Library: 510–29.
- Gort, Michael, and Steven Klepper. 1982. "Time Paths in the Diffusion of Product Innovations." *The Economic Journal* 92 (367). JSTOR: 630–53.
- Hannan, Michael T, and John Freeman. 1993. *Organizational Ecology*. Harvard University Press.
- Klapper, Leora, Raphael Amit, and Mauro F Guillén. 2010. "Entrepreneurship and Firm Formation across Countries." In *International Differences in Entrepreneurship*, 129–58. University of Chicago Press.
- Klapper, Leora, Anat Lewin, and Juan Manuel Quesada Delgado. 2011. "The Impact of the Business Environment on the Business Creation Process." In *Entrepreneurship and Economic Development*, 108–23. Springer.
- Krugman, Paul. 1998. "What's New about the New Economic Geography?" *Oxford Review of Economic Policy* 14 (2). Oxford Univ Press: 7–17.
- Lancaster, Tony. 1992. *The Econometric Analysis of Transition Data*. Cambridge university press.
- Loveman, Gary, and Werner Sengenberger. 1991. "The Re-Emergence of Small-Scale Production: An International Comparison." *Small Business Economics* 3 (1). Springer: 1–37.
- Masso, Jaan, Raul Eamets, and Kaia Philips. 2004. "Creative Destruction and Transition: The Effects of Firm Entry and Exit on Productivity Growth in Estonia."

- Mata, José. 1993. "Entry and Type of Entrant: Evidence from Portugal." *International Journal of Industrial Organization* 11 (1). Elsevier: 101–22.
- Mata, Jose, and Pedro Portugal. 1994. "Life Duration of New Firms." *The Journal of Industrial Economics*. JSTOR, 227–45.
- Mata, José, Pedro Portugal, and Paulo Guimaraes. 1995. "The Survival of New Plants: Start-up Conditions and Post-Entry Evolution." *International Journal of Industrial Organization* 13 (4). Elsevier: 459–81.
- Nelson, Richard R, and Sidney G Winter. 2009. *An Evolutionary Theory of Economic Change*. Harvard University Press.
- Nunes, Alcina, and Elsa de Morais Sarmento. 2012. "18. Business Demography Dynamics in Portugal: A Non-Parametric Survival Analysis." *The Shift to the Entrepreneurial Society: A Built Economy in Education, Sustainability and Regulation*. Edward Elgar Publishing, 260.
- Núñez, Soledad. 2004. "Salida, Entrada Y Tamaño de Las Empresas Españolas." *Boletín Económico. Banco de España*, 53–60.
- Pellenbarg, PH, and PJM Van Steen. 2003. "Spatial Perspectives on Firm Dynamics in the Netherlands." *Tijdschrift Voor Economische ...* 94 (1984): 1–15. <http://onlinelibrary.wiley.com/doi/10.1046/j.1467-9663.2003.00288.x/abstract>.
- Robinson, Catherine, Brigid O'Leary, and Ana Rincon. 2006. "Business Start-Ups, Closures and Economic Churn: A Review of the Literature." *Enterprise Directorate, BERR, UK*.
- Sarmiento, Elsa de Morais, and Alcina Nunes. 2010. "Getting Smaller: Size Dynamics of Employer Enterprises in Portugal." *Economic Analysis Using Linked Employer and Employee Data*, no. First Edition. Gabinete de Estratégia e Planeamento do Ministério do Trabalho e da Solidariedade Social (GEP/MTSS): 69–94.
- . 2011. "Análise Comparativa de Sobrevivência Empresarial: O Caso Da Região Norte de Portugal." *Revista Portuguesa de Estudos Regionais* 25–26. APDR-Associação Portuguesa de Desenvolvimento Regional: 77–94.
- . 2012a. "Criação de Empresas Em Portugal E Espanha No Período 2000-2007: Análise Comparativa Com Base No World Bank Group Entrepreneurship Survey (Wbges)." *Tourism & Management Studies* 8. scielopt: 116–31.
- . 2012b. "The Dynamics of Employer Enterprise Creation in Portugal over the Last Two Decades: A Firm Size, Regional and Sectoral Perspective." *Notas Económicas* 36. Faculdade de Economia da Universidade de Coimbra: 6–22.
- Schrör, Hartmut. 2009. "Business Demography: Employment and Survival." *Birth* 16: 18.
- Sharpe, Andrew, and Ian Currie. 2008. "Competitive Intensity as Driver of Innovation and Productivity Growth: A Synthesis of the Literature." Centre for the Study of Living Standards.
- Storey, David J. 2016. *Understanding the Small Business Sector*. Routledge.
- Thurik, A Roy. 1999. "Entrepreneurship, Industrial Transformation and Growth." *The Sources of Entrepreneurial Activity* 11: 29–65.
- Van Dijk, Jouke, and Piet H. Pellenbarg. 2000. "Firm Relocation Decisions in The Netherlands: An Ordered Logit Approach." *Papers in Regional Science* 79 (2): 191–219. doi:10.1007/s101100050043.
- von Ungern-Sternberg, Thomas. 1990. "The Flexibility to Switch between Different Products." *Economica* 57 (227). [London School of Economics, Wiley, London School of Economics and Political Science, Suntory and Toyota International Centres for Economics and Related Disciplines]: 355–69. doi:10.2307/2554939.