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Competitiveness and Survival: A Comparative Analysis of Italian Regions

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Abstract: This paper focuses on business demography of Italian firms to identify the relationships among firms characteristics and their competitiveness using, as a proxy, their survival in the market. We use a 6-digit level of aggregation to capture market dynamics and we focus on five Italian regions between 2000 and 2005 both for manufacturing and service sectors. The empirical analysis shows that firms are characterized by small size and low technological intensity in all regions. Both for manufacturing and service sectors the survival rates for large size firms are significantly higher than those of smaller firms and, on average, the survival rates after few years are very low. Service firms live longer than manufacturing firms and their hazard rates turn out to be less sensitive to size. From the empirical analysis we derive that regions have a similar structure and we find evidence of technological niches in Emilia Romagna, Toscana and Puglia.

Keywords: Business Demography, Survival, Competitiveness, Knowledge Intensive Business Sectors (KIBS)

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1. Introduction: Competitiveness and Survival

The conclusions of the Lisbon European Council (2001) are one of the most important elements for future EU policy. This Council set the ten-year goal of making the European Union "the most dynamic, competitive, sustainable knowledge-based economy in the world, enjoying full employment and strengthen economic and social cohesion". The European Council has subsequently made its spring meetings a focal point for economic, social and environmental policy issues, in particular looking at investment in knowledge to ensure future competitiveness and jobs. Clearly these priority actions are in keeping with the broader objectives of enterprise policy, namely to encourage an entrepreneurial culture, create additional jobs and to promote high technology and knowledge-intensive sectors of the economy. The keywords of the Lisbon strategy represent the agenda of European countries, but these goals are still far from be achieved, at least in Italy.

From the ISTAT Annual Report (2005), for example, we learn that 22% of the EU25 firms are Italian, but their weight in terms of employment is only 11%. The Italian firms size is half the European average size and their productivity is 10% lower. Moreover, 4 years after birth, only 60% of the Italian firms survive; they specialize in traditional sectors with a low productivity and a low technology. These are not the knowledge-intensive sectors promoted by the European Council and also the international demand growth for these goods is low.

The same Report states that the low Italian economic growth and competitiveness in a global economy like the contemporary one, between 1999 and 2004 depends on three main factors: firms productivity, sectoral composition and business demography.

The determinants of competitiveness are widely discussed both within economic literature and among policy makers. The birth of new enterprises and their survival in the market are often seen as a crucial variable of economic growth and competitiveness in a modern economy (see, for example, Bartelsman, Scarpetta and Schivardi, 2003, Bartelsman, Haltiwanger and Scarpetta, 2004). New enterprises increase the competitive pressure on incumbent enterprises in a market and force firms to increase their own efficiency. They stimulate innovation and make easier to adopt new technologies, while helping to increase overall productivity, shifting resources from less to more productive activities. Many authors describe this process as Schumpeterian *creative destruction*, whereby technological innovations and new ideas about how to manage business continually reshuffle firms, giving rise to new enterprises competing with established ones and eventually driving-out old technologies. Bartelsman, Haltiwanger and Scarpetta (2004), for example, focus on the process of creative destruction across 24 developing countries (2-digit industries) over the past decade using different micro data sources (business registers, census, or representative enterprise surveys). They find that all countries display a massive reallocation of resources by the entry and exit of many firms in all markets, the failure of many newcomer and incumbent firms and the expansion of successful, competitive ones. They show that there are also large differences across groups of countries, stating that while entry and exit rates are fairly similar across industrial countries, post entry performance differs markedly, affecting considerably the competitiveness of the country. In a preceding work (2003) Bartelsman, Scarpetta and Schivardi (2003) compare the demography of firms of ten OECD countries using information from business registers. They confirm that entry and exit rates are similar across countries, while post entry performance differs between Europe and the US, a potential indication of the importance of barriers to firm growth as opposed to barriers to entry.

This paper focuses on business demography of Italian firms to identify the relationships among firms characteristics and their competitiveness using, as a proxy, their demographic dynamics and survival in their markets (6-digit) . Standard dataset at the usual level of aggregation (2-3 digit) describe properly industries evolution more than markets. An industry typically encompasses many markets (and technological regime), each with its associated product category; markets are not independent of each other and usually have very peculiar characteristics (Sutton, 1998).

We use data from five Italian regions (Toscana, Emilia Romagna, Lombardia, Veneto Puglia) both for manufacturing and service sectors. These regions, as well as all Italian regions, share a traditional characteristic of distribution: firms show left-skewed size distribution. Toscana and Emilia Romagna and Veneto have similar economic structure (small firms, “industrial districs”, middle size niche firms); Lombardia is the “most European” among Italian regions, i.e. it shows big firms, high tech industries and a large service sector. Finally, Puglia is an example of a dynamic region in southern of Italy.

We analyse, firstly, the differences in their likelihood of survival between large and small firms and, secondly, the effects of the size and technological context on the regional likelihood of survival.

In the following section we present an overview of the literature on business demography, the third section introduces the database and the estimation techniques, the fourth presents the empirical results and the fifth part draws some conclusions.

2. The demography of firms: an overview

In 1931 a french engineer, Robert Gibrat, proposed an explanation for the appearance of skew size distributions in a number of environments ranging from biology to income distributions [1]. Gibrat described also the size distribution of firms in manufacturing industries. He shows that firms distribution is well approximated by a Log Normal, hence, he states that a firm's absolute rate of growth could be represented by a random variable whose mean is proportionate to the current firm size or, equivalently, that the proportionate rate of growth is represented by a random variable with mean independent of the current firm size. This is the so called *Law of Proportionate Effects* and it is a crucial point in the debate concerning the firm's size distribution. This is to say that the expected value of the increment to a firm's size in each period is proportional to the current size of the firm[2]. Even if Kalecki in 1945 describes Gibrat's book as a "great achievement", his work has very little impact on the literature on firms growth until late 1950s (Sutton, 1998). Gibrat's approach obtains particular attention during the 1960s, the so called "golden age for stochastic models of the size distribution", when various models were proposed and developed to explain firm's dynamics (Steindl, 1965, 1968). As the literature grows, several works relax some stringent assumptions on the entry and the exit of the firms, but in general maintain the Gibrat's Law in some forms to specify the size-growth relationship for surviving and successful firms. These models allow to consider different size distributions beyond the lognormal distribution (Simon, Bonini 1958, Steindl, 1968, Aldeman 1973, Marsili, 2001, Bottazzi and Secchi, 2004, Bottazzi et al., 2004)

Recent empirical studies suggest that an answer to the evidence presented by Gibrat could be represented by the fact that, on average, smaller firms have a lower probability of survival but those who survive grow proportionately faster than larger firms. This approach is a generalization of the problem of the shape of the distribution and allows to expand the analysis to other characteristics (life cycle stage, technological context, industry characteristics) influencing the firms probability of survival and their competitiveness in the market.

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[1] He traced the origin of this thinking to the work of Jacobus Kapteyn (1916), an astronomer who was interested in the evidence of skew distributions in various settings, especially in biology. Kapteyn assumed that underlying a skewed distribution was a simple Gaussian process: many small additive elements independent of each other generate a normally distributed random variable *z*. An observed skew distribution of some *z* could be modelled assuming that some underlying function of *x* was normally distributed. Gibrat used the simplest of such processes suggesting that the logarithm of *x* developed as Kapteyn described.

[2] Size can be measured in several ways and the Gibrat's observations have applied to measures of annual sales, of current employment and of total assets. There are in principle systematic differences between these measures but this is not the focus of interest in this literature.

This literature on firm dynamics and industry evolution explaining the way firms enter an industry, grow, survive or exit from the markets, essentially rejects the *Law* (Geroski, 1995, Sutton, 1997). Geroski and Sutton, for example, in their surveys underline the existence of strong relations between the likelihood of survival and the firm size, and almost all empirical studies find that the firm size is positively related to the likelihood of survival. Sutton (1997) shows that size at time *t* is linked to the growth in the subsequent period[3]. Geroski (1995) shows that, because small firms have a lower likelihood of survival than larger firms and the likelihood of small-firm survival is directly related to growth, firms size is negatively related to growth. This implies that the greater the entry size in a given industry, the greater will be the likelihood of survival confronting the new entrants; i.e ., "entry appears to be relatively easy, but survival is not" (Geroski, 1995). According to this perspective, some studies suggest that, on average, smaller firms have a lower probability of survival but those who survive grow proportionately faster than larger firms (Evan, 1987; Hall, 1987, Agarval and Audretsch, 2001).

Empirical research on the size-growth relation covers different time periods and countries and generally confirms a positive relationship between firms size and likelihood of survival (Dunne, Roberts and Samuelson, 1988 - 1989, Audretsch, 1991, 1995, Agarval, 1997, Mata, Portugal, 1994, Agarval and Audretsch, 2001, Business Demography, Eurostat, 2005; Bartelsman, Scarpetta and Schivardi, 2003; Bartelsman, Haltiwanger and Scarpetta, 2004). These empirical studies are consistent with theories on industry evolution suggesting that the number and the evolution of entrants in an industry may not be invariant to the stage of life cycle (Agarval, Gort, 1996, Agarval, 1998). The industry life-cycle theory suggests that the number of entrants, as a proxy of the number of innovations in an industry, evolves over the life-cycle; moreover, it shows that the role of innovation in entries changes in the "entrepreneurial" and in "routinized" technological regimes (Audretsch,1995).

According to the theory of strategic niches (Porter, 1979, Caves and Porter, 1977), firms remain small because they occupy product niches that are not accessible to their larger counterparts. Hence, size represents an advantage in increasing the likelihood of survival in the formative, more technological advanced stage of the industry, but not in a mature stage and in traditional sectors in which the size advantage should not be statistically significant.

[3] This specification follows from the assumption that the probability that the next opportunity is taken by a firm is proportional to the current size of the firm, which is the assumption underlying the Gibrat's Law.

3. Data and Statistical Model

This study uses data on 6-DIGITS manufacturing and services firms (from AIDA dataset)[4] in their first 10 years of life during the period 2000-2005. We measure the entry size of the firm by the total sales - adjusted at 2005 prices -, hence we classify firms according to ten size classes (for the criteria adopted see Appendix B)[5]. Markets are characterized by technology levels (OECD STI Scoreboard, 2005 for manufacturing firms and Miles et al, 1995; Nählinder, 2002, for services) distinguished as low, medium-low, medium-high and high technological intensity. Technological effort is a critical determinant of growth and international competitiveness and this classification captures innovations occurring in the formative or in the mature stage of the life cycle of the markets (Appendix A).

