Firm Entry and Survival in the Spanish Manufacturing and Service Industries

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An important feature of industrial markets is the intense turnover due to the high number of entrants and exits, particularly with regard to small firms. Many new entrants are victims of selection processes that create barriers to survival. This study provides an overview of two important aspects of industrial dynamics in Spanish manufacturing and service firms between 1994 and 2008: the market turnover and the determinants of survival during the first years from a cohort of firms created in 1994. The semiparametric results show that the likelihood of a firm to fail increases in R&D intensive sectors and it decreases when the price-cost margins are high. Related with firm characteristics, firm size and growth of the surviving firms increase the likelihood of survival of the firms belonging to the cohort during their infancy.

This paper is part of a research realised with the financial support of Ministry of Innovation and Science in the project ECO2009-08735 and the Consolidated Group of Research 2009-SGR-907. We are grateful to Verònica Gombau-Bertomeu for her research support. The usual disclaimer applies.

This article has been originally published as: Agustí Segarra i Blasco, Mercedes Teruel Carrizosa (2007): Creación y supervivencia de las nuevas empresas en las manufacturas y los servicios, Economía Industrial, 47-58

1. Introduction

Spain experienced an intense industrial dynamics during the period 1994 to 2008. For instance, respectively 135,339 and 750,387 firms where created in the Spanish manufacturing and service industries. In addition, the average gross entry rates over the period were equal to 7.02% and 8.33% for manufacturing and services; gross exit rates amounted to 7.51% and 6.84% respectively for the manufacturing and services, and turnover rates –entries and exits- were equal to 13.87% for manufacturing and 15.85% for services. Firm turnover therefore results an important phenomenon in the Spanish economy in recent years.

Many new entrants exit the market very early. The main reason is that during the early years, new firms face high hazard risk. Thus the number of exits is large during the initial period. The survival likelihood of a cohort of new entrants is, after six years, 54.27% in the manufacturing sector and 51.88% in the service sector. This means that during the first six years almost half the cohort firms exited. Therefore, firm turbulence and market selection mechanisms are two important elements of industrial dynamics. This paper provides empirical evidence on firm turnover and the determinants of new entrants' survival likelihood for Spanish manufacturing and service sectors.

Recently, a number of studies has examined the sector- and firm-level determinants of firm survival in the manufacturing sector. The evidence shows that the firm survival likelihood varies over time. When firms survive beyond the critical period of infancy, the survival likelihood increases. Moreover, the initial firm size and external conditions are factors to consider when analyzing firm trajectory. For instance, an intensive technologically or innovative environment may have a negative effect on the survival likelihood (Segarra and Callejon, 2002; Audretsch et al., 2000), but those firms that struggle to invest in innovative activities may increase their survival likelihood (Esteve et al., 2004; Cefis and Marsili, 2005). The role of services in firm turnover has not been extensively considered despite its important role.

This paper provides empirical evidence on the survival likelihood of new firms and the determinants of firm survival considering the sector, cohort and firm characteristics. Furthermore, we analyse the factors affecting firm survival in manufacturing and service industries from a single source of statistics: the Directorio Central de Empresas (DIRCE) developed by the Spanish National Statistical Institute since 1994. Our results show that the hazard risk decreases during the firm' infancy but sector characteristics implies a variation of entrants' ability to survive between manufacturing and service industries.

The structure of the paper is as follows. The second section highlights the relationship between turbulence and firm survival. The third section examines the empirical Spanish evidence using the DIRCE database. The fourth section shows the determinants of firm survival. Finally, the fifth section presents the most relevant conclusions.

2. Firm entry, survival and innovative environments

In recent years a growing number of researchers have examined the factors determining industrial dynamics and market evolution. Most studies have concentrated attention on three key issues: firm turbulence -entry and exit of firms-, the learning processes, selection and survival of new firms, and, finally, firm growth and market structure. This section provides a brief overview of the first two issues representing a puzzle of industrial dynamics.

One of the most attractive features of industrial dynamics is the high market turbulence. The number of firms entering and exiting is very high in every period, yet the penetration rate of new firms is low. This phenomenon has always attracted the economists' attention, starting from Alfred Marshall (1920). He interprets the market evolution through the metaphor of the "forest", where young trees grow and displace gradually to larger, older trees. From this approach, the characteristics of entering and exiting firms differ and differences appear especially in the long-term. More recently, the availability of appropriate databases and the empirical evidence derived from data have shown that the speed and intensity of market turbulence is stronger than what the Marshallian approach would suggest. Firm turbulence indeed affects a large number of firms and the hazard risk in a new cohort is also high, especially during the firm infancy. In order to interpret industrial dynamics better, Audretsch (1995) proposes a second metaphor graphically called "conical revolving door" given the intense turnover among small firms. In this second scenario the displacement is simultaneous and, very often, firms exiting the market today are those that entered yesterday. This metaphor highlights the intense market selection process which mostly affects new firms.

Both metaphors interpret market turbulence from different approaches. In the first approach entries and exits are like two sides of a coin. In other words, forces that facilitate firm entry and growth are equal to those that force the exit of less efficient

firms. In the second approach, the relationship between entrants and exits is simultaneous, because not only new firms displace the other firms, but also inefficient exits create new opportunities for potential entrants. According to Fotopoulos and Spence (1998), in the first case the relationship between entrants and 'exiters' is symmetric, and in the second case it is simultaneous. Regarding Spanish manufacturing firms, Arauzo et al. (2007) find that firm entry causes a simultaneous displacement effect on incumbents that causes an immediate exit of firms. Empirical evidence confirms that entry of small firms is relatively easy, while entry of larger firms is more difficult and, more importantly, many small entrants exit the market (Bartelsman et al., 2005).

Recently, there is a growing interest to study the relationship between firm entry and exit due to market competition. Recent studies (Gerosky, 1995; Nickell, 1996; Blundell et al., 1999, Aghion et al., 2005) show how competition stimulates productivity growth because it leads incumbents to reduce their costs and to innovate (Boone, 2000). Aghion et al. (2005) have found an inverse U relationship between the level of market competition and productivity growth. Thus low levels of competition increase competitive pressures and encourage firms to increase productivity, but high levels of competition increases competitive pressure too much and discourages firms to improve productivity.

These intense competition and firm turbulence affects a large number of firms and increases the hazard rate suffered by new cohorts of firms, especially during the firm infancy. Audretsch's (1995) "conical revolving door" shows how the hazard risk is not indifferent to variables such as firm age and size. In this sense, Gerosky (1995) suggests several stylized facts observed in the empirical literature of most countries: i) a positive relationship between initial size and survival likelihood (Mata and Portugal, 1994; Dunne et al., 1989), ii) a positive relationship between firm age and its survival likelihood. As a consequence, small firms face up a higher hazard risk due to larger scale disadvantages. While entrants suffer a higher hazard risk because they know their real abilities through the passive learning process during the early years (Jovanovic, 1982) or developing new skills (Nelson and Winter, 1982; Ericson and Pakes, 1995). However, the link between firm age and survival likelihood is complex and presents an inverted U-shaped (Mata and Portugal, 1994; Mata et al., 1995) and even negative (Honjo, 2000) relationship.

