Firm creation and survival in Portugal

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January 2017

Abstract
In this study we use a very rich panel dataset that allows us to identify new firms at founding and follow them over time. We provide a comprehensive characterization of the dynamics of firm entry and firm exit in Portugal, in the period between 2005 and 2012. In particular, we analyze the distribution of new firm creation and survival by sector of activity, size class, and over the business cycle. The results suggest that entry rates are fairly high while survival rates are small. Moreover, the share of new entrants' sales on total sales and the employment share suggest that new firms are in general small. Entry rates and employment rates show as pro-cyclical for smaller firms. (JEL: L11)

Introduction

Newly created firms are an important driver of innovation and job creation. Haltiwanger *et al.* (2013) document that new firms are responsible for most of new jobs in the U.S. and Adelino *et al.* (2016) show that firm entry account for most of net employment creation in response to local demand shocks in the U.S.. Nevertheless, despite the number of firms that starts activity ever year, new firms fail at a significant rate in their first years of life.

The dynamics of firm entry and firm exit have been widely studied in the literature of industrial organization. Geroski (1995) provides a survey of empirical work on the determinants of firm entry and the likelihood of firms to survive over time. The author documents that firm entry is common, with a high number of firms entering most markets in most years, mainly for firms operating at the small-scale. A second stylized fact is that entry rates are rarely high or persistently low over time in particular industries, and that firm entry is generally not synchronized across industries. Moreover, entry and exit rates are highly positively correlated, which is consistent with the organizational ecology population theory developed by Hannan and Freeman (1989), in which new firms are more likely to survive in populations with a

small number of other competing new entrants. More recently, Geroski *et al.* (2010) document that firms that enter in industries with lower entry rates are more likely to survive. Additionally, Geroski (1995) pinpoints that the survival rate of most entrants is low and successful entrants may take a long time to achieve a size comparable to the average incumbent.

Empirical evidence for Portugal suggests that the aforementioned stylized facts hold for Portuguese newly created firms. Mata (1993) presents an overview of the determinants of entry for Portuguese manufacturing firms according to the type of entrant. Geroski *et al.* (2010), Mata *et al.* (1995), and Mata and Portugal (1994) show that market-specific conditions are important determinants of firm survival. It is therefore important to understand market dynamics across economic sectors and over time for Portuguese firms. In fact, little is known about the size and economic activity sector distribution of new firms in Portugal, and how firm creation and survival respond to aggregate economic conditions.

In this study we provide a comprehensive characterization of the dynamics of firm creation and survival in Portugal in the period between 2005 and 2012, using a rich dataset that allows us to identify firms at birth and follow them over time. In particular, we analyze the distribution of newly created firms by firm sector of economic activity, size class, and over the business cycle.

The results suggest that entry is common across sectors of economic activity and that new firms are in general much smaller than their incumbent counterparts. This finding is corroborated by the low employment share of new firms by firm size[1]. Moreover, while it seems that barriers to entry are modest, barriers to survival seem to be very relevant. In fact, about only 41 percent of new firms survive throughout the sampling period. These low survival rates are independent of the firm's economic activity sector. Moreover, entry rates for smaller firms show as pro-cyclical, suggesting that the likelihood of entry is higher during upturns.

This paper is organized as follows: Section 2 describes the data. Section 3 presents the main descriptive facts of firm entry and survival by sector of economic activity and size class. Section 4 studies the dynamics of new firms over the business cycle. Section 5 concludes.

Data

The dataset we use in this study is the Portuguese dataset Simplified Corporate Information - IES (*Informação Empresarial Simplificada*) that covers

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1. It is important to highlight that, while the share of new firms' employment in total employment is fairly low, the share in job creation may be important.

the population of virtually all Portuguese nonfinancial corporations[2]. Data on firm's employment are obtained in *Quadros de Pessoal*, which is a dataset compiled by the Portuguese Ministry of Employment and is an annual mandatory employment survey addressed to establishments employing at least one wage earner.

IES data consists of a new system to collect firm mandatory annual economic, financial, and accounting information for a single moment and a single entity. Firms report detailed balance sheet information as well as information on several important variables, namely employment and legal form of the firm. Even though data on IES started being collected in 2006, there was a report collecting data in 2005 that was also taken into consideration in the analysis. Data are available for the period between 2005 and 2014. Our sample consists of firms with limited liability and with at least one employee during the sampling period. Moreover, firms belonging to an economic group are not considered as new firms in the analysis.