To analyse whether the likelihood of survival is invariant to firm size and to technological intensity we use the *Analysis of Duration* (Lancaster, 1990) that allows to estimate the *length of the time until failure*[6]. The variable of interest in the analysis of duration is the length of time that elapses from the beginning of some events either until their end or until the measurement is taken which may precede termination. Observations will typically consist of a cross section of durations $t_1, t_2, \ldots, t_n \in T$, where T is a random variable (discrete or continue), and for this type of data the analysis of duration allows to estimate the probability that the event "failure" appears next period. The process being observed may have begun at different points in calendar time and, because its length is not constant over time, the random variable T is unavoidably censored. Let T be a random variable with a cumulative probability

$$F(t) = \int_0^t f(s)ds = \Pr(T \leq t)$$

where $f(t)$ is the continuous probability distribution. We are interested in the probability that the period is pf length at least t, which is given by the *survival function*

$$S(t) = 1 - F(t) = \Pr(T \geq t)$$

and the probability that the phenomenon will end the next short interval of time Δ is

$$l(t, \Delta) = \Pr(t \leq T \leq t + \Delta \mid T \geq t)$$

A useful function to describe this aspect is the *Hazard Rate:*

[4] We select firms having revenues higher than 100,000 euro.

[5] For sensitivity purposes, we repeated the analysis with geometric classes deriving the same results. For simplicity, we chose to present the results based on fractile classes. All results are available upon request.

[6] Simple examples are the length of a strike, the durability of electric and electronic components, the length of survival after the diagnosis of a disease or after an operation and time until business failure

$$\lambda(t) = \lim_{\Delta \to 0} \frac{\Pr(t \le T \le t + \Delta \mid T \ge t)}{\Delta} = \lim_{\Delta \to 0} \frac{F(t+\Delta) - F(t)}{\Delta S(t)} = \frac{f(t)}{S(t)}$$

which is the rate at which spells are completed after duration *t*, given that they last at least until *t*. λ is the parameter to estimate and the estimation method is the Maximum Likelihood by the *Cox Proportional Hazard Regressions*. These models are used to measure the effect of different regressors (in our case entry size and technological level) on the survival probability of the phenomenon, estimating the regressors *hazard rates.*

The *hazard function* $h_i(t)$ of a firm i is expressed as

$$h_i(t) = h(t, x_i) = h_0(t)\exp(x_i^{'}\beta)$$

$h_0(t)$ being an arbitrary and unspecified baseline hazard function representing the probability of failure conditional on the fact that the firm has survived until time *t*, x_i is a vector of measured explanatory variables for the *i-th* firm and β is the vector of unknown parameters to be estimated. Negative coefficients or risk ratios less than one imply that the hazard rate decreases and the corresponding probability of survival increases.

Life-table analysis is another very useful tool to show firms survival and failure rates. Life-table analysis estimates the survival rate at time *s*, where s is defined as the fraction of the total number of firms that survived at least *s* years. Life tables give the number of firms that die conditional on their age, i.e. they represent the probability of failure given that the firm has survived *s* years. Two tests of homogeneity (the parametric Likelihood Test and the nonparametric Log-Rank) are conducted to check for significance of differences between large and small entry size survival rates within the different environments based on the technological level.

4. Survival Analysis: a comparative perspective

This section analyses the relationship between firms likelihood of survival and their size and technological level to investigate whether being a big or a small firm producing high or low tech goods can improve its competitiveness in the market, at least in terms of survival probability. We expect to find that size and technology represent critical determinants for firms capability to compete in the market. Also, we expect to find regional differences concerning these relationships, as stressed by different development patterns of the Italian regions considered.

We present, firstly, results from manufacturing firms and, secondly, results from service firms searching for similarities and differences among regions.

4.1. Manufacturing

From Table 1 to Table 8, summary statistics are presented. Table 1 shows the data structure. The structure is quite similar across regions: the majority of firms are classified as small (ranging from 52% in Emilia Romagna to 60% in Lombardia, Toscana and Puglia) and low technology intensive (ranging from 35% in Lombardia to 62% in Toscana and Puglia). From this preliminary analysis, firms in Toscana and Puglia seem to be the less technologically advanced among the regions considered. But what does it mean in terms of their survival and, consequently, in terms of competitiveness in the market?

Manufacturing firms have on average a quite low expectancy of life (5 years and half) and technological level (around 1, which means *medium-low* technological level) while their size, on average, is 5.5 (around 500,000 euros revenues). Firms in Emilia Romagna are the largest while firms in Lombardia have the highest technological level. Small and medium firms show similar characteristics while big firms present substantial differences among regions: Puglia has the longest life (six years and half) but the lowest technological level (only 0.564) while firms in Lombardia live six years on average and show a higher technological level (1.105). Contrary to common wisdom, when compared to other regions, Lombardia does not appear to have either larger firms or more technologically advanced sectors on average but certainly a larger number of firms.

As expected, in all regions the number of small firms is higher than the number of big firms, as well as the number of firms in traditional sectors is much higher than the number of firms in high tech sectors.

Figures 1-5 present results from the life table analysis. Survival rates after 4 years is 60%, confirming what assessed by ISTAT in the Annual Report (2005). Survival rates for large entrants are always significantly higher than for the small entrants, independently of the regions; this confirms the hypothesis by Audretsch, (1991, 1995) on the positive relationship between entrants size and their likelihood of survival. Only 55% of the small entrants survive four years compared to the 73% of the large entrants and the difference is more evident after seven years (21% vs. 36%).

Figure 4 and 5 show that likelihood of survival also varies with technology level (low, medium, high). The likelihood of survival increases from low to high tech markets (four years probability levels: 61% in low tech and 64% in high tech). After 4 and 7 years, among low tech markets, only firms in Emilia Romagna have a likelihood of survival higher than 70%, while high tech firms live longer in Toscana (the likelihood of survival after 4 years is 65% and after 7 years it is 30%).

Hazard rate analysis confirms the results sketched above. Table 10 presents the results from several Cox proportional hazard regressions which allow to asses the effect of regressors on the hazard rate function and to measure the risk ratio associated to each variable. Note that a negative coefficient implies a decrease in hazard rate and the effect of the variable on the hazard rate is captured by the deviation of the risk ratio form 1. The effect of entry size and technological intensity are reported in regression 1; all coefficients are negative and strongly significant, showing that hazard rates are lower in high tech markets and for larger entry size firms. Entering a high tech market reduces a firm’s hazard rate (ranging from -10% in Puglia to 40% in Toscana) as well as a larger size reduces the failure risk (ranging from -7% in Puglia to -15% in Toscana and Emilia Romagna).

Regression 2 and 3 on small and medium firms confirm the results from the whole sample: size gives an advantage to large size firms, producing high tech goods . Regression 4 focuses on big firms showing that neither size nor technological intensity are significant in affecting the firm’s hazard rate. Focussing on regressions from 5 through 8 for Emilia Romagna, Toscana and Puglia, we find that size matters in low, medium-low, medium-high tech markets, but smaller firms have an hazard similar to their larger counterparts in high tech markets. This seems to confirm the existence of technological niches in Emilia Romagna, Toscana and Puglia: size represents an advantage in increasing the likelihood of survival in mature, traditional markets but not in formative, high tech markets (Porter, 1979, Caves and Porter, 1977).

Table 1: Percentage of Firms in each group per region

	Emilia Romagna	**Veneto**	**Lombardia**	**Toscana**	**Puglia**
Small Firms	52.47	59.06	60.00	59.99	59.91
Medium Firms	26.67	20.29	19.99	19.98	19.93
Big Firms	20.87	20.65	20.01	20.04	20.16
Low-Tech Firms	35.88	42.55	35.12	62.07	62.47
Medium-Low Tech Firms	31.67	30.31	32.14	21.18	22.98
Medium-High Tech Firms	27.41	22.04	25.59	13.16	10.85
High Tech Firms	5.04	5.10	7.15	3.59	3.69

Note: Small Firms (100,000-900,000 euro), Medium Firms (900,001-3,500,000 euro), Big Firms (>3,500,001)

Table 2: Summary Statistics

ALL FIRMS					
Variable	Obs	Mean	Std.Dev.	Min	Max
Emilia Romagna					
Size	5655	6.131	2.579	1	10
Span	5655	5.473	2.619	0	10
Tech	5655	1.016	0.913	0	3
Veneto					
Size	7152	5.560682	2.88069	1	10
Span	7152	5.440856	2.629315	1	10
Tech	7152	0.896952	0.916226	0	3
Lombardia					
Size	12351	5.500769	2.872595	1	10
Span	12351	5.511214	2.619581	1	10
Tech	12351	1.047688	0.943888	0	3
Toscana					
Size	4901	5.501	2.873	1	10
Span	4901	5.330	2.643	1	10
Tech	4901	0.583	0.850	0	3
Puglia					
Size	2654	5.509	2.876	1	10
Span	2654	5.548	2.504	1	10
Tech	2654	0.558	0.828	0	3

Table 3: Summary Statistics

SMALL FIRMS					
Variable	Obs	Mean	Std.Dev.	Min	Max
Emilia Romagna					
Size	2967	4.124	1.757	1	6
Span	2967	5.123	2.615	1	10
Tech	2967	0.979	0.927	0	3
Veneto					
Size	4224	3.512311	1.711722	1	6
Span	4224	5.049479	2.601693	1	10
Tech	4224	0.884706	0.928519	0	3
Lombardia					
Size	7410	3.500405	1.70794	1	6
Span	7410	5.166532	2.614589	1	10
Tech	7410	1.020513	0.953139	0	3
Toscana					
Size	2940	3.500	1.708	1	6
Span	2940	4.999	2.648	1	10
Tech	2940	0.584	0.858	0	3
Puglia					
Size	1590	3.503	1.711	1	6
Span	1590	5.135	2.441	1	10
Tech	1590	0.554	0.864	0	3

Table 4: Summary Statistics

MEDIUM FIRMS					
Variable	Obs	Mean	Std.Dev.	Min	Max
Emilia Romagna					
Size	1508	7.468	0.499	7	8
Span	1508	5.757	2.577	1	10
Tech	1508	1.058	0.899	0	3
Veneto					
Size	1451	7.504	0.500	7	8
Span	1451	5.812	2.577	1	10
Tech	1451	0.927	0.886	0	3
Lombardia					
Size	2469	7.500	0.500	7	8
Span	2469	5.894	2.535	1	10
Tech	2469	1.072	0.933	0	3
Toscana					
Size	979	7.499	0.500	7	8
Span	979	5.531	2.498	1	10
Tech	979	0.582	0.825	0	3
Puglia					
Size	529	7.499	0.500	7	8
Span	529	5.860	2.407	1	10
Tech	529	0.561	0.776	0	3

Table 5: Summary Statistics

BIG FIRMS					
Variable	Obs	Mean	Std.Dev.	Min	Max
Emilia Romagna					
Size	1180	9.468	0.499	9	10
Span	1180	5.986	2.556	1	10
Tech	1180	1.056	0.895	0	3
Veneto					
Size	1477	9.510	0.500	9	10
Span	1477	6.196	2.542	1	10
Tech	1477	0.903	0.910	0	3
Lombardia					
Size	2472	9.500	0.500	9	10
Span	2472	6.162	2.541	1	10
Tech	2472	1.105	0.924	0	3
Toscana					
Size	982	9.500	0.500	9	10
Span	982	6.119	2.583	1	10
Tech	982	0.579	0.849	0	3
Puglia					
Size	535	9.503	0.500	9	10
Span	535	6.469	2.499	1	10
Tech	535	0.564	0.769	0	3