Theoretical and empirical studies find linkages between firm entry and the existence of positive expectations for profits. But the uncertainty of the level of efficiency and the reaction of incumbents leads to the exit of a large number of inefficient firms. Firm entry and exit determine the subsequent industrial dynamics (Audretsch, 1997; Dunne et al., 1988).

However, the market environment largely determines firms' strategic capacity. An extensive theoretical and empirical literature has linked the likelihood of firm survival to entrepreneurial innovation capability. At a theoretical level, the contributions of Ericson and Pakes (1995) and Pakes and Ericson (1998) introduce the concept of "active learning" as opposed to Jovanovic's (1982) "passive learning". Furthermore, they incorporate heterogeneous patterns of firm investment in R&D. As a consequence, when firm age and environment change, the initial strategies are often inappropriate and firms should be able to adapt. Their results show that a high percentage of innovation and uncertainty are associated with a high hazard risk.

At empirical level, two types of studies emerge that relate innovation or R&D with survival likelihood. First, some studies relate the level of industry technological intensity with firm survival. In this sense, Gerosky (1995) provides evidence on how

firms in innovative sectors have a higher hazard risk. These results are consistent with Audretsch (1995) and Audretsch et al. (2000), yet their results are also conditional on firm age. That means that firms in the most innovative sectors show a lower survival likelihood during their infancy, but their survival likelihood is higher once they overcome this critical period. For Spain, Segarra and Callejón (2002) find a negative relationship between sectors' R&D intensity and firm survival likelihood. One explanation of tis result is the fact that technology-intensive environments require that firms have a higher adaptive capacity. Other authors such as Agarwal and Audretsch (1999) provide evidence on the relationship between the survival likelihood, the product life cycle and technological innovation. Their results show that in the initial stages of product life cycle with a low technological intensity, the survival likelihood is lower for small firms. While in the mature stages of the life cycle with a high technological intensity, small firms have equal opportunities to survive because they can access niche markets. This result is also in line with Costa et al. (2004) who find that firm entry and post-entry behaviour depends on the type of industrial activity, the size of the new firm and the stage in the product life cycle of this activity.

A second line of research is related to a firm's innovative effort and its survival likelihood. Concerning Spain, Esteve et al. (2004) show that firms performing R&D have better survival prospects than those that do not invest in R&D. More recently, Cefis and Marsili (2005) confirm the results of Esteve et al. After controlling for firm age and size, their results show a positive relationship between innovation at firm level and their survival likelihood.

Therefore, previous empirical evidence indicates the existence of a negative relationship between technology-intensive environments and survival likelihood. However, this relationship may be modified by increasing the firm's innovative activity, which is in line with Ericson and Pakes (1995) and Pakes and Ericson (1998). More recently, Santarelli and Vivarelli (2007) point out that entrants are rather heterogeneous with innovative entrepreneurs being found together with passive followers, over-optimist gamblers and even 'escapees' from unemployment. Nevertheless, few studies have compared firm behaviour in manufacturing and service industries. Obviously, the barriers to entry and survival in these industries are heterogeneous. This heterogeneity will affect the chances of survival and firms' willingness to remain in each market.

3. Firm turbulence: emprical evidence

Evidence from the DIRCE database shows that 13,010 new firms with employees entered in 1994 while 16,644 firms exited from the Spanish manufacturing sector in the same year. Therefore, the gross entry rate was equal to 8.21% and the gross exit rate was equal to 10.61%, while the turnover rate was equal to 18.82%. Moreover, there were 611,679 firms with employees in the service industries in 1994, of which 54,428 firms were new in the market and 68,907 firms exit. Therefore, in services the gross entry rate was equal to 8.90%, the gross exit rate was equal to 11.27%, and the turnover rate was equal to 20.17%.

However, the data offers evidence that the turnover rate tends to decrease in recent years. In particular, the turbulence of the manufacturing industries reduces from 18.82% in 1994 to 8.33% in 2008, while in services it falls from 20.17% in 1994 to 12.29% in 2008. Thus our evidence shows the following features: i) a high market turbulence, ii) a similarity in the magnitude of the entry and exit rates which vary depending on the economic cycle, iii) a low penetration of new firms. In other words, entrants generally have a size below the average market size and must spend a period of ten years before those new firms reach the average size of firms in the market (Gerosky, 1995).

Table 1. Firm turbulence rate in manufacturing and service sectors. Firms with employees. (1994-2008)

Manufactures (CNAE 15-36)

	Firms	Entrants	Exits	GER (%)	GXR (%)	TR (%)	NER (%)
1994	156,925	13,010	16,644	8.21	10.61	18.82	-2.32
1995	158,990	14,243	15,269	8.96	9.60	18.56	-0.65
1996	158,610	11,745	10,309	7.40	6.50	13.90	0.91
1997	152,056	11,759	8,852	7.73	5.82	13.55	1.91
1998	155,928	12,709	10,312	8.15	6.61	14.76	1.54
1999	159,444	10,195	10,365	6.39	6.50	12.89	-0.11
2000	158,248	14,990	12,597	9.47	7.96	17.43	1.51
2001	162,761	15,176	12,822	9.32	7.88	17.20	1.45
2002	166,579	8,787	9,838	5.27	5.91	11.18	-0.63
2003	166,512	8,100	9,321	4.86	5.60	10.46	-0.73
2004	166,634	7,564	7,464	4.54	4.48	9.02	0.06
2005	164,052	7,061	8,167	4.30	4.98	9.28	-0.67
2006	162,471	6,199	8,275	3.82	5.09	8.91	-1.28
2007	160,686	5,904	7,336	3.67	4.57	8.24	-0.89
2008	158,576	5,758	7,451	3.63	4.70	8.33	-1.07