We follow the empirical literature on firm survival and identify a firm exit as a firm closure. Then, the time of exit is found by identifying the moment in which firms cease to report IES information. We require that a firm is absent from the survey for at least two years in order to identify an exit because temporary non-reporting may occur for a number of reason other than cessation of activity. This means that a firm exits at time t if it is absent from IES at time $t + 1$ and $t + 2$. If a firm does not report information temporarily, meaning that the firm is in the survey at time $t - 1$ and $t + 1$ but not at time t, we considered the firm as active and inputed data as the average of variables between $t - 1$ and $t + 1$. This means that we use data only until 2012 in the analysis of firm survival because data for 2013 and 2014 are considered to determine a firm exit. In turn, the founding year of the firm is available in the dataset and used to identify new firms.

Dynamics of firm entry and firm survival

In this section we describe the main facts related to firm natality and firm survival for Portuguese new firms over the period between 2005 to 2012. We begin the analysis by considering the aggregate evolution of new firms and proceed by distinguishing the distribution of new firms by sector of economic activity and size class.

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2. The sampling method consists of non-financial corporations covering all sectors of activity defined in the Portuguese Classification of Economic Activities with the following exceptions: financial intermediation, general government, private households with employed persons, international organizations, and other non-resident institutions.

Aggregate market dynamics

Table 1 reports the number of new firms by sampling year and survival rates by age cohort of new firms. The estimates suggest that survival rates calculated without accounting for firm heterogeneity at the sector of economic activity or size class level, seem to be independent of the age cohort. At a first glance, entry rates seem lower after 2009, which may suggest the presence of an economic crisis effect in firm creation. Nevertheless, the relationship between entry rates and the business cycle is analyzed in more detail in Section 4.

Cohort	Start-ups	Entry rate	Survival rates by life duration of the firm (in percentage)							
			1	2	3	4	5	6	7	8
2005	12514	3,42	99	92	82	73	65	59	53	48
2006	14227	3,81	94	85	74	65	58	52	46	
2007	15100	3,92	93	82	71	63	55	48		
2008	14642	3,77	94	83	72	62	55			
2009	9721	3,00	93	83	72	63				
2010	8883	3,24	95	86	76					
2011	10143	3,72	95	85						
2012	8205	3,16	95							
2013	8476	3,25								

TABLE 1. New firms and survival rates by cohort

Notes: The sampling period goes from 2005 to 2013. Firm exits are identified only until 2012. For more details see Section 2.

Figure 1 depicts the survival rates of new firms obtained through the estimation of a Kaplan-Meier survival function. It follows from the nature of the dataset that the amount of information available to estimate survival rates is different in each sampling year because firms are observed over a different number of years. The maximum age attained by a firm born in 2005 is equal to eight years and for a firm born in 2011 is equal to two years. Nevertheless, these results suggest that new firms fail at a significant rate, with approximately 50 percent of new firms exiting operation after their sixth year of life. The results also suggest that a considerable fraction of new firms fails in their first year of life and that about only 41 percent of new firms survive for eight years. These results tally with the high mortality of new firms documented in the industrial organization empirical literature.

Market dynamics by sector of economic activity

In this section we analyze new firm entry and survival by sector of economic activity, with economic activity sectors defined at the 2-digit NACE. Table 2 reports the number of new entrants, entry rates, and the share of sales of
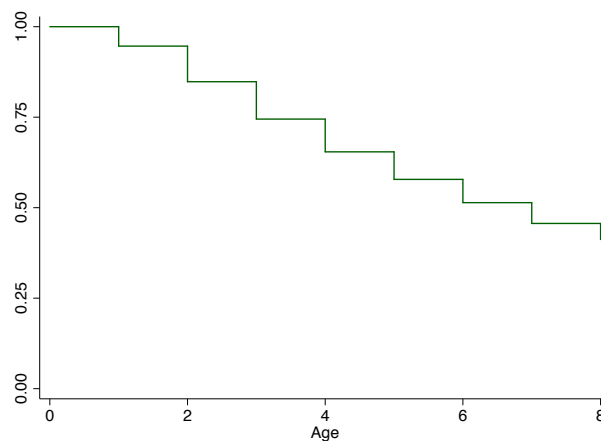
FIGURE 1: Kaplan-Meier survival function.

new firms on total activity sector sales, calculated for 2005[3]. The entry rate is defined at the sector of economic activity level and is calculated as the number of new firms divided by the total number of firms (entrants plus incumbents) in a given year. The share on sales equals sales by entrants divided by total sales in a given sector of economic activity. The survival rate is defined as the percentage of new firms surviving in a given sector of economic activity up until 2012 as of the total number of new firms created in 2005.