Table 6: Summary Statistics

LOW TECH FIRMS					
Variable	Obs	Mean	Std.Dev.	Min	Max
Emilia Romagna					
Size	2029	5.926	2.662	1	10
Span	2029	5.300	2.583	0	10
Veneto					
Size	3043	5.417	2.931	1	10
Span	3043	5.367	2.646	1	10
Lombardia					
Size	4338	5.241	2.917	1	10
Span	4338	5.461	2.589	1	10
Toscana					
Size	3042	5.494	2.889	1	10
Span	3042	5.345	2.642	1	10
Puglia					
Size	1658	5.362	2.885	1	10
Span	1658	5.546	2.526	1	10

Table 7: Summary Statistics

MEDIUM-LOW TECH FIRMS					
Variable	Obs	Mean	Std.Dev.	Min	Max
Emilia Romagna					
Size	1791	6.233	2.427	1	10
Span	1791	5.458	2.637	1	10
Veneto					
Size	2168	5.726	2.740	1	10
Span	2168	5.392	2.579	1	10
Lombardia					
Size	3969	5.609	2.770	1	10
Span	3969	5.413	2.630	1	10
Toscana					
Size	1038	5.485	2.790	1	10
Span	1038	5.220	2.642	1	10
Puglia					
Size	610	5.921	2.870	1	10
Span	610	5.459	2.424	1	10

Table 8: Summary Statistics

MEDIUM-HIGH TECH FIRMS					
Variable	Obs	Mean	Std.Dev.	Min	Max
Emilia Romagna					
Size	1550	6.380	2.598	1	10
Span	1550	5.699	2.654	1	10
Veneto					
Size	1576	5.706	2.931	1	10
Span	1576	5.602	2.640	1	10
Lombardia					
Size	3161	5.817	2.891	1	10
Span	3161	5.654	2.663	1	10
Toscana					
Size	645	5.749	2.888	1	10
Span	645	5.332	2.607	1	10
Puglia					
Size	288	5.823	2.734	1	10
Span	288	5.792	2.570	1	10

Table 9: Summary Statistics

HIGH TECH FIRMS					
Variable	Obs	Mean	Std.Dev.	Min	Max
Emilia Romagna					
Size	285	5.596	2.621	1	10
Span	285	5.554	2.477	1	10
Veneto					
Size	365	5.145	2.958	1	10
Span	365	5.649	2.707	1	10
Lombardia					
Size	883	5.153	2.890	1	10
Span	883	5.685	2.535	1	10
Toscana					
Size	176	4.818	2.930	1	10
Span	176	5.699	2.785	1	10
Puglia					
Size	98	4.490	2.737	1	10
Span	98	5.418	2.424	1	10

Table 10: Cox Regressions

Regression		Variable	Hazard ratio	St. Err.	z	p-value	chi-square
Emilia Romagna							
1	all firms	Size**	0.855	0.022	-6.220	0.000	51.57 (0.000)
		Tech. Intensity**	0.784	0.058	-3.280	0.001	
2	Small firms	Size**	0.778	0.034	-5.730	0.000	45.97 (0.000)
		Tech. Intensity**	0.811	0.073	-2.330	0.020	
3	Medium firms	Size	0.773	0.232	-0.860	0.391	11.68 (0.002)
		Tech. Intensity**	0.526	0.102	-3.300	0.001	
4	Big firms	Size	0.994	0.291	-0.020	0.983	0.05 (0.97)
		Tech. Intensity	0.967	0.148	-0.220	0.825	
5	Low tech	Size**	0.888	0.032	-3.350	0.001	11.2 (0.000)
6	Medium-low tech	Size**	0.808	0.046	-3.770	0.000	14.19 (0.000)
7	Medium-high tech	Size**	0.845	0.049	-2.910	0.004	8.44 (0.003)
8	High tech	Size	0.768	0.171	-1.190	0.236	1.4 (0.235)
Veneto							
Regression		**Variable**	**Hazard ratio**	**St. Err.**	**z**	**p-value**	**chi-square**
1	all firms	Size**	0.841	0.016	-8.860	0.000	90.53 (0.000)
		Tech. Intensity**	0.854	0.052	-2.580	0.010	
2	Small firms	Size**	0.848	0.032	-4.410	0.000	21.96 (0.000)
		Tech. Intensity	0.896	0.065	-1.510	0.132	
3	Medium firms	Size**	0.467	0.125	-2.840	0.005	18.32 (0.000)
		Tech. Intensity**	0.694	0.104	-2.450	0.014	
4	Big firms	Size	1.064	0.376	0.170	0.862	0.93 (0.629)
		Tech. Intensity	0.835	0.176	-0.860	0.392	
5	Low tech	Size**	0.849	0.022	-6.300	0.000	39.69 (0.000)
6	Medium-low tech	Size**	0.861	0.033	-3.930	0.000	15.42 (0.000)
7	Medium-high tech	Size**	0.815	0.036	-4.580	0.000	20.95 (0.000)
8	High tech	Size**	0.793	0.069	-2.680	0.007	7.16 (0.002)

Regression		Variable	Hazard ratio	St. Err.	z	p-value	chi-square
Lombardia							
Regression		**Variable**	**Hazard ratio**	**St. Err.**	**z**	**p-value**	**chi-square**
1	all firms	Size**	0.865	0.012	-10.400	0.000	126.15 (0.000)
		Tech. Intensity**	0.872	0.036	-3.310	0.001	
2	Small firms	Size**	0.857	0.023	-5.690	0.000	47.67 (0.000)
		Tech. Intensity**	0.849	0.041	-3.350	0.001	
3	Medium firms	Size	0.747	0.155	-1.410	0.159	4.6 (0.105)
		Tech. Intensity	0.810	0.108	-1.590	0.113	
4	Big firms	Size	0.836	0.170	-0.880	0.376	1.16 (0.559)
		Tech. Intensity	1.064	0.113	0.590	0.558	
5	Low tech	Size**	0.869	0.018	-6.860	0.000	47 (0.000)
6	Medium-low tech	Size**	0.831	0.024	-6.400	0.000	40.94 (0.000)
7	Medium-high tech	Size**	0.896	0.026	-3.820	0.000	14.57 (0.000)
8	High tech	Size*	0.887	0.052	-2.030	0.042	4.12 (0.04)
Toscana							
Regression		**Variable**	**Hazard ratio**	**St. Err.**	**z**	**p-value**	**chi-square**
1	all firms	Size**	0.854	0.021	-6.280	0.000	67.99 (0.000)
		Tech. Intensity**	0.601	0.067	-4.560	0.000	
2	Small firms	Size	0.941	0.047	-1.220	0.222	15.67 (0.000)
		Tech. Intensity**	0.638	0.079	-3.610	0.000	
3	Medium firms	Size	0.949	0.347	-0.140	0.886	3.75 (0.153)
		Tech. Intensity**	0.463	0.185	-1.930	0.054	
4	Big firms	Size	0.376	0.196	-1.870	0.061	8.67 (0.013)
		Tech. Intensity	0.479	0.210	-1.680	0.093	
5	Low tech	Size**	0.868	0.023	-5.470	0.000	29.93 (0.000)
6	Medium-low tech	Size**	0.842	0.057	-2.530	0.012	6.38 (0.001)
7	Medium-high tech	Size**	0.706	0.083	-2.970	0.003	8.82 (0.000)
8	High tech	Size	0.890	0.199	-0.520	0.602	0.27 (0.601)

Regression		Puglia Variable	Hazard ratio	St. Err.	z	p-value	chi-square
1	all firms	Size*	0.932	0.032	-2.010	0.044	4.76 (0.092)
		Tech. Intensity	0.908	0.115	-0.760	0.446	
2	Small firms	Size	1.018	0.086	0.210	0.834	0.04 (0.972)
		Tech. Intensity	1.001	0.146	0.010	0.995	
3	Medium firms	Size	1.107	0.476	0.240	0.812	0.06 (0.97)
		Tech. Intensity	0.991	0.253	-0.040	0.972	
4	Big firms	Size**	0.072	0.074	-2.560	0.011	12.41 (0.001)
		Tech. Intensity*	0.272	0.173	-2.040	0.041	
5	Low tech	Size	0.975	0.040	-0.620	0.534	0.39 (0.534)
6	Medium-low tech	Size	0.880	0.074	-1.510	0.131	2.29 (0.130)
7	Medium-high tech	Size**	0.794	0.069	-2.650	0.008	7.04 (0.008)
8	High tech	Size	0.936	0.107	-0.580	0.565	0.33 (0.564)