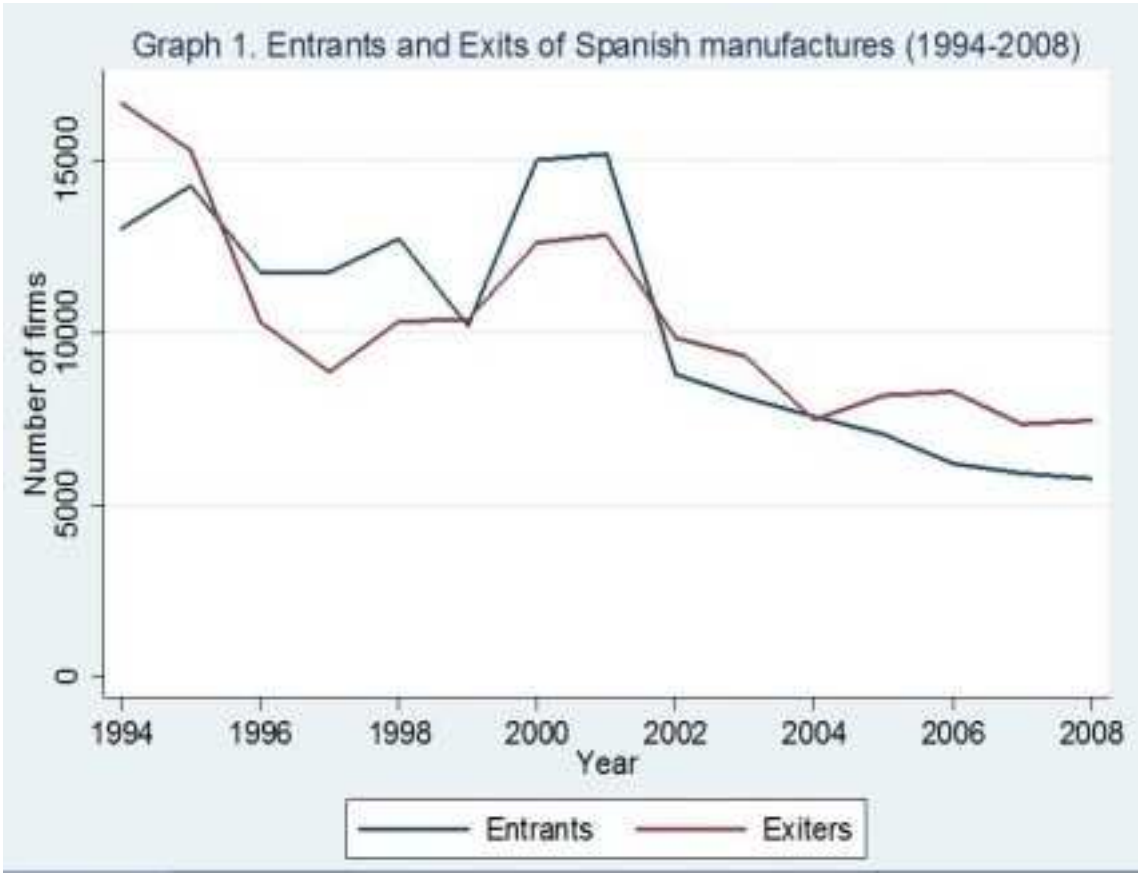
Services (CNAE 50-74)

	Firms	Entrants	Exits	GER (%)	GXR (%)	TR (%)	NER (%)
1994	611,679	54,428	68,907	8.90	11.27	20.17	-2.36
1995	637,513	57,207	56,667	8.97	8.89	17.86	0.08
1996	663,048	66,530	48,702	10.03	7.35	17.38	2.69
1997	685,217	69,066	47,771	10.08	6.97	17.05	3.11
1998	711,693	73,825	55,181	10.37	7.75	18.13	2.62
1999	737,555	59,528	58,066	8.07	7.87	15.94	0.20
2000	739,694	59,542	58,066	8.05	7.85	15.90	0.20
2001	771,694	60,514	61,533	7.84	7.97	15.82	-0.13
2002	796,817	57,492	61,349	7.22	7.70	14.91	-0.48
2003	832,746	60,827	56,097	7.30	6.74	14.04	0.57
2004	889,522	67,435	46,782	7.58	5.26	12.84	2.32
2005	920,827	63,993	56,700	6.95	6.16	13.11	0.79
2006	961,575	66,220	56,095	6.89	5.83	12.72	1.05
2007	1,008,945	67,592	54,472	6.70	5.40	12.10	1.30
2008	1,033,586	63,576	63,448	6.15	6.14	12.29	0.01

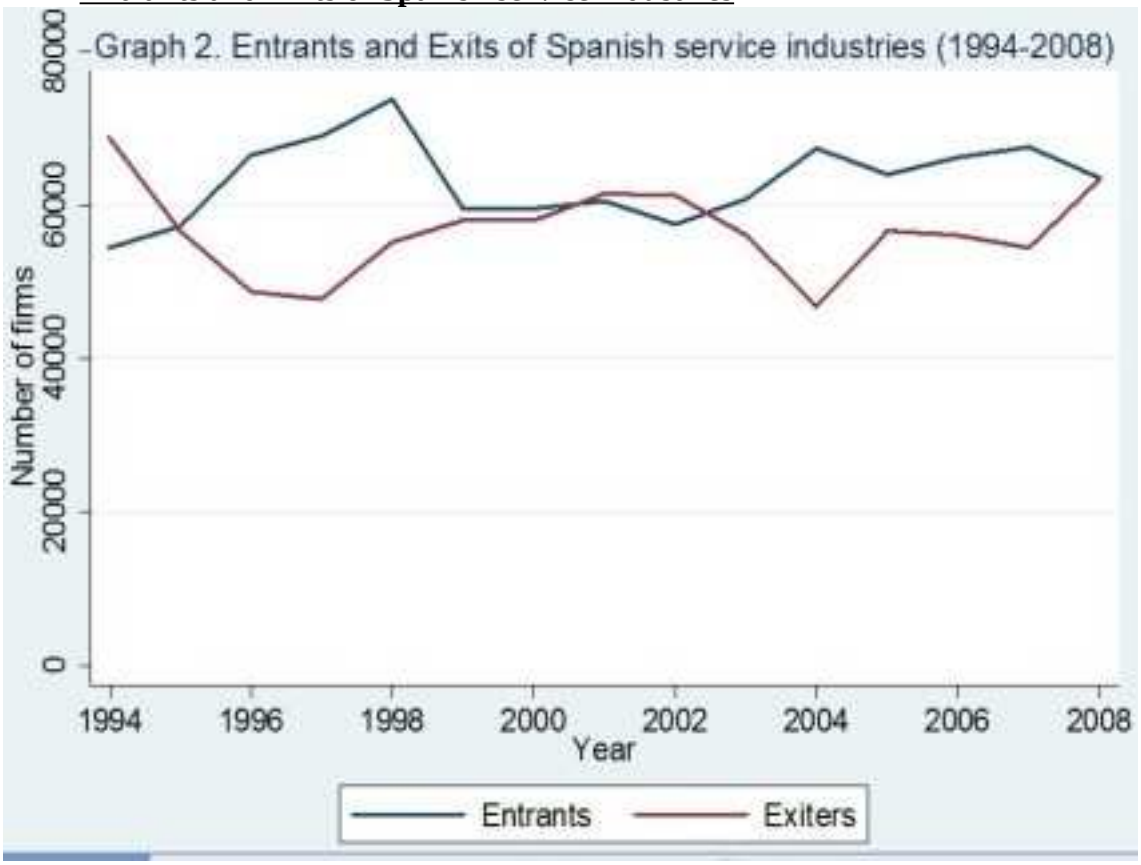
* GER represents the Gross Entry Rate, GXR is the Gross Exit Rate, TR es the Turbulence Rate (= GER+ GXR) and the NER represents the Net Entry Rate (= GER– GXR).
Source: Directorio Central de Empresas from Spanish National Institute of Statistics.

These results suggest that small differences exist in the industrial dynamics of both industries: the decrease in turbulence in service is lower than in manufacturing industries. Several reasons explain the greater turbulence of service firms: i) barriers to entry of firms in service are lower than the barriers in manufacturing industries; ii) the barriers to exit are lower in many service sectors which facilitate the exit of inefficient firms or when entrepreneurs are no longer willing to manage the firm; iii) for decades, the weight of service sectors has increased in the Spanish economy. Finally, the net entry rate of firms in recent years shows an evolution of the market, characterised by two features. On the one hand, there is a net loss of firms in the manufacturing sectors since 2002 (Graph 1). On the other hand, the net entry rate is slightly positive in the service sectors (Graph 2).