The results in Table 2 indicate that 12,514 new firms were created in 2005. The sector of economic activity with a higher entry activity is trade with 3,969 new firms and the one with less entry activity is agriculture with 210 new firms. The entry rate ranges from 3.15 percent in the transportation and storage sectors to 8.19 percent in the information and communication sectors, which are high entry rates[4]. These figures suggest that entry is common in most sectors of economic activity. Nevertheless, the share of sales by entrants on total sales in a given sector of economic activity is fairly small, ranging from 0.20 percent in the information and communication sectors to 1.61 percent in the accommodation and food service activities sector. Geroski (1995) suggests that this difference between entry rates and entry penetration is due to the much smaller scale of entrants than their incumbent counterparts. An estimate of the average size of entrants relative to that of all firms can be obtained by

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3. It follows from the nature of the data that survival rates are calculated using a different amount of information for different cohorts, being the 2005 cohort the one that conveys more information. Furthermore, the results in the previous section suggest that survival rates are independent of the age cohort.

4. Audretsch (1995) documents that entry rates for Netherlands range from 2.53 percent to 4.72 percent across manufacturing sectors.

dividing the entrants' share on sales by entry rates. According to the results reported in Table 2, entrants are estimated to be on average approximately 15 percent of the average size of Portuguese firms in 2005.

	2005			2012	
	New firms	Entry rate (%)	Share on sales (%)	Surviving firms	Survival rate (%)
Agriculture	210	4.13	1.29	147	70.50
Manufacturing	1,217	3.60	0.31	640	48.05
Construction	1,750	5.63	0.57	831	41.12
Trade	3,969	5.51	0.66	2,044	46.88
Transporting	476	3.15	0.66	269	50.86
Accommodation	1,184	5.50	1.61	559	39.55
Information	321	8.19	0.20	170	49.41
Real estate	290	4.07	0.44	148	45.18
Others	3,097	6.98	0.53	1,778	52.87
Total	12,514	5.63	0.66	6,586	47.51

TABLE 2. New firm entry and survival rates by sector of activity

Notes: *Agriculture* stands for agriculture, forestry, and fishing, *Trade* for wholesale and retail trade, *Transporting* for transporting and storage, *Accommodation* for accommodation and food service activities, *Information* for information and communication, and *Others* includes all other sectors.

The survival rates of newly created firms in 2005 and that are still operating in 2012 range from approximately 39.55 percent in the accommodation and food service activities sector to 70.5 percent in the agriculture sector. Moreover, the survival rate calculated for all firms born in 2005 is approximately 48 percent.

These findings are consistent with the stylized facts identified by Geroski (1995) regarding the start-up size and survival rates of new firms. Furthermore, the fact that new firms are in general small and that their lives are typically short suggest that new firms play a modest role in shaping industry structure and industry performance[5].

One interesting result is that the coefficient of variation estimated for the entry rate equals 0.32 and for the survival rate is approximately 0.18, which suggests that survival rates show considerably lower variability than entry rates. This result is apparently inconsistent with the industrial organization literature on market dynamics, which posits that entry rates show considerably lower variance than survival rates. Furthermore, we find that entry rates show greater cross-sector variation than within sector variation, which is also not in line with previous research (see Geroski (1995) and Audretsch (1995), for example). Nevertheless, this inconsistency may

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5. Mata and Portugal (1995) document that the competitive disciplining role played by new firms on incumbent firms is rather modest.

arise from the fact that in this study we consider the full economy and distinguish across sectors of economic activity, while most of the industrial organization literature on market dynamics considers only industries within the manufacturing sector.

Market dynamics by size class

In this section we consider the entry rate and the entrants' employment share by firm size to exploit the extent of new firm creation in the Portuguese economy. The entry rate is defined in the previous section and the entrants' employment share is obtained by dividing the employment in new firms by the total employment. Mata (1996) calls this measure the entry share. Both measures are computed by size class.