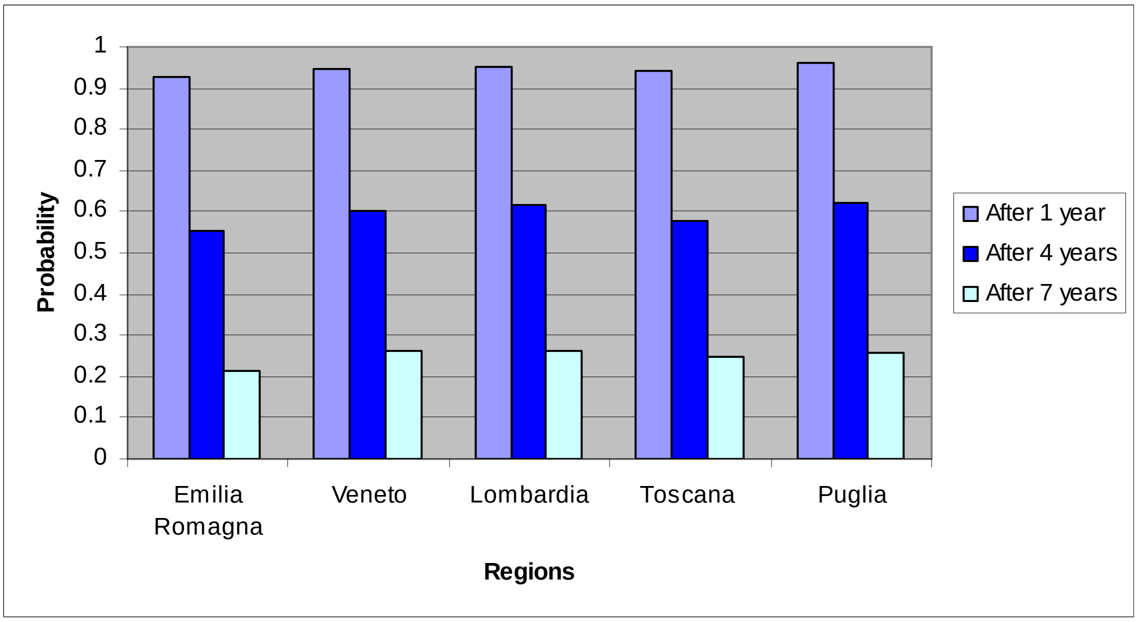


Figure 1 Survival Rates: All Manufacturing Firms

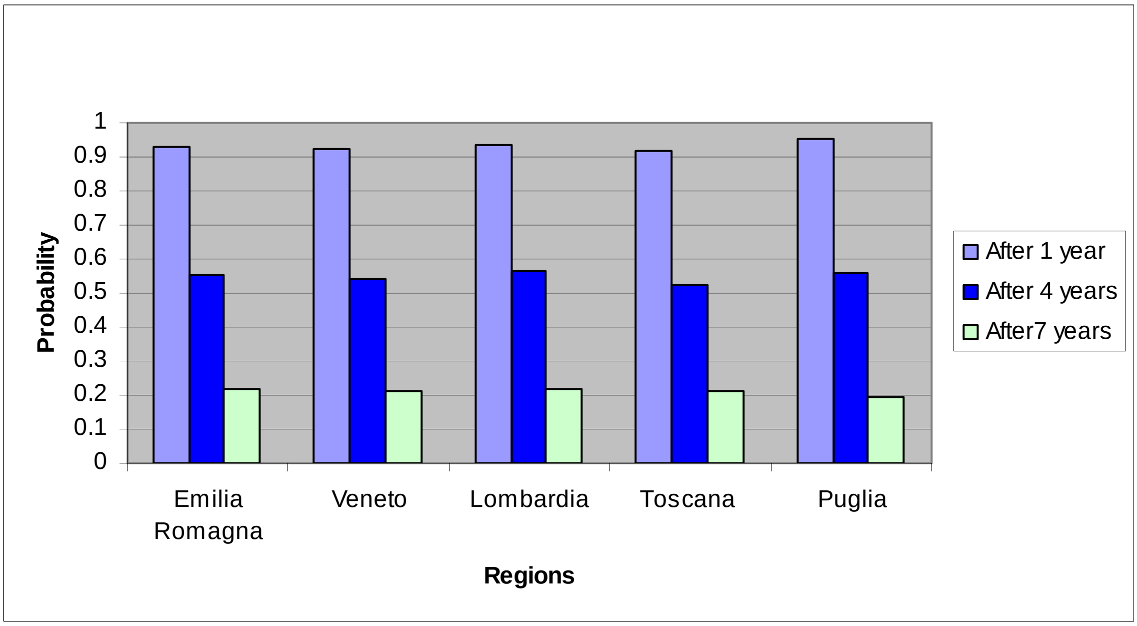


Figure 2 Survival Rates: Small Manufacturing Firms

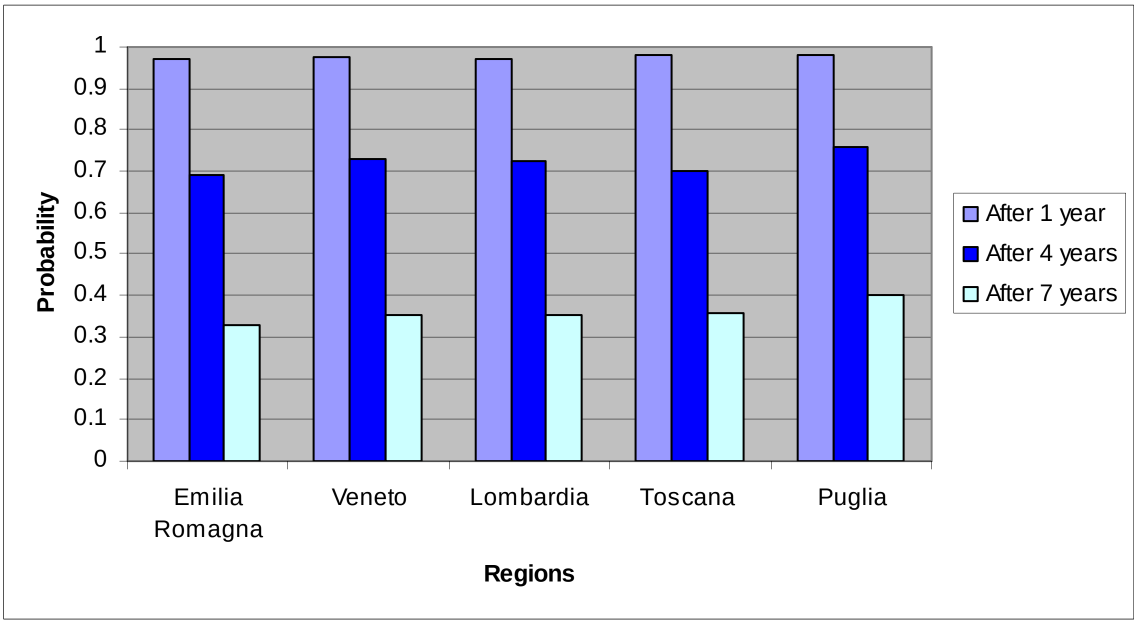


Figure 3 Survival Rates: Big Manufacturing Firms

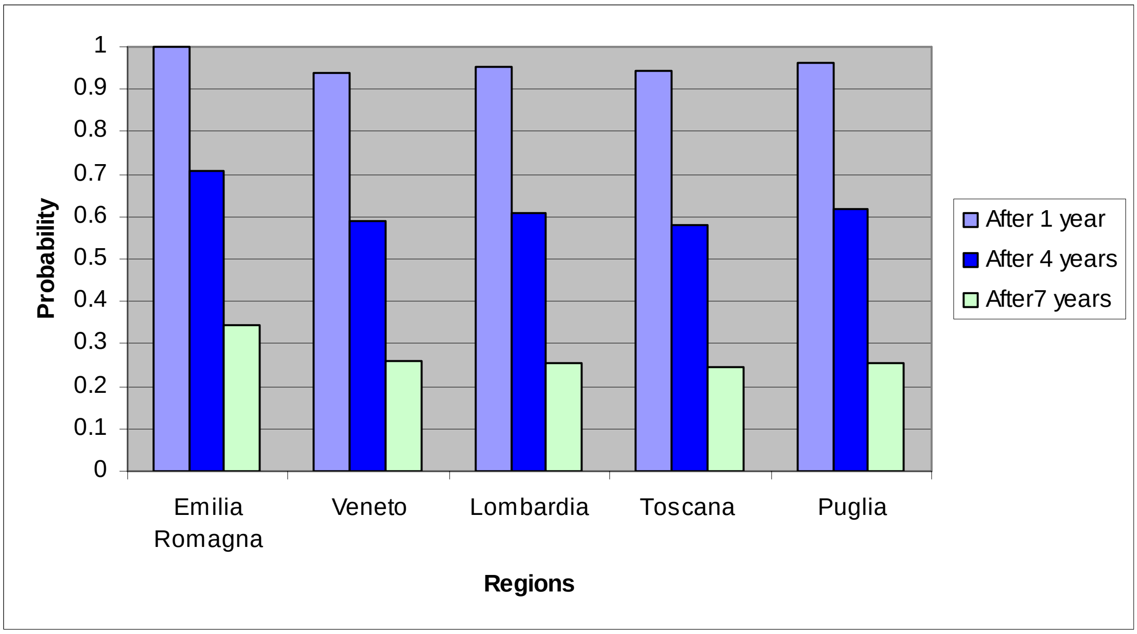


Figure 4 Survival Rates: Low Tech Manufacturing Firms

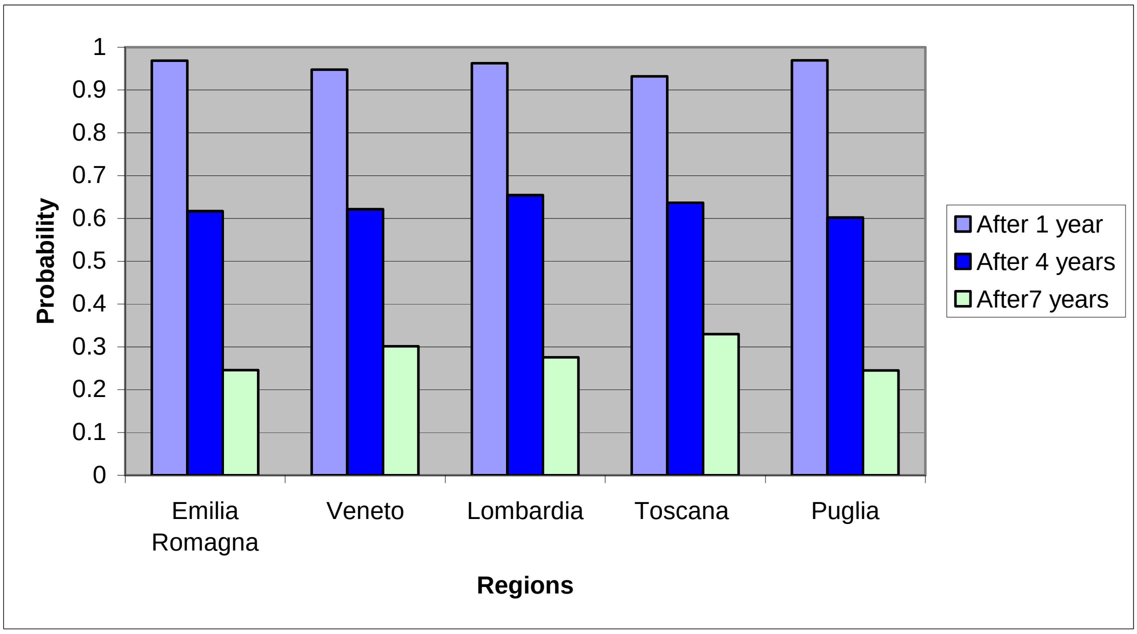


Figure 5 Survival Rates: High Tech Manufacturing Firms

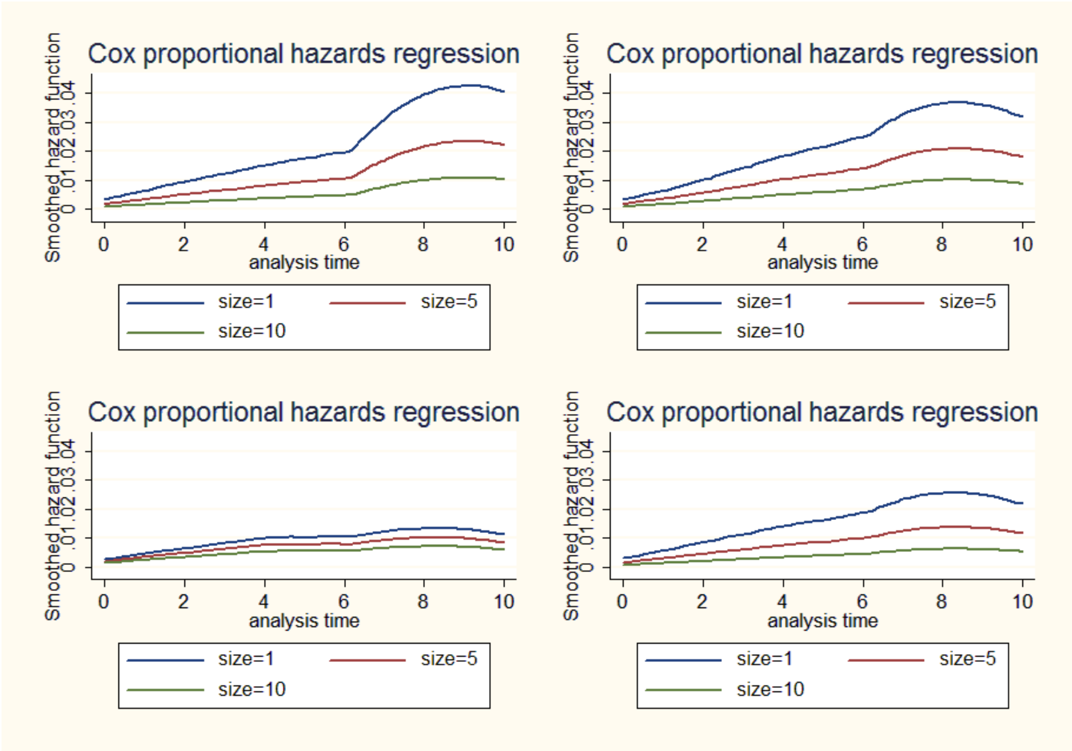


Figure 1m: Hazard Functions for different sizes of manufacturing firms in Emilia Romagna (top-left panel), Lombardia (top-right panel), Puglia (bottom-left panel), Toscana (bottom-right panel)