Entrants and Exits of Spanish manufactures



Entrants and Exits of Spanish service industries



As already mentioned, firms' entry usually depends on positive earnings expectations. In general, the number of entries is correlated with the economic cycle because earnings expectations are higher in periods of higher economic growth. Furthermore, the exit of firms usually presents a negative correlation with the business cycle. As a consequence, when economic growth is positive exit rate decreases and, therefore, its contribution to market turbulence is below the entry rate. In contrast, the exit rate increases, implying higher turbulence, when economic growth decreases.

Table 2 shows the correlation between the gross entry rate, the gross exit rate and annual GDP growth. The main results are as follows. First, a negative correlation emerges between gross exit rates and GDP growth. In other words, the number of exits in the market decreases when GDP increases. This pattern is identical in the manufacturing (with a correlation equal to -0.3997) and in service industries (with a correlation equal to -0.1782). Second, the relationship between entry rates and GDP growth also displays a negative relationship which is nearly identical for manufacturing (with a correlation equal to -0.4594) and service industries (with a correlation equal to -0.4564). Some differences however emerge across sectors. On the one hand, manufacturing industries show a higher correlation between gross exit rate and GDP growth. On the other hand, the simultaneous relationship between gross entry and exit rates is lower in the service (with a correlation equal to 0.5178) than in the manufacturing (with a correlation equal to 0.9887) sector.

However, during the last decade Spanish firms' structure has considerably changed. The number of manufacturing firms has decreased quite substantially the number of service firms has increased. Table 2 also shows the correlation between entry and exit rates and GDP growth. This shows highly remarkable differences between the manufacturing and service industries. First, during the period 1996-2001 GDP growth showed a highly intensive relationship with gross entry (with a correlation equal to 0.7401) and exit rates (with a correlation equal to 0.8984). This relationship changed to be negative after 2001 with gross entry (with a correlation equal to -0.8352) and exit rates (with a correlation equal to -0.8411).

Table 2. Correlation of the Percentages of Gross Entry Rate (GER), Gross Exit Rate (GXR) and GDP growth at constant prices. 1996-2008.

Manufactures

	1996-2008			**1996-2001**			**2002-2008**		
	GER	**GXR**	**GDP growth**	**GER**	**GXR**	**GDP growth**	**GER**	**GXR**	**GDP growth**
GER	1.0000			1.0000			1.0000		
GXR	0.9887	1.0000		0.7837	1.0000		0.9995	1.0000	
GDP growth	-0.4594	-0.3997	1.0000	0.7401	0.8984	1.0000	-0.8352	-0.8411	1.0000

Service industries

	1996-2008			**1996-2001**			**2002-2008**		
	GER	**GXR**	**GDP growth**	**GER**	**GXR**	**GDP growth**	**GER**	**GXR**	**GDP growth**
GER	1.0000			1.0000			1.0000		
GXR	0.5178	1.0000		-0.7153	1.0000		0.1160	1.0000	
GDP growth	-0.4564	-0.1782	1.0000	-0.5620	0.4534	1.0000	0.8207	0.3273	1.0000

Source: own elaboration from Spanish National Institute of Statistics and DIRCE.

Surprisingly, service industries show an opposite direction. First, during the period 1996-2001 GDP growth presents a negative relationship with gross entry rates (with a correlation equal to -0.5620) and a positive relationship with gross exit rates (with a correlation equal to 0.4534). Second, after 2001 GDP growth shows a positive relationship with gross entry (with a correlation equal to 0.8207) and exit rates (with a correlation equal to 0.3273). Thus, the constant Spanish economic growth has been accompanied by a changing industrial dynamics. The increase of service firms may be explain by an increase in producer services and also of services to final consumer.

This decrease in manufacturing firms may have consequences on economic growth. In that sense, Audretsch and Thurik (2004) and Carree and Thurik (2006) point out that there are three channels through which entrepreneurship may positively affect economic growth: increasing innovation and knowledge spillovers, increasing competition, and increasing diversity in sectors and firms. From this perspective, the Spanish economy seems to be loosing a potential capacity to grow. However, it may be expected that the fewer firms that enter into markets are more competitive and efficient.

4. Firm survival: Empirical evidence

This section presents empirical evidence about the evolution of the cohort of Spanish firms created during the year 1994. Our data allows us to follow the trajectory of each firm in the cohort until 1999. The analysis of firm survival likelihood with censored panel data have a long tradition in economics, both in the field of labour and industrial economics. Table 3 provides some statistics on the evolution of the cohort and some relevant indicators such as the survival likelihood and the hazard rate on an annual basis. The survival likelihood is the percentage of firms that remain at the end of each year divided by the number of firms operating initially in the cohort. The hazard rate indicates the probability that the a firm leaves the market at any given time.

The survival likelihood of a cohort of firms in year 't' indicates the percentage of firms that remain active in "t" in relation to the initial number of firms in the cohort, that can expressed as follows,

$$S(t) = \frac{Active\ \ firms\ \ in\ \ "t"}{Entrants\ \ \ in\ the\ initial\ \ period}$$

The probability that a firm exits the market during "t" is the hazard risk that this firm faces. If the variable time has a discrete dimension, then the hazard rate will have the following expression,

$$h(t) = \lim_{\Delta t \to 0} \frac{P(t \le T \le t + \Delta t | T \ge t)}{\Delta t} = \frac{f(t)}{S(t)}$$

where *h(t)* is the probability that a firm exits by time “t + Δt” conditional on having survived until “t”; *f(t)=dF(t)/dt* is the corresponding density function of the distribution of exits conditioned on the initial number of firms; *F(t)=Pr(T<t)* is the probability that firms reach a critical period “T” which is inferior to “t” and, finally, *S(t)=1-F(t)* is the survival function.

Table 3 shows that the cohort of manufacturing firms consisted in 13,010 new firms in 1994, but after one year 1,745 firms had already exited the market. The probability of exiting the market in 1995 was 13.41% and, therefore, the probability of remaining at the end of 1995 was 86.59% (100-13.41). At the end of 1999 there were only 7,603 firms operating. In other words, only a 54.27% of manufacturing firms from the initial cohort were still operating after six years. Regarding services, the initial cohort consisted in 54,428 firms, 16.48% of which exited the market in less than one year and the survival likelihood after six years was equal to 51.88%. In the previous section we

pointed out that service industries present larger turbulence than manufacturing industries. The life table shows that firms in the service industries suffer from a higher risk failure than those in the manufacturing industries.

During the initial period after entry the failure risk is high. In manufacturing industries the failure risk of entrants follows an inverted U shape. This result is in line with the results obtained in other countries (Germany, UK, USA, etc). In fact, the failure risk of firms is high during the first year of their life but is even greater during the second and third years. This phenomenon is described by some authors as the 'liability of the adolescence' and refers to the difficulties to adapt to the conditions of competition (Lopez and Bridge, 2006). For service industries the hazard rate presents a declining trend and shows that the first year is critical for entrants. The hazard rate during the first year reached 17.9%, significantly reduced the second year and increased again in the third year. Despite the higher failure risk of service firms, those service firms that survive at the end of the period face a similar failure risk than manufacturing firms.