Tables 3 and 4 report entry rates and entry shares by size class and time-averaged over the sampling period, with size classes defined using the number of employees. According to the estimates reported in Table 3, the most striking result is that new firms are in general quite small, with approximately 95 percent of new firms employing less than ten workers. The fraction of new firms employing more than 50 workers at birth is very small. The results regarding the employment share of new firms show that firms with less than ten workers are responsible for the creation of 65 percent of the total jobs created by new firms, and only 4.3 percent of job creation is attributed to new firms employing more than 100 workers. The results reported in Table 4 corroborate the previous findings and suggest that entry rates and entry shares are higher in the size classes with few employees.

	Total	<5	5-9	10-49	50-99	>100
Entry rate (%)	5.013	85.067	10.357	4.298	0.1865	0.0742
Entry share (%)	1.508	41.163	23.656	26.301	4.573	4.307

TABLE 3. New firm entry by size class

Note: Entry rates and entry shares are time-averaged over the period between 2005 and 2013, and calculated as a proportion of the total number of firms. Figures in size classes correspond to the relative contribution of each size class to the *total* entry rate and *total* entry share.

	<5	5-9	10-49	50-99	>100
Entry rate (%)	6.557	2.817	1.558	0.710	0.368
Entry share (%)	5.088	2.743	1.394	0.694	0.181

TABLE 4. New firm entry by size class

Note: Entry rates and entry shares and time-averaged over the period between 2005 and 2013, and calculated as a proportion of the number of firms in a given size class.
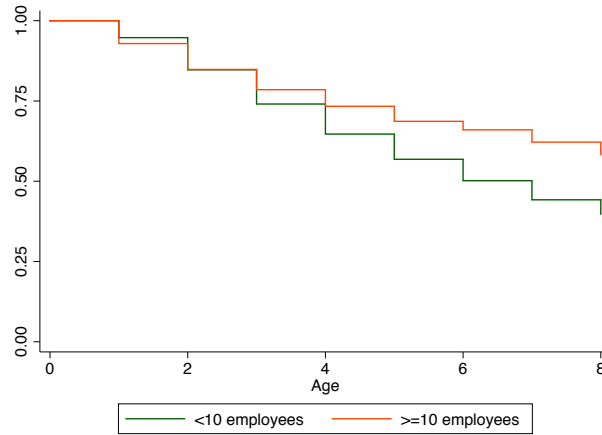
FIGURE 2: Kaplan-Meier survival function by number of employees at birth.

Figure 2 shows survival rates of new firms by distinguishing between firms with less than 10 employees at birth and firms with at least 10 employees at birth. Survival rates of firms with at least 10 employees are considerably higher than of their counterparts after the third year of life. Moreover, the difference in survival rates of the two groups seems to widen with the age of firms. This result is in line with the industrial organizational literature on firm survival that states that large firms experience higher survival probabilities than their smaller counterparts.

New firm dynamics over the business cycle

A strand of the industrial organization literature on market dynamics pinpoint that periods of high firm creation follow periods of relatively depressed conditions because unemployed individuals are more likely to create new firms than employed ones (see Highfield and Smiley (1987) and Evans and Leighton (1989)). An alternative strand of this literature posits that firm entry is pro-cyclical, meaning that firm creation is particularly important during good times because profit opportunities are greater and, therefore, new firms are more likely to survive. In this section we study the behavior of firm creation according to aggregate macroeconomic conditions.

Figures 3 and 4 depict entry rates and employment shares by firm size and real GDP growth rates, respectively. We follow Mata (1996) and consider real GDP growth lagged by one period because firm creation at time t is expected to respond to GDP growth registered in the previous year $t-1$. At first glance, entry rates and employment shares seem to respond to macroeconomic conditions in a pro-cyclical fashion in the case of the smaller firms. In turn,
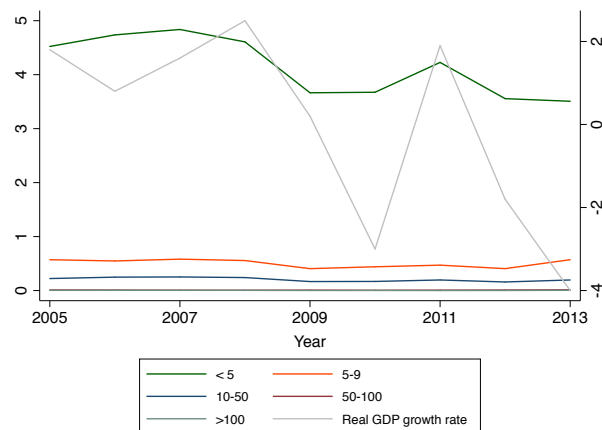
FIGURE 3: Entry rates by size class and real GDP growth rate.