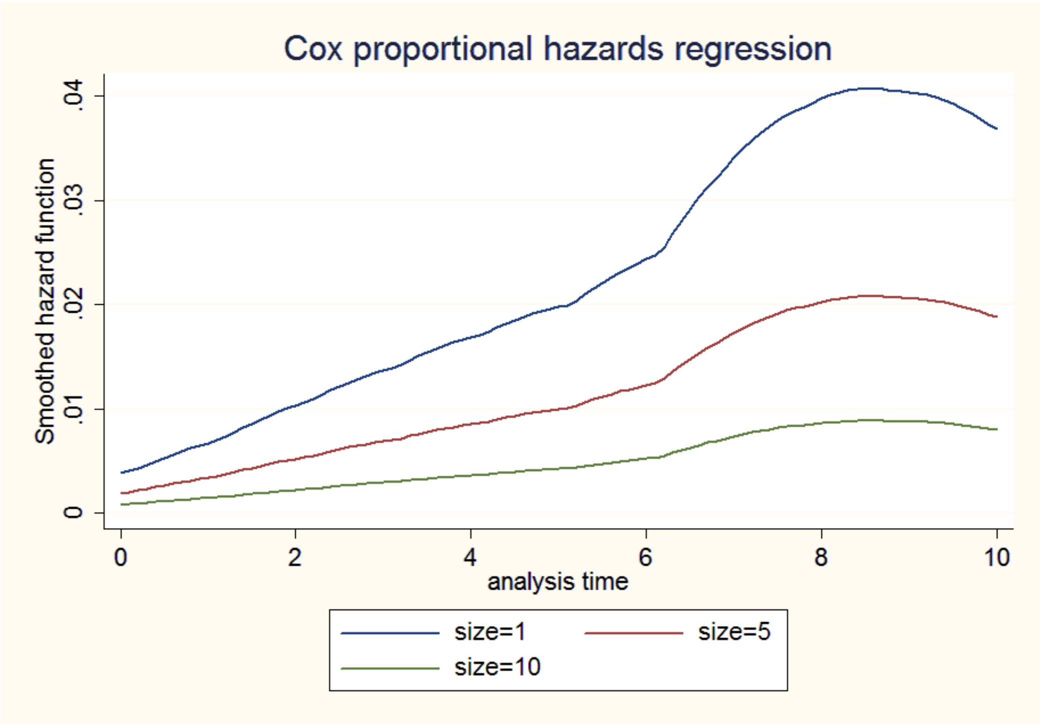


Figure 2m: Hazard Function for different sizes of manufacturing firms in Veneto

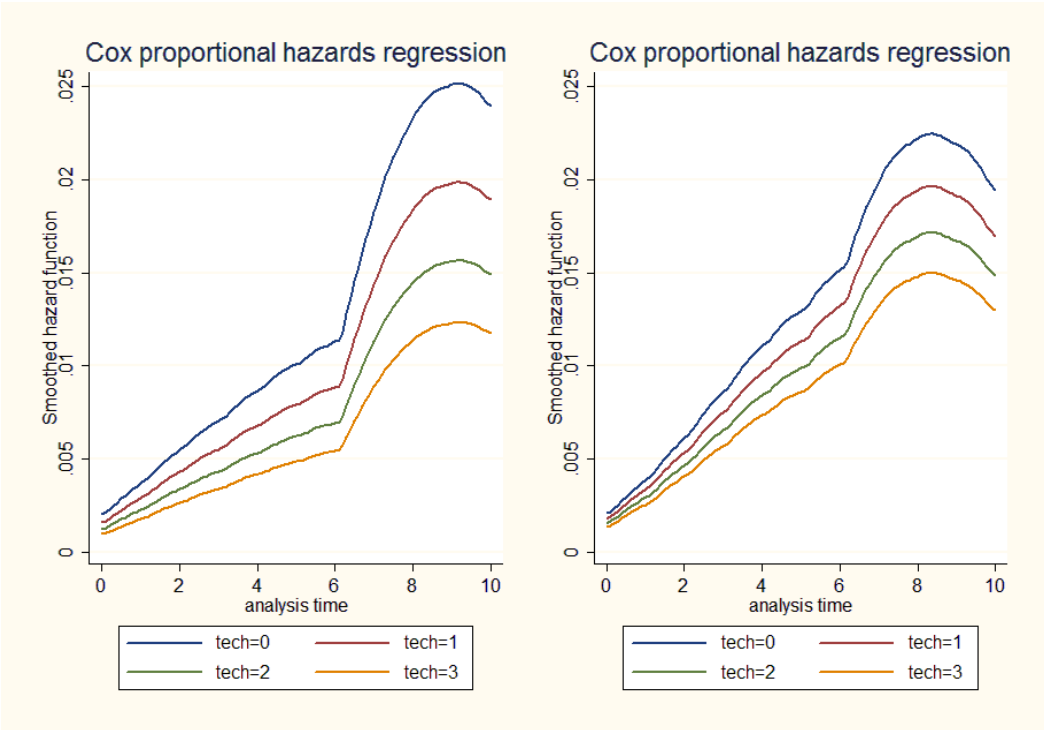
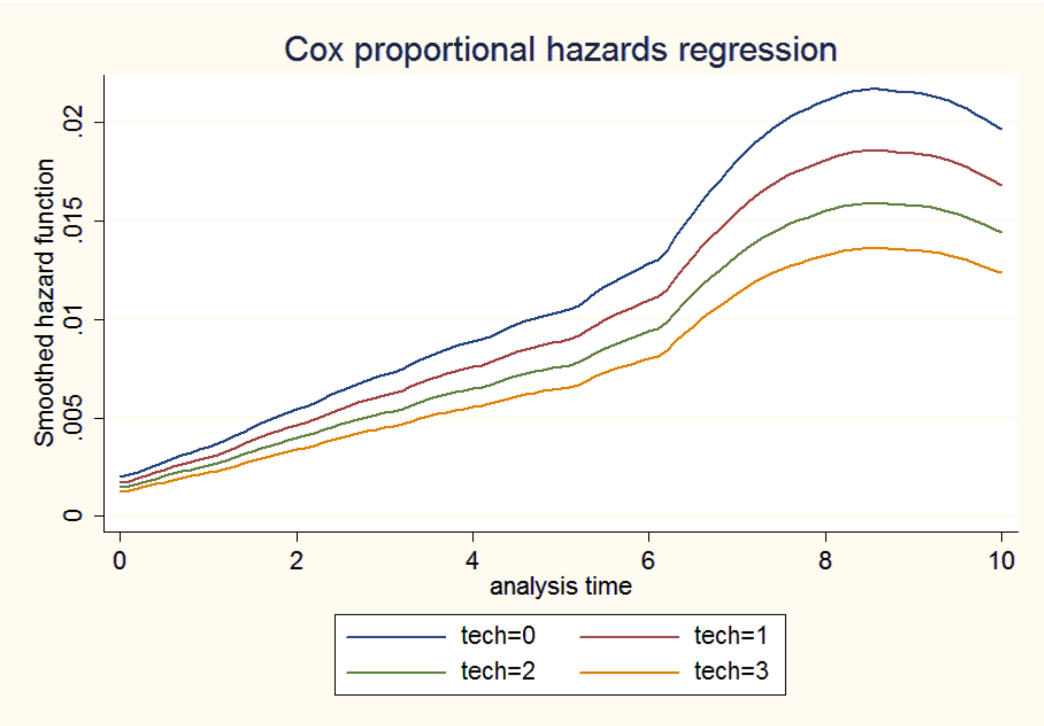


Figure 3m: Hazard Functions for different technological levels of manufacturing firms in Emilia Romagna (left panel) and Lombardia (right panel)



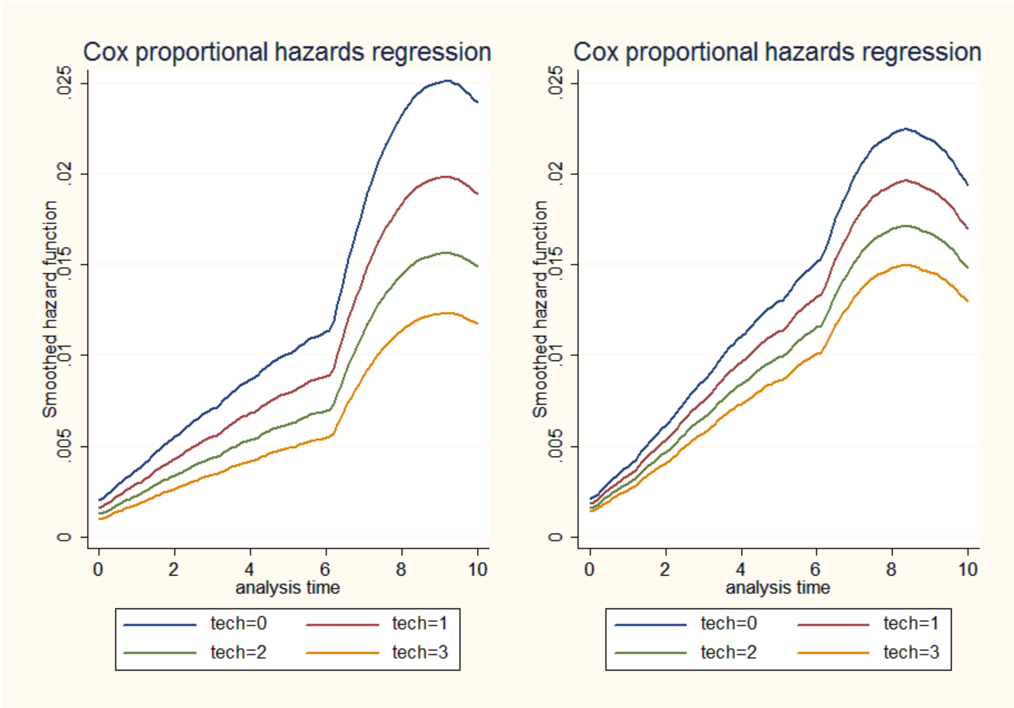


Figure 4m: Hazard Functions for different technological levels of manufacturing firms in Puglia (left panel) and Toscana (right panel)