Table 3 Life span of the cohort of entrants in 1994 for manufacturing and service industries

	Manufactures					
	Active firms	**Exits**	**Failure likelihood**	**Probability to survive**	**Survival likelihood**	**Hazard Rate**
1995	13,010	1,745	0.1341	0.8659	0.8659	0.1438
1996	11,265	1,548	0.1374	0.8626	0.7469	0.1476
1997	9,717	1,324	0.1363	0.8637	0.6451	0.1462
1998	8,393	790	0.0941	0.9059	0.5844	0.0988
1999	7,603	543	0.0714	0.9286	0.5427	0.0741
	Services					
	Active firms	**Exits**	**Failure likelihood**	**Probability to survive**	**Survival likelihood**	**Hazard Rate**
1995	54,428	8,968	0.1648	0.8352	0.8352	0.1796
1996	45,460	5,930	0.1304	0.8696	0.7263	0.1395
1997	39,530	5,326	0.1347	0.8653	0.6284	0.1445
1998	34,204	3,630	0.1061	0.8939	0.5617	0.1121
1999	30,574	2,338	0.0765	0.9235	0.5188	0.0795

Source: DIRCE

Life duration for manufacturing and service industries show that the life span of entrants differs according to sectors' characteristics such as economies of scale, technological intensity and barriers to entry and exit. However, recent studies not only consider the sectors' characteristics, but also individual factors that are shown to have a significant effect on firm survival. In particular, a relevant dimension of the survival likelihood during infancy is the initial firm size. The empirical literature has frequently shown that the survival of entrants is directly related to their size (Audretsch and Mahmood, 1995,; Mahmood 1992; Fotopoulos and Louri, 2000; Segarra et al., 2002). New findings indicate that the initial firm size is especially relevant in service industries in order to determine the life span of entrants.

Table 4 shows the survival rates of the cohort of entrants in 1994 according to their initial size. The first striking feature is the high percentage of small firms in the cohort: firms with less than 6 workers represent respectively 74.88% and 89.36% of total firms in the manufacturing and the service industries. A very small size is likely to limit the capacity to develop learning and adaptation processes that are of vital importance during firm infancy. In contrast, new firms with more than 50 workers represent only 0.76% of the total of manufacturing firms and 0.41% of service firms. These data indicate the asymmetrical nature of the cohorts of entrants, given the large percentage of smaller firms and the scarcity of larger firms.

Table 4 Survival likelihood of new firms according with inicial firm size

	Manufactures

	Size (1-2)	Size (3-5)	Size (6-9)	Size (10-19)	Size (20-49	Size (50 +)	All
after 1 year	0.8293	0.8911	0.9156	0.9095	0.8841	0.9394	0.8659
after 2 year	0.7159	0.7673	0.7851	0.7792	0.7795	0.8788	0.7469
after 3 year	0.6132	0.6628	0.7026	0.6606	0.6773	0.8081	0.6451
after 4 year	0.5529	0.6063	0.6385	0.5955	0.6045	0.7273	0.5844
after 5 year	0.5125	0.5693	0.5911	0.5385	0.5750	0.6465	0.5427
Average life	7,504	8,848	9,463	8,2249	8,993	11,230	8,205
Firms in the cohort	6.308	3.434	1.624	1.105	440	99	13.010
	Services						
	Size (1-2)	**Size (3-5)**	**Size (6-9)**	**Size (10-19)**	**Size (20-49**	**Size (50 +)**	**All**
after 1 year	0.8121	0.8790	0.9013	0.9074	0.8752	0.9554	0.8352
after 2 year	0.7014	0.7702	0.8001	0.7998	0.8039	0.8973	0.7263
after 3 year	0.6029	0.6750	0.6974	0.6940	0.7358	0.8259	0.6284
after 4 year	0.5348	0.6087	0.6345	0.6473	0.6742	0.7545	0.5617
after 5 year	0.4916	0.5645	0.5972	0.6085	0.6337	0.7009	0.5188
Average life	7.087	8.749	9.602	9.897	10.604	12.997	7.658
Firms in the cohort	37,602	11,040	3,272	1,673	617	224	54,428

Note: the average life of the cohort is estimated through an exponential distribution.
Source: DIRCE

Firm survival rates widely differ according to firm size. Small entrants face lager risks and enjoy lower survival likelihood after their first year of life. After six years, smaller firms have a cumulative survival rate of 51.25%, while firms with more than 50 employees have a cumulative survival rate of 64.65%. The firm failure risk is especially high for micro-firms during the early years. For instance, in manufacturing industries, the percentage of entrants with less than three workers exiting the market during the first year amounts to 17.07%.

Firm size determines even more strongly the trajectory of service firms. Entrants with less than 3 workers reported a cumulative survival rate of 49.16% after six years of life, against 70.09% for entrants with more than 50 employees. As a consequence, entrants in service industries with a larger scale are more likely to survive and adapt to market conditions than smaller entrants due to a disadvantage in terms of operational scale.

Size affects not only survival but also the duration of firms in the cohorts. Assuming that the average duration of entrants in the cohort follows an exponential distribution, we find important differences in average firm duration. Smaller manufacturing firms have an average life of 7.5 years while the average life of those with more than 50 workers is higher than 11 years, the average life of the cohort being 8.2 years. In contrast, the average life of small service firms is 7 years and that of firms with more than 50 employees is almost thirteen years, the average life duration of the whole cohort being 7.6 years. Hence the initial size has a strong incidence on the survival likelihood of all firms although the effect on duration is different in the two considered sectors.

A deeper look into sectors, using a more detailed classification according to the CNAE (National Classification of Economic Activities) shows that the survival of entrants differs according to sectors' characteristics (Annex Table 1). In line with the international empirical evidence, entrants go through a critical period of infancy in which half of entrants disappear. The implications are numerous. First, entrants are not sufficiently trained to adapt to the market because: i) there are barriers to survive; ii) they make errors in the estimation of their efficiency levels; iii) the strategies adopted by incumbents and entrants. Secondly, the exit of entrants is followed by new entries

into the market. This suggests that entries and exits are part of a process in which a large number of entrants replace inefficient firms which may be relatively young.

The empirical evidence shows that there are significant differences between sectors such as *Manufacturing of office machinery and computers* (CNAE-30) and *Insurance and private pension plans* (CNAE-66) in which the survival rate does not exceed 20%. While in sectors such as *Sales, maintenance and repair of vehicles* (CNAE -50) and *wood and cork industry* (CNAE -20) the survival rate exceeds 60%.

We therefore provide insights on the characteristics of Spanish industrial dynamics, including a high turnover of existing firms, a high failure risk during infancy, and a high capacity of survivors to adapt to competitive environments and grow. Recent works on firm growth in Spain show that small young firms, which are to able to survive, obtain higher growth rates than larger firms (Calvo, 2006; Teruel, 2009). However, the sectors' characteristics generate different barriers to entry and to survival of incumbents and potential entrants.