Notes: Entry rates by size class and real GDP growth rate (rhs scale), in percentage. Real GDP growth rates are lagged by one year. Source for real GDP growth rate: Eurostat.
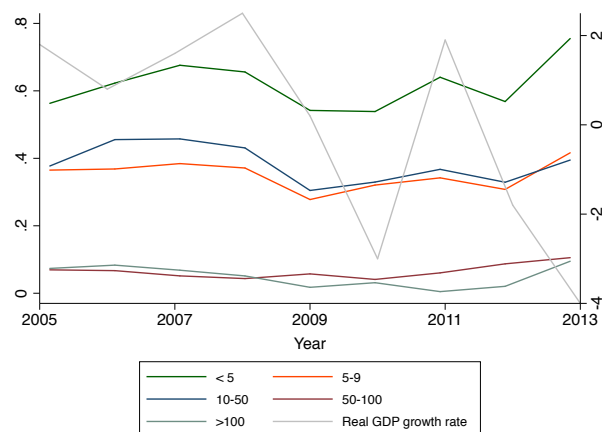

FIGURE 4: Entry rates by size class and real GDP growth rate.

Notes: Employment shares by size class and real GDP growth rate (rhs scale), in percentage. Real GDP growth rates are lagged by one year. Source for real GDP growth rate: Eurostat.

no pattern can be found in the case of larger firms. These results are in line with the findings of Mata (1996), who show that small firms are created mostly when aggregate conditions are more favorable. Empirical evidence for the U.S. also shows that firm entry is less common in recessions and that in general new firms are smaller in bad times (see Moreira (2015)).
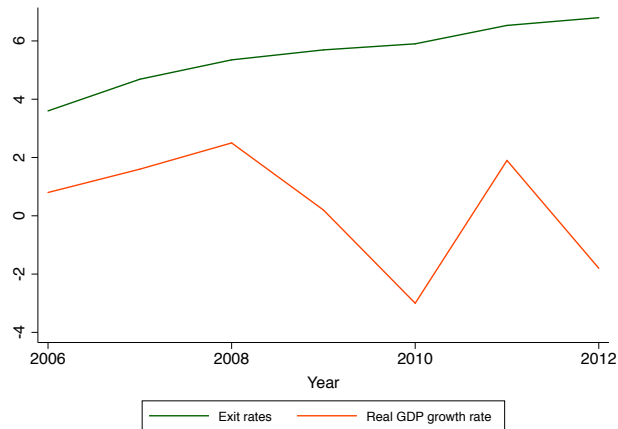
FIGURE 5: Entry rates by size class and real GDP growth rate.

Notes: Exit rates and real GDP growth rate, in percentage. Real GDP growth rates are lagged by one year. Source for real GDP growth rate: Eurostat.

The empirical literature on new firm survival documents that macroeconomic conditions do matter for firm survival (see Geroski *et al.* (2010), Boeri and Bellmann (1995), and Ilmakunnas and Topi (1999)). Figure 5 shows the behavior of exit rates over the business cycle. In general, it seems that exit rates have increased steadily over the sampling period, and that periods of economic recovery were not followed by lower exit rates[6].

Conclusions

Newly created firms are an important driver of innovation and job creation. However, new firms fail at a significant rate. In this study we use a comprehensive dataset that allows us to identify firms at birth and follow them over their lives. We analyze firm creation and firm survival, exploring heterogeneity at the sector of economic activity level and size class. Furthermore, we study the behavior of firm creation over the business cycle.

The results suggest that entry rates are fairly high but represent a small share of the total sales in a given sector of economic activity, meaning that new firms are in general much smaller than their incumbent counterparts.

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6. The analysis of exit rates over the business cycle starts only in 2006 because IES information started to be collected in 2006. Even though the report with information regarding 2005 was also taken into consideration in the remaining analysis, exit rates in 2005 are most likely biased because data for 2005 was collected in 2006.

This result is corroborated by the low employment shares of new firms. These findings suggest that new firms play a limited role in shaping industry structure and industry performance.

The results also indicate that a considerable fraction of new firms fail in their initial years of life and about only 41 percent of new firms survive throughout the sampling period. These high firm mortality rates are independent of the age cohort. Furthermore, we document that entry rates for smaller firms seem to be pro-cyclical.

It is important to highlight that the aim of this study is a descriptive one and no causal effects should be attempted based on this analysis.

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