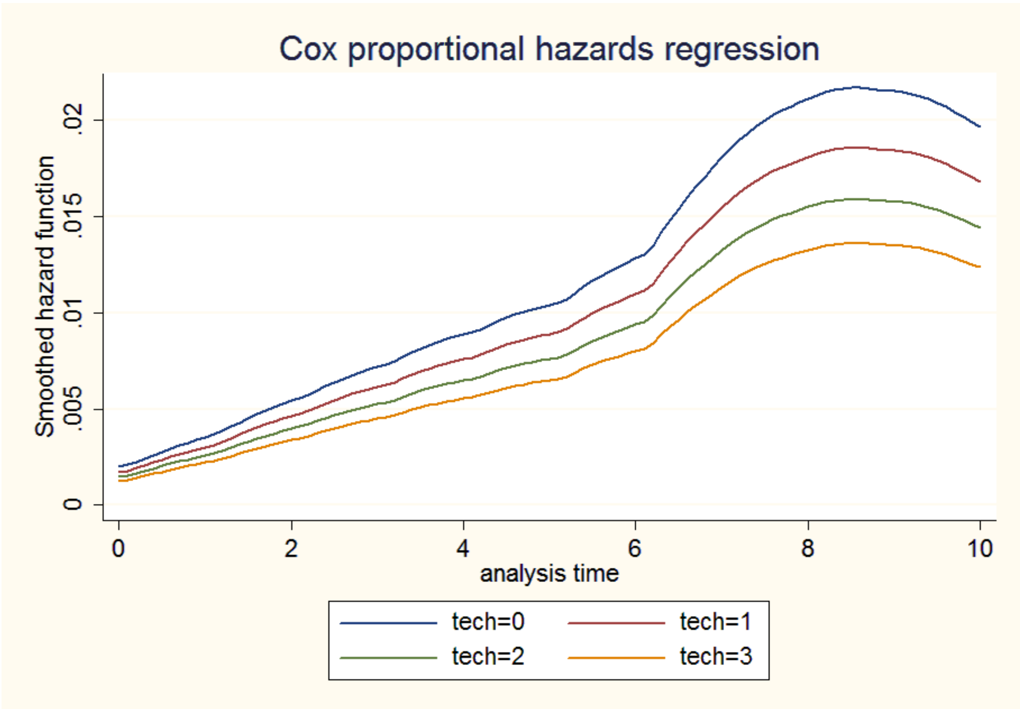


Figure 5m: Hazard Function for different technological levels of manufacturing firms in Veneto

4.2. Services

Summary statistics for service firms are presented from Table 11 to 19. In Table 11 we present the service firms structure in all regions. Firstly, the number of service firms is higher than the number of manufacturing firms, even if regions are very different from each other (14,964 manufacturing firms versus 5655 service firms in Emilia Romagna, 35589 versus 12351 in Lombardia and 14483 versus 4901 in Toscana). Also, the structure is very different across regions: even if the majority of firms is classified as small, in Emilia Romagna they are only 40% of all service firms while in Lombardia they represent 60% of all service firms. Service firms are mostly low technology intensive (ranging from 77% in Lombardia to 91% in Puglia): they represent traditional business services like retail trade or hotels and restaurants, not *knowledge intensive business services*.

From Table 11 and tables related, service firms, on average, are larger (especially in Toscana and Emilia Romagna) but technologically less intensive than manufacturing firms (on average, less than 0.3). Moreover, note that high tech service firms in Puglia and Veneto have an extremely small size, 3.8 and 4.2 and are much more numerous than high tech manufacturing firms (in Puglia 160 versus 98, in Veneto 546 versus 365). Low tech service firms in Toscana and Emilia Romagna have, on average, larger size than firms in other regions (around 700,000 euro revenues).

Figures from 6 to 10 present results from the life table analysis. Survival rates for service firms are higher than the corresponding rates for manufacturing firms, for all regions. Also, survival rates of service firms decrease substantially after four years but for big firms they are always significantly higher than for small firms. In particular, Emilia Romagna and Lombardia show that after four years, still 75% of their large service firms are still alive versus 61% of the big Tuscan firms. On the contrary, only 50% of small service firms are alive after four years (very close to the value derived for small manufacturing firms). This confirms the positive relationship between size and survival we already described for manufacturing firms.

Figure 9 and 10 show, also for service firms, that likelihood of survival varies with technology level. The likelihood of survival increases from P-Kibs (Professional-knowledge intensive business service) to T-Kibs sectors (Technological-knowledge intensive business service). The four years probability is 55% for P-kibs firms and 61% for T-kibs firms.

Table 20 presents the results from several Cox proportional hazard regressions. The effect of entry size and technological intensity are reported in regression 1; all coefficients are negative and strongly significant, showing that size and technological intensity are always positively related to probability of survival. Entering a high tech market reduces a firm's hazard rate as well as a larger size reduces the failure risk showing the same relationships we described for manufacturing firms even if the effect of size on the failure rate is lower (on average, size reduces the hazard rate only by 9%) while the effect of technology is stronger (on average it reduces the hazard rate by 65%) than for manufacturing firms. These effect are quite homogeneous across regions.

Regression 2 and 3 on small and medium firms confirm results sketched above for the whole sample: size gives an advantage to firms with large size and intensive knowledge skills. Regression 4 focuses on big firms showing that neither size nor technological intensity are significant in affecting the firm’s hazard rate for all regions but for Lombardia. Regressions from 6 to 8 show that the effect of size on knowledge intensive firms is not significant, showing that size does not reduce the failure rate of high skills firms as shown by the small size of T-kibs firms in Puglia and Veneto. On the contrary, size is important in reducing traditional and P-kibs firms hazard rate: in Emilia Romagna size reduces the failure risk by 11% as well as in Veneto, in Lombardia it reduces the risk by 7% and in Toscana the risk is reduced by 5%. In competitive markets low skilled services have to compete to survive: they can either increase their skills or their size.

Table 11: Percentage of Firms in each group per region

	Emilia Romagna	**Veneto**	**Lombardia**	**Toscana**	**Puglia**
Small Firms	40.62	59.73	60.00	47.47	59.91
Medium Firms	33.05	20.09	20.00	18.70	20.11
Big Firms	26.33	20.19	20.01	33.83	19.98
Low-Tech Firms	82.29	83.02	77.04	88.36	91.79
Medium-Low Tech Firms	7.38	6.34	11.49	4.25	2.92
Medium-High Tech Firms	6.11	6.99	7.21	4.82	3.39
High Tech Firms	4.22	3.65	4.25	2.58	1.89

Note: Small Firms (100,000-900,000 euro), Medium Firms (900,001-3,500,000 euro), Big Firms (>3,500,001)

Table 12: Summary Statistics

ALL FIRMS					
Variable	Obs	Mean	Std.Dev.	Min	Max
Emilia Romagna					
Size	14964	6.719	2.397	1	10
Span	14964	5.179	2.546	1	10
Tech	14964	0.323	0.771	0	3
Veneto					
Size	14941	5.513	2.877	1	10
Span	14941	5.147	2.563	1	10
Tech	14941	0.313	0.758	0	3
Lombardia					
Size	35589	5.500	2.873	1	10
Span	35589	5.151	2.571	1	10
Tech	35589	0.387	0.798	0	3
Toscana					
Size	14483	6.260	2.980	1	10
Span	14483	5.139	2.524	1	10
Tech	14483	0.216	0.648	0	3
Puglia					
Size	8458	5.500	2.872	1	10
Span	8458	5.195	2.446	1	10
Tech	8458	0.154	0.558	0	3

Table 13: Summary Statistics

SMALL FIRMS					
Variable	Obs	Mean	Std.Dev.	Min	Max
Emilia Romagna					
Size	6078	4.321	1.642	1	6
Span	6078	4.807	2.533	1	10
Tech	6078	0.427	0.861	0	3
Veneto					
Size	8924	3.497	1.709	1	6
Span	8924	4.839	2.549	1	10
Tech	8924	0.411	0.847	0	3
Lombardia					
Size	21352	3.500	1.708	1	6
Span	21352	4.865	2.550	1	10
Tech	21352	0.460	0.857	0	3
Toscana					
Size	6875	3.498	1.698	1	6
Span	6875	4.842	2.510	1	10
Tech	6875	0.285	0.737	0	3
Puglia					
Size	5067	3.496	1.706	1	6
Span	5067	4.948	2.421	1	10
Tech	5067	0.203	0.637	0	3

Table14: Summary Statistics

MEDIUM FIRMS					
Variable	Obs	Mean	Std.Dev.	Min	Max
Emilia Romagna					
Size	4946	7.486	0.500	7	8
Span	4946	5.312	2.515	1	10
Tech	4946	0.272	0.725	0	3
Veneto					
Size	3001	7.500	0.500	7	8
Span	3001	5.427	2.488	1	10
Tech	3001	0.195	0.619	0	3
Lombardia					
Size	7117	7.500	0.500	7	8
Span	7117	5.445	2.535	1	10
Tech	7117	0.293	0.716	0	3
Toscana					
Size	2709	7.466	0.499	7	8
Span	2709	5.196	2.458	1	10
Tech	2709	0.203	0.627	0	3
Puglia					
Size	1701	7.497	0.500	7	8
Span	1701	5.390	2.404	1	10
Tech	1701	0.096	0.438	0	3

Table 15: Summary Statistics

BIG FIRMS					
Variable	Obs	Mean	Std.Dev.	Min	Max
Emilia Romagna					
Size	3940	9.455	0.498	9	10
Span	3940	5.587	2.527	1	10
Tech	3940	0.225	0.650	0	3
Veneto					
Size	3016	9.501	0.500	9	10
Span	3016	5.781	2.533	1	10
Tech	3016	0.139	0.516	0	3
Lombardia					
Size	7120	9.500	0.500	9	10
Span	7120	5.713	2.544	1	10
Tech	7120	0.262	0.654	0	3
Toscana					
Size	4899	9.470	0.499	9	10
Span	4899	5.523	2.527	1	10
Tech	4899	0.127	0.499	0	3
Puglia					
Size	1690	9.499	0.500	9	10
Span	1690	5.736	2.459	1	10
Tech	1690	0.065	0.363	0	3

Table 16: Summary Statistics

LOW TECH FIRMS					
Variable	Obs	Mean	Std.Dev.	Min	Max
		Emilia Romagna			
Size	12314	6.883	2.323	1	10
Span	12314	5.118	2.559	1	10
		Veneto			
Size	12404	5.769	2.848	1	10
Span	12404	5.088	2.570	1	10
		Lombardia			
Size	27419	5.711	2.840	1	10
Span	27419	5.063	2.582	1	10
		Toscana			
Size	12797	6.392	2.957	1	10
Span	12797	5.093	2.531	1	10
		Puglia			
Size	7764	5.610	2.867	1	10
Span	7764	5.178	2.457	1	10