5.- Determinants of entrants' firm survival

In recent years, a large number of studies has examined the factors that affect the trajectory of entrants at both sector and individual levels. Audretsch and Mahmood (1994) have dealt with sectoral and individual determinants that affect the trajectory of U.S. manufacturing firms. Their results show that the failure risk is negatively related to firm size and that firms are more likely to survive in industries that grow at high rates and in industries less intensive in R&D and innovation. For Portuguese manufacturing industries, Mata and Portugal (1994) find evidence that the failure risk of entrants is inversely related to their initial size, the number of establishments of the firm and the sector's growth, while it is positively related to the gross entry rate in the sector. Following this literature, this section addresses a set of factors affecting the survival likelihood of entrants of the 1994 cohort. The econometric results distinguish between manufacturing and service industries.

The failure risk that firms face during their life trajectory varies between sectors and individual characteristics. As a consequence, the hazard function depends on a vector of variables that incorporates both types of characteristics. In order to estimate the relationship between the risk function and the exogenous variables, Cox (1972) proposed a proportional hazard model, where the hazard function is defined by a multivariate model that includes a vector *Z* of independent variables. The relationship between the observed variables and the lifetime of the firms can be expressed by the specification proposed by Kiefer (1988),

$$h(t|z) = h_0(t)\exp(Z\beta)$$

where *h(t)* is the hazard rate of individual firm in period t, *Z* is a vector of exogenous variables and β is a vector of parameters, $h_0(t)$ is an unknown hazard function subject to *Z = 0* (*baseline hazard function*). The Cox model (1972) provides a likelihood estimator that estimates the parameters β without estimating h_0.

After taking logarithms and incorporating independent variables, we estimate the following Cox regression,

$$h(t) = h_0(t) + \beta_1 SectoralGrowth + \beta_2 R\&D + \beta_3 SizeEntrants +$$
$$+ \beta_4 Mobility + \beta_5 SmallEntrants + \beta_6 MES + \beta_7 GER + \beta_8 PCM + \mu_t$$

where the dependent variable *h(t)* is the life span of a firm expressed in logarithms; $h_0(t)$ is the *baseline hazard function*; *SectoralGrowth* is the cumulative average annual rate of added value at sector level; *R&D* is the investment in R&D over sales;

SizeEntrants is the initial firm size; *Mobility* indicates the percentage of businesses that survive in 1998 and changed their size during the period 1994-1998, *SmallEntrants* is the percentage of small firms in the 1994 cohort with less than six workers; *MES* is the minimum efficient size according to the criteria established by Comanor and Wilson (1967); *GER* is the Gross Entry Rate of each sector; *PCM* is a proxy of price-cost margin expressed by industry sales minus intermediate consumption and salaries, and divided by sales; and μ_t is a random error.

The determinants of firm survival that are included in our econometric model can be distributed in three groups of explanatory variables: sector variables, variables related to the cohort, and individual variables. Sector variables describe the characteristics of the industrial environment in which firms operate (*SectoralGrowth*, *R&D*, *MES* and *PCM*). The variables of the cohort reflect some outstanding features of the cohort to which the firm belongs (*SmallEntrants*, *GER*, *Mobility*). Finally, the individual variables define the firm attributes (*SizeEntrants*).

Results obtained for Spanish manufacturing and service industries in the Cox regressions are presented in Table 5. The first estimation includes all explanatory variables except for *GER* and *PCM*. The second estimation incorporates *GER* in the sector where the firm operates. This variable refers to the sector's turbulence and allows us to measure the impact of firm turnover on the survival likelihood of entrants. Finally, the third estimation incorporates *PCM* and *GER* simultaneously. Results are generally significant and often vary between manufacturing and service industries.

Concerning manufacturing firms, the sector's growth rate presents a statistically significant positive sign in the first two estimations indicating that its impact on the hazard rate is positive. In other words, its impact on the survival likelihood of entrants is negative. Although it may seem paradoxical that entrants in sectors with high growth face greater risks during their consolidation, these results are consistent with those obtained for U.S. manufacturing by Audretsch et al. (2000) and for Spanish manufactures by Segarra and Callejón (2002). Growing markets offer greater opportunities for entrants, but they are often over-optimistic and underestimate their limitations to achieve market share. Gort and Klepper (1982) point that growing industries are typical in earlier stages of the industry life cycle when the requirements of adapting to a changing environment and hence the risk of failure are high. Thus we can expect to find a negative relationship between the sector's growth and the survival likelihood.

In contrast, Mata et al. (1995) argue that competition is less intense and entrants have fewer difficulties to survive after their entrance in markets with high growth rates. Similarly, Mata and Portugal (1994, 1999) and Audretsch (1995a, b) explained the positive relationship between the sector's growth and the survival likelihood by good demand conditions which lead to an increase in the price-cost-margins. These results are in line with our evidence for service industries, since the failure risk reduces significantly in the growing markets.

Table 5. Determinants of failure risk in manufactures and services (standard deviation in brackets)

	MANUFACTURING		
SectoralGrowth	0.0058	0.0064	0.0025
	(0.0034)**	(0.0036)**	(0.0039)
R&D	0.0089	-0.0038	-0.0085
	(0.0019)*	(0.0165)	(0.0165)
Size entrantes	-0.0903	-0.0903	-0.0902
	(0.0117)*	(0.0117)*	(0.0117)*
Mobility	-0.0136	-0.0138	-0.0159
	(0.0035)*	(0.0035)*	(0.0036)*
SMEs	-0.0089	-0.0088	-0.0070

	(0.0020)*	(0.0020)*	(0.0021)*
MES	-0.0903	-0.0440	-0.0500
	(0.0117)*	(0.0310)	(0.0320)
GER 1994		-0.0026	-0.0070
		(0.0062)	(0.0064)
PCM			-0.0146
			(0.0060)*
N	13.010	13.010	13.010
-2Log-likelihood	110077.934	110077.750	110071.736
χ^2	163.931	163.965	169.727
	SERVICES		
SectoralGrowth	-0.0435	-0.01770	-0.0217
	(0.0023)*	(0.0032)*	(0.0032)*
R&D	0.2017	0.0961	0.0567
	(0.0213)*	(0.0285)*	(0.0282)**
Size entrantes	-0.1447	-0.1456	-0.1466
	(0.0079)*	(0.0079)*	(0.0079)*
Mobility	0.0164	-0.0016	-0.0145
	(0.0024)*	(0.0028)	(0.0032)*
SMEs	-0.0225	0.0107	0.0607
	(0.0042)*	(0.0054)**	(0.0072)*
MES	0.0110	0.0040	0.0120
	(0.0010)*	(0.0010)*	(0.0010)*
GER 1994		0.0610	0.0810
		(0.0052)*	(0.0055)*
PCM			-0.0103
			(0.0009)*
N	54,428	54,428	54,428
-2Log-likelihood	558839.394	558695.521	558568.149
χ^2	750.360	898.414	1026.310
Coefficients statistically significant at (*) 1%, (**) 5% and (***) 10%.			

The impact of industrial technological intensity on entrants' hazard rate presents ambiguous results in the manufacturing sector. Investment in R&D has a significant positive effect in the first estimate. This result shows that more R&D intensive sectors are more difficult environments for the survival of entrants, at least during their infancy. Results are even more significant in the service sector, where the most R&D-intensive markets appear to have larger barriers to survival.

Initial firm size has a significant direct effect on the ability to survive in markets, both in manufacturing and in service industries. A larger initial firm size reduces the risk that entrants face during their infancy, especially in the service sectors. When the firm enters the market with a certain scale, its ability to access external sources of funding increases and it finds it easier to adapt to competitive market conditions, substantially reducing the failure risk (Audretsch and Mahmood, 1995).

Firm mobility indicates that the ability to grow during firm infancy reduces the failure risk of manufacturing firms in the 1994 cohort, but results are more ambiguous regarding service firms. A high mobility is often interpreted as the result of dynamic learning processes after firm's entrance (Jovanovic 1982; Hopenhayn, 1992; Pakes and Ericson, 1998). Another factor for mobility is the influence of market structure and ex-ante unknown MES with which entrants must efficiently operate in the market (Caves, 1998). Achieving an optimum size during the consolidation phase is crucial for manufacturing firms, as shown in our results. However, contrary to our expectations, the presence of micro firms reduces the failure risk in the cohort of manufacturing firms, but it has ambiguous results for service industries.

Concerning service industries, minimum efficient size is inversely related to survival likelihood, while the minimum efficient size is not a barrier to manufacturing firms'

survival. The negative sign of the parameter MES in the manufacturing sector suggests that small entrants do not face higher failure risks in industries with large economies of scale than in industries with low economies of scale.

Regarding the last two determinants of firm survival, results are unambiguous and identical in manufacturing and services. On the one hand, the market turbulence measured by the gross entry rate is directly related to the failure risk of entrants. This result is significant for service industries but not for the manufacturing industries. Previous studies, such as Honjo (2000) or Mata and Portugal (1994, 1999), find a negative impact of the gross entry rate on the firm survival likelihood. On the other hand, entrants find fewer difficulties to continue operating during the initial phase of consolidation and growth in sectors with high price-cost margins of established firms.

6. Conclusions

The turbulence of Spanish manufacturing and service firms is an important dimension of industrial dynamics. During the period 1994-2008, the turnover rate of manufacturing industries shows a downward trend. In other words, entrants and exits recorded a lower degree of turbulence over time. Turbulence in service firms is high during the period but in recent years, despite high Spanish economic growth, entries and exits of firms have been more stable. However, the fall in gross entry and exit rates is different in nature in the manufacturing and in the service industries.

Regarding the manufacturing industries, the 2002-2008 period is characterised by a substantial reduction in firm creation and destruction and an intense process of concentration. The manufacturing sector currently has a large number of medium and large firms that have close links with international markets. Industrial dynamics are explained by different factors in the service industries. First, the capacity of the Spanish economy to create new service firms over the period 2002-2008 is higher than the number of exits. Second, the fall of gross entry and exit rates is explained by the large growth in the number of service firms. The Spanish economy had 611,679 service firms in 1994, while at the end of year 2008 the number of service firms has increased up to 1,033,586. The increase in the number of Spanish service firms has been outstanding during the period 1994-2008, while the turnover rate and the number of active firms decreased considerably in the manufacturing sector.

Differences in firm turnover are also related to the sensitivity of entries and exits to the economic cycle. Exits display a clear countercyclical behaviour and entrances show a weak relationship with the economic cycle in the manufacturing sector. In contrast, exits display a negative relationship with the economic cycle and entries present a pro-cyclical behaviour in the service sector.

Results are unambiguous regarding the survival of entrants belonging to the 1994 cohort. The failure risk is high during the firm infancy: the failure rate displays an inverted U-form in the manufacturing sector and a constant downward trend in the service sector. After six years only 54.27% of manufacturing firms and 51.88% of service firms remained in the market. The early years of firms' life is subject to an intense selection process. Firms which manage to overcome the 'liability of the adolescence' and continue operating after six years have a high survival likelihood and reach the average firm size of their sector after some years. These results are in line both with the noisy selection models in the tradition of Jovanovic (1982) and with the results of Mata and Portugal (1994, 1999) concerning the Portuguese manufacturing sector.

Moreover, the survival likelihood considerably varies according to sector's and individual characteristics. The initial firm size is a key factor to reduce the failure risk during the consolidation phase of entrants. The survival likelihood reduces for R&D

intensive sectors. In contrast, the survival likelihood increases when entrants are able to adjust their size to sector's characteristics and when operating margins are high.

Finally, our results confirm the international empirical evidence and help to understand the effects of some determinants of firm survival. The global trend of high investment in technological and innovative markets will increase the difficulties of new entrants' survival, especially those with small initial firm size, financial constraints and limitations to adapt and learn the new rules of competition. In this context, public policies can facilitate the entrance of new firms and their adaptation to new competitive environment by removing barriers of access to financial sources, technology and human capital. However, since entrants are heterogeneous and may make "entry mistakes," policy incentives should be highly selective, favouring nascent entrepreneurs and providing a suitable environment to learn, survive and grow.

Agarwal. R. and Audretsch. D. (1999): "Does start-up size matter?: The impact of the life cycle and technology on firm survival". Occasional Papers. Institute for Development Strategies. Indiana University.

Aghion. P.. Bloom. N.. Blundell. R. Griffith. R. and Howitt. P. (2005): "Competition and Innovation: An Inverted-U Relationship". The Quarterly Journal of Economics. 120: 701-728

Arauzo. J. M.. Manjón. M.. Martín. M. and Segarra. A. (2007): "Regional and Sector-specific Determinants of Industry Dynamics and the Displacement–replacement Effects". Empirica. 34(2): 89-115.

Audretsch. D. (1995): "Innovation. growth and survival". International Journal of Industrial Organization. 13 (4): 441-457.

Audretsch. D. (1997): "Technological regimes. industrial demography and the evolution of industrial structures". Industrial and Corporate Change. 6 (1): 49-82.

Audretsch. D. and Mahmood. t. (1994): "The rate of hazard confronting new firms and plants in U.S. manufacturing". Review of Industrial Organization. 9(1): 41-56.

Audretsch. D. and Mahmood. T. (1995): "Firm Survival: New Results Using a Hazard Function". The Review of Economics and Statistics. 77(1): 97-103.

Audretsch, D. B. and A. R. Thurik (2004), 'A model of the entrepreneurial economy,' International Journal of Entrepreneurship Education, 2, 143–166.

Audretsch. D.. Houweling. P. and Thurik. A.R. (2000) 'Firm Survival in the Netherlands'. Review of Industrial Organization. 16. 1–11.

Bartelsman, E.: Scarpetta, S. and Schivardi, F. (2005): "Comparative analysis of firm demographics and survival: evidence from micro-level sources in OECD countries", Industrial and Corporate Change, 14(3):365-391.

Blundell. R.. Griffith. R. and Van Reenen. J. (1999): "Market Share. Market Value and Innovation in a Panel of British Manufacturing Firms". Review of Economic Studies. 66. 529-554.

Boone. J. (2000): "Competition". Center for Economic Research Discussion Paper No.2000-104. Tilburg University. Netherlands.