Table 17: Summary Statistics

MEDIUM-LOW TECH FIRMS					
Variable	Obs	Mean	Std.Dev.	Min	Max
		Emilia Romagna			
Size	1105	5.999	2.620	1	10
Span	1105	5.344	2.516	1	10
		Veneto			
Size	947	4.377	2.855	1	10
Span	947	5.386	2.559	1	10
		Lombardia			
Size	4089	5.035	2.961	1	10
Span	4089	5.418	2.524	1	10
		Toscana			
Size	615	5.485	3.091	1	10
Span	615	5.502	2.433	1	10
		Puglia			
Size	247	4.526	2.665	1	10
Span	247	5.259	2.268	1	10

Table 18: Summary Statistics

MEDIUM-HIGH TECH FIRMS					
Variable	Obs	Mean	Std.Dev.	Min	Max
Emilia Romagna					
Size	914	5.954	2.567	1	10
Span	914	5.595	2.385	1	10
Veneto					
Size	1044	4.143	2.581	1	10
Span	1044	5.527	2.446	1	10
Lombardia					
Size	2567	4.492	2.732	1	10
Span	2567	5.509	2.480	1	10
Toscana					
Size	698	5.095	2.898	1	10
Span	698	5.503	2.448	1	10
Puglia					
Size	287	4.300	2.621	1	10
Span	287	5.474	2.338	1	10

Table 19: Summary Statistics

HIGH TECH FIRMS					
Variable	Obs	Mean	Std.Dev.	Min	Max
Emilia Romagna					
Size	631	5.881	2.537	1	10
Span	631	5.485	2.489	1	10
Veneto					
Size	546	4.288	2.566	1	10
Span	546	5.364	2.558	1	10
Lombardia					
Size	1514	4.646	2.775	1	10
Span	1514	5.413	2.535	1	10
Toscana					
Size	373	5.206	2.833	1	10
Span	373	5.424	2.451	1	10
Puglia					
Size	160	3.831	2.597	1	10
Span	160	5.388	2.328	1	10

Table 20: Cox Regressions

Regression		Variable	Hazard ratio	St. Err.	z	p-value	chi-square
		Emilia Romagna					
1	all firms	Size**	0.903	0.015	-6.170	0.000	69.83 (0.000)
		Tech. Intensity**	0.662	0.048	-5.710	0.000	
2	Small firms	Size**	0.912	0.033	-2.530	0.011	36 (0.000)
		Tech. Intensity**	0.604	0.063	-4.840	0.000	
3	Medium firms	Size	0.927	0.129	-0.540	0.588	12.65 (0.001)
		Tech. Intensity**	0.667	0.088	-3.060	0.002	
4	Big firms	Size	1.017	0.177	0.100	0.924	1.22 (0.544)
		Tech. Intensity	0.854	0.129	-1.040	0.296	
5	Low tech	Size**	0.894	0.016	-6.350	0.000	38.32 (0.000)
6	Medium-low tech	Size	1.020	0.066	0.300	0.762	0.09 (0.76)
7	Medium-high tech	Size	0.889	0.074	-1.410	0.158	1.98 (0.159)
8	High tech	Size	0.943	0.122	-0.450	0.651	0.2 (0.65)

Regression		Variable	Hazard ratio	St. Err.	z	p-value	chi-square
		Veneto					
1	all firms	Size**	0.907	0.013	-6.960	0.000	74.41 (0.000)
		Tech. Intensity**	0.681	0.047	-5.580	0.000	
2	Small firms	Size*	0.946	0.027	-1.920	0.055	41.06 (0.000)
		Tech. Intensity**	0.642	0.052	-5.500	0.000	
3	Medium firms	Size*	0.737	0.132	-1.710	0.040	6.98 (0.003)
		Tech. Intensity*	0.711	0.134	-1.810	0.050	
4	Big firms	Size*	0.663	0.135	-2.010	0.044	4.16 (0.124)
		Tech. Intensity	1.043	0.180	0.250	0.805	
5	Low tech	Size**	0.899	0.013	-7.220	0.000	52.09 (0.000)
6	Medium-low tech	Size	1.011	0.057	0.190	0.850	0.04 (0.850)
7	Medium-high tech	Size	0.939	0.072	-0.820	0.413	0.695 (0.406)
8	High tech	Size	0.933	0.102	-0.630	0.526	0.41 (0.519)

Regression		Variable	Hazard ratio	St. Err.	z	p-value	chi-square
Lombardia							
1	all firms	Size**	0.934	0.008	-8.280	0.000	165.15 (0.000)
		Tech. Intensity**	0.686	0.026	-9.750	0.000	
2	Small firms	Size**	0.954	0.017	-2.710	0.007	88.57 (0.000)
		Tech. Intensity**	0.690	0.031	-8.320	0.000	
3	Medium firms	Size	1.055	0.114	0.500	0.620	13.69 (0.001)
		Tech. Intensity**	0.724	0.071	-3.300	0.001	
4	Big firms	Size**	0.792	0.088	-2.090	0.036	26.04 (0.000)
		Tech. Intensity**	0.609	0.076	-3.950	0.000	
5	Low tech	Size**	0.937	0.008	-7.240	0.000	52.22 (0.000)
6	Medium-low tech	Size**	0.919	0.024	-3.180	0.001	10.42 (0.000)
7	Medium-high tech	Size**	0.895	0.038	-2.640	0.008	7.36 (0.006)
8	High tech	Size*	0.967	0.062	-0.530	0.599	0.28 (0.597)

Regression		Variable	Hazard ratio	St. Err.	z	p-value	chi-square
Toscana							
1	all firms	Size**	0.954	0.014	-3.200	0.001	27.12 (0.000)
		Tech. Intensity**	0.694	0.065	-3.910	0.000	
2	Small firms	Size	0.990	0.037	-0.280	0.782	18 (0.000)
		Tech. Intensity**	0.629	0.081	-3.610	0.000	
3	Medium firms	Size	1.045	0.225	0.200	0.839	0.51 (0.775)
		Tech. Intensity	0.890	0.161	-0.640	0.519	
4	Big firms	Size	0.930	0.144	-0.470	0.639	3.48 (0.175)
		Tech. Intensity	0.720	0.147	-1.600	0.109	
5	Low tech	Size**	0.951	0.015	-3.290	0.001	10.65 (0.001)
6	Medium-low tech	Size	0.920	0.074	-1.030	0.302	1.08 (0.299)
7	Medium-high tech	Size	1.048	0.096	0.510	0.607	0.27 (0.606)
8	High tech	Size	1.118	0.164	0.770	0.444	0.6 (0.438)

Regression		Puglia Variable	Hazard ratio	St. Err.	z	p-value	chi-square
1	all firms	Size	0.977	0.023	-1.020	0.306	1.31 (0.519)
		Tech. Intensity	1.044	0.115	0.390	0.699	
2	Small firms	Size	0.948	0.049	-1.040	0.298	1.16 (0.559)
		Tech. Intensity	1.026	0.133	0.200	0.845	
3	Medium firms	Size	0.922	0.267	-0.280	0.778	0.15 (0.925)
		Tech. Intensity	1.082	0.318	0.270	0.787	
4	Big firms	Size	0.798	0.227	-0.790	0.428	0.78 (0.675)
		Tech. Intensity	1.129	0.344	0.400	0.691	
5	Low tech	Size	0.966	0.023	-1.410	0.159	1.98 (0.159)
6	Medium-low tech	Size**	1.318	0.170	2.140	0.032	4.97 (0.025)
7	Medium-high tech	Size	1.019	0.104	0.190	0.851	0.04 (0.851)
8	High tech	Size	0.742	0.272	-0.810	0.416	0.9 (0.344)