Calvo. J.L. (2006): "Testing Gibrat's Law for Small. Young and Innovating Firms". Small Business Economics. 26(2): 117-123.

Carree, M. and A. R. Thurik (2006), 'Understanding the role of entrepreneurship for economic growth,' in M. Carree and A. R. Thurik (eds), The Handbook of Entrepreneurship and Economic Growth. Elgar: Cheltenham, pp. ix–xix.

Caves. R. E. (1998): "Industrial Organization and New Findings on the Turnover and Mobility of Firms". Journal of Economic Literature. 36 (4): 1947-1982.

Cefis. E. and Marsili. O. (2005): "A matter of life and death: innovation and firm survival". Industrial and Corporate Change. 14(6):1167-1192.

Comanor. W.S. and Wilson. T. A. (1967): “Advertising Market Structure and Performance”. The Review of Economics and Statistics. 49(4): 423-440.

Costa, M.T.; Segarra, A. and Viladecans, E. (2004): “The Location of New Firms andthe Life Cycle of Industries”, Small business Economics, 22: 265–281.

Cox. D.R. (1972): “Regression Models and Life-Tables”. Journal of the Royal Statistical Society. Series B (Methodological). 34(2): 187-220.

Dunne. T.. Roberts. M.J. and Samuelson. L. (1988): “Patterns of firm entry and exit in us manufacturing industries”. RAND Journal of Economics. 19:495–515.

Dunne. T.. Roberts. M.J. and Samuelson. L. (1989): “The Growth and Failure of U. S. Manufacturing Plants”. The Quarterly Journal of Economics. 104 (4): 71-698.

Ericson. R. and Pakes. A. (1995): “Markov-perfect industry dynamics: a framework for empirical work”. Review of Economic Studies. 62:53–82.

Esteve. S.. Sanchis. A. and Sanchis. J.A. (2004): “The Determinants of Survival of Spanish Manufacturing Firms ”. Review of Industrial Organization. 25: 251-273.

Fotopoulos. G. and Spence. N. (1998): ‘Spatial Variations in New Manufacturing Plant Openings: Some Empirical Evidence from Greece’. Regional Studies 33(3). 219–229.

Fotopoulos. G. and Louri. H. (2000): “Determinants of Hazard Confronting New Entry: Does Finantial Structure Matter?”. Review of Industrial Organization. 17: 285-300.

Gerosky. P.A. (1995): “What do we know about entry?”. International Journal of Industrial Organization. 13:421–440. 1995.

Honjo. Y. (2000): “Business failure of new firms: an empirical analysis using a multiplicative hazard function”. International Journal of Industrial Organization. 18:557–574.

Hopenhayn. H.A. (1982): “Entry. Exit. and firm Dynamics in Long Run Equilibrium”. Econometrica. 60 (5): 1127-1150.

Jovanovic. B. (1982): “Selection and the evolution of industry”. Econometrica. 50: 649–670.

Kiefer. N.M. (1988): “Economic Duration Data and Hazard Functions”. Journal of Economic Literature. 26(2): 646-679.

López. P. and Puente. S. (2006): “Business demography in Spain: determinants of firm survival”. Documentos de Trabajo. Banco de España.

Mahmood. T. (1992): “Does the Hazard Rate for New Plants Vary Between Low- and High-Tech Industries?”. Small Business Economics. 4: 201-209.

Marshall. A. (1920): Principles of Economics. Macmillan. New Cork.

Mata. J. and P. Portugal (1994): “Life duration of new firms”. The Journal of Industrial Economics. 42:227–245.

Mata, J. and P. Portugal, 1999, Technology Intensity, Demand Conditions, and the Longevity of Firms, in D.B. Audretsch and A.R. Thurik (eds.), Innovation, Industry Evolution and Employment, Cambridge, UK: Cambridge University Press, pp. 265–279.

Mata. J.; P. Portugal and P. Guimaraes (1995): “The survival of new plants: Startup conditions and post-entry evolution”. International Journal of Industrial Organization. 13:469–481.

Nelson R. and S. Winter (1982): An Evolutionary Theory of Economic Change. Harvard: Bellknap.

Nickell. S. (1996): “Competition and Corporate Performance”. Journal of Political Economy. 104 : 724-746.

Pakes. A. and R. Ericson (1998): “Empirical Applications of Alternative Models of Firm and Industry Dynamics”. Journal of Economic Theory. 79(1): 1-45.

Santarelli, E. and Vivarelli, M. (2007): “Entrepreneurship and the process of firms’entry, survival and growth”, Industrial and Corporate Change, 16(3): 455-488.

Segarra. A.. J.M. Arauzo. N. Gras. M. Manjón. F. Mañé. M. Teruel and B. Theilen (2002): La creación y la supervivencia de las empresas industriales. Editorial Cívitas. Madrid.

Segarra. A. and Callejón. M. (2002): “New firms' survival and market turbulence: New evidence from Spain”. Review of Industrial Organization. 20: 1-14.

Teruel. M. (2006): Firm growth. pesistence and multiplicity of equilibria: an analysis of Spanish manufacturing and service industries. tesis doctoral.

Annex

Table Annex 1 Exits and survival likelihood in the cohort of year 1994 at sectoral level

CNAE sectors	Entries	Survival likelihood	*CNAE sectors*	Entries	Survival likelihood
15 Food products and beverages	1,465	55.43	*50 Sale and repair of motor vehicles*	3,231	64.28
16 Tobacco	4	50.00	*51 Wholesale trade and commission trade*	7,497	55.72
17 Textiles	566	52.83	*52 Retail trade*	15,593	50.51
18 Clothes	878	44.42	*55 Hotels and restaurants*	13,246	43.32
19 Tanning and dressing of leather	703	42.67	*60 Land transport*	3,039	58.67
20 Wood and products of wood and cork	1,372	62.61	*61 Water transport*	5	60.00
21 Paper	124	63.71	*62 Air transport*	11	45.45
22 Publishing, printing and recorded media	1.027	60.76	*63 Travel agencies*	772	59.59
24 Chemicals	218	55.96	*64 Post and telecommunications*	341	44.87
25 Rubber and plastics products	372	55.38	*65 Financial intermediation*	40	55.00
26 Other non-metallic mineral products	705	58.16	*66 Insurance and pension funding*	97	13.40
27 Basic metals	108	50.93	*67 Activities auxiliary to finances*	628	54.62
28 Fabricated metal products	2,517	56.97	*70 Real estate activities*	2,183	58.45
29 Machinery and equipment	649	56.55	*71 Renting of machinery and equipment*	558	42.47
30 Office, accounting and computing machinery	69	17.39	*72 Computer and related activities*	457	47.05
31 Electrical machinery and apparatus	343	30.61	*73 Research and development*	30	56.67
32 Radio, TV and communication equipment	71	43.66	*74 Other business activities*	6,700	57.33
33 Medical, precision and optical instruments	169	55.03	*Total Services (50-74)*	54,428	51.88
34 Motor vehicles, trailers and semi-trailers	136	51.47			
35 Other transport equipment	144	50.00			
36 Furniture, manufacturing n.e.c.	1,370	52.41			
Total Manufactures (15-36)	13,010	54.27			

Source: DIRCE