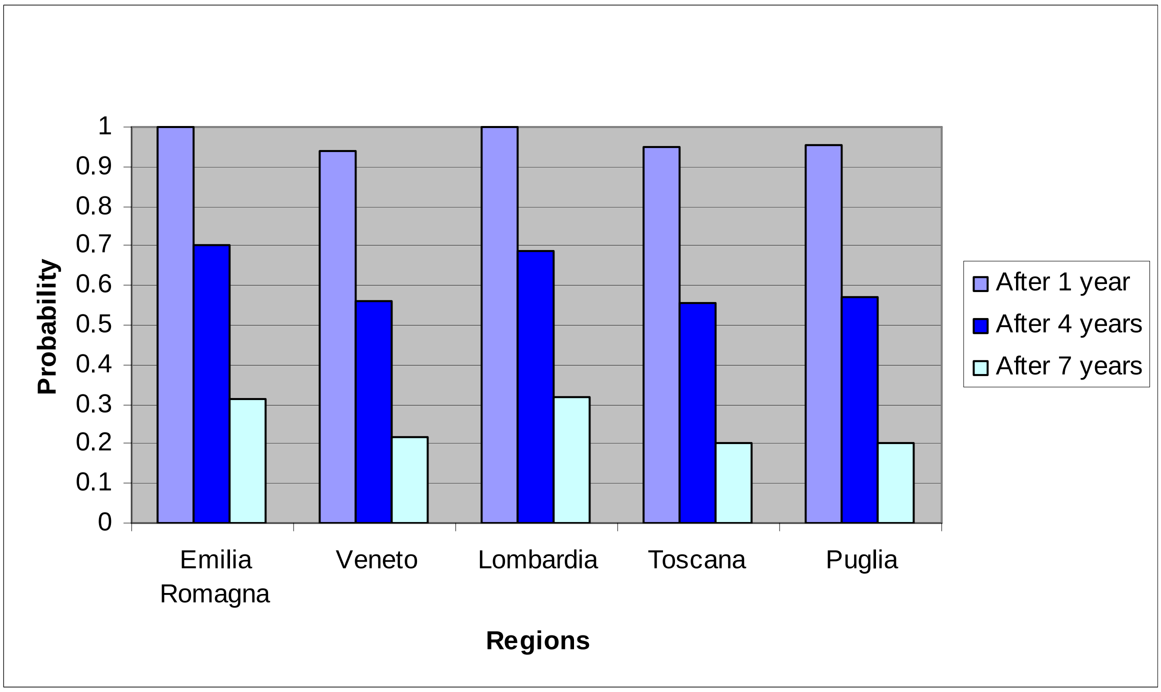


Figure 6 Survival Rates: All Service Firms

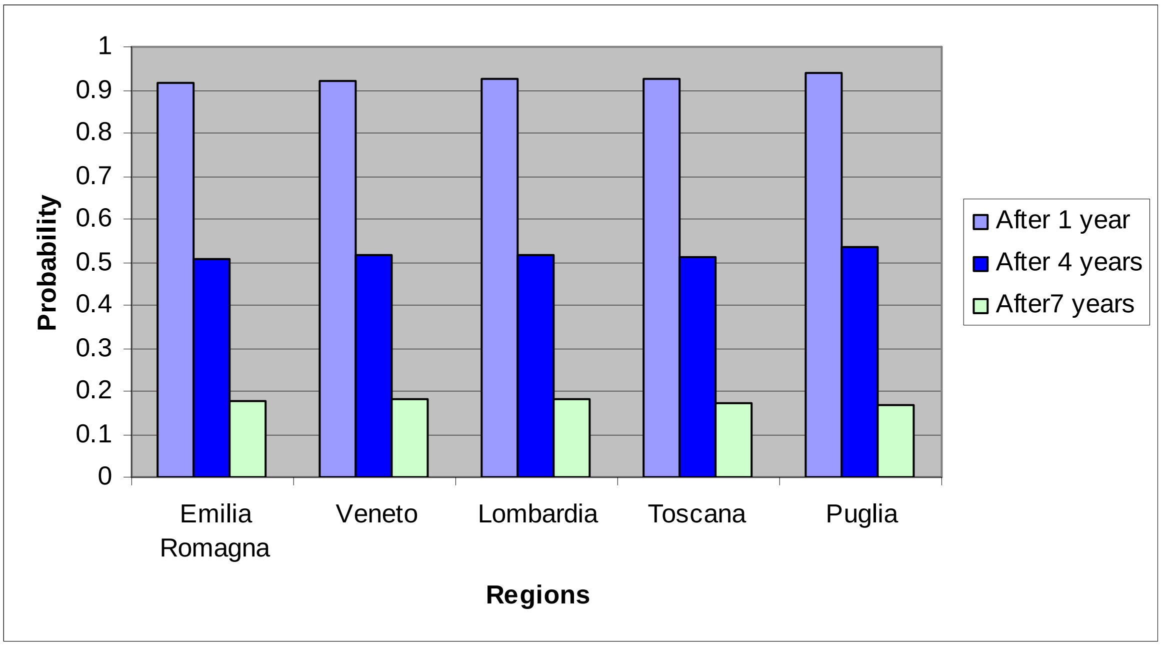


Figure 7 Survival Rates: Small Service Firms

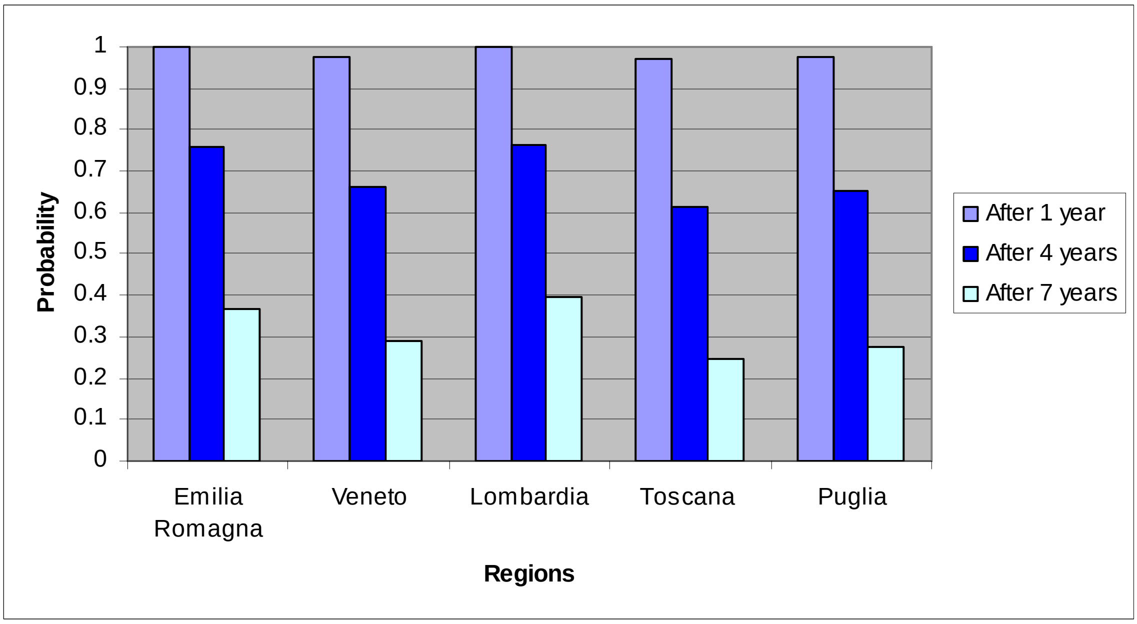


Figure 8 Survival Rates: Big Service Firms

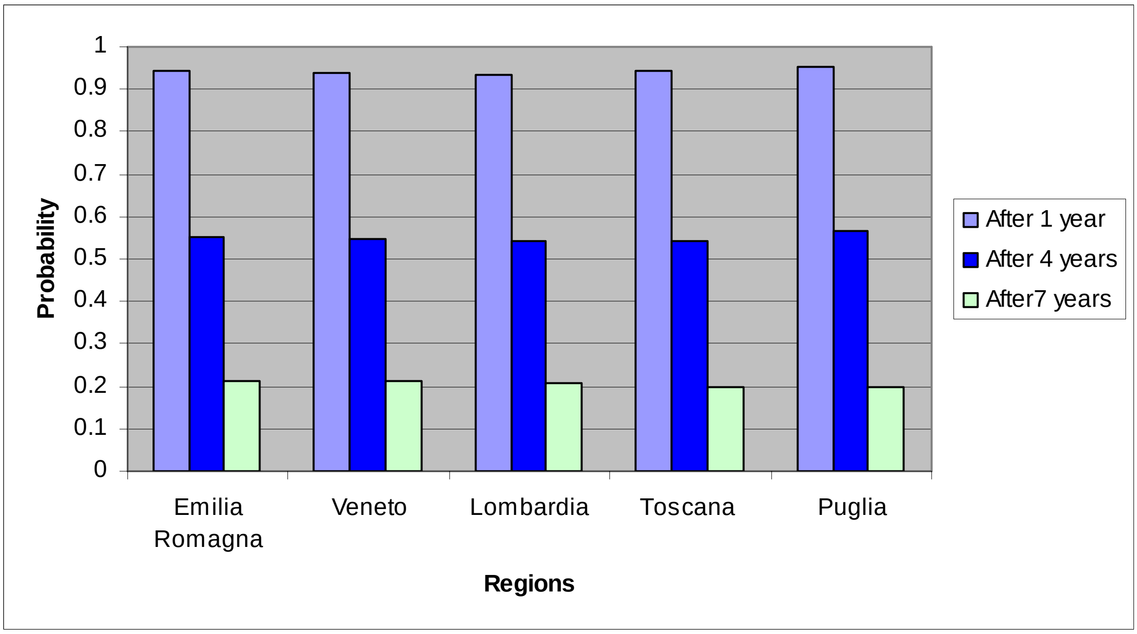


Figure 9 Survival Rates: P-Kibs Firms

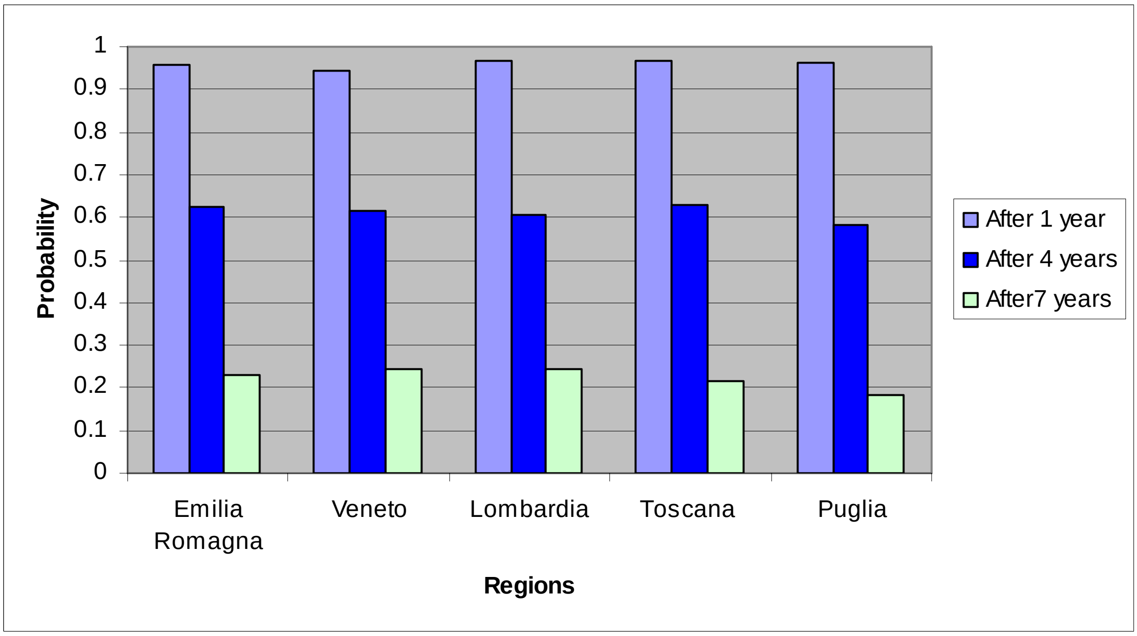


Figure 10 Survival Rates: T-Kibs Firms

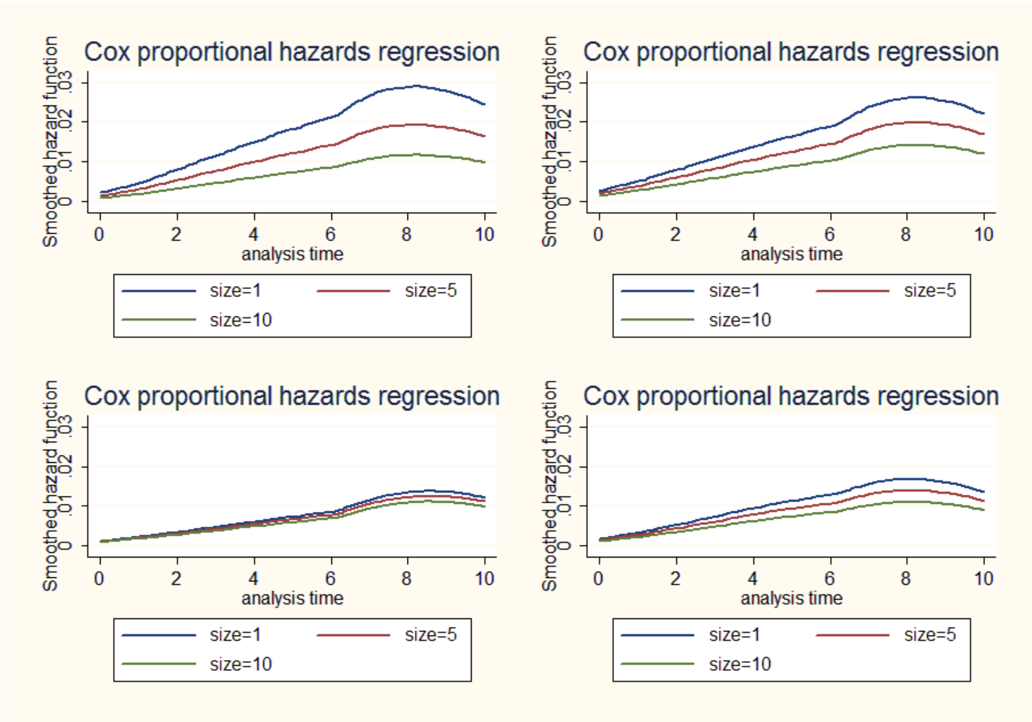


Figure 1s: Hazard Functions for different sizes of service firms in Emilia Romagna (top-left panel), Lombardia (top-right panel), Puglia (bottom-left panel), Toscana (bottom-right panel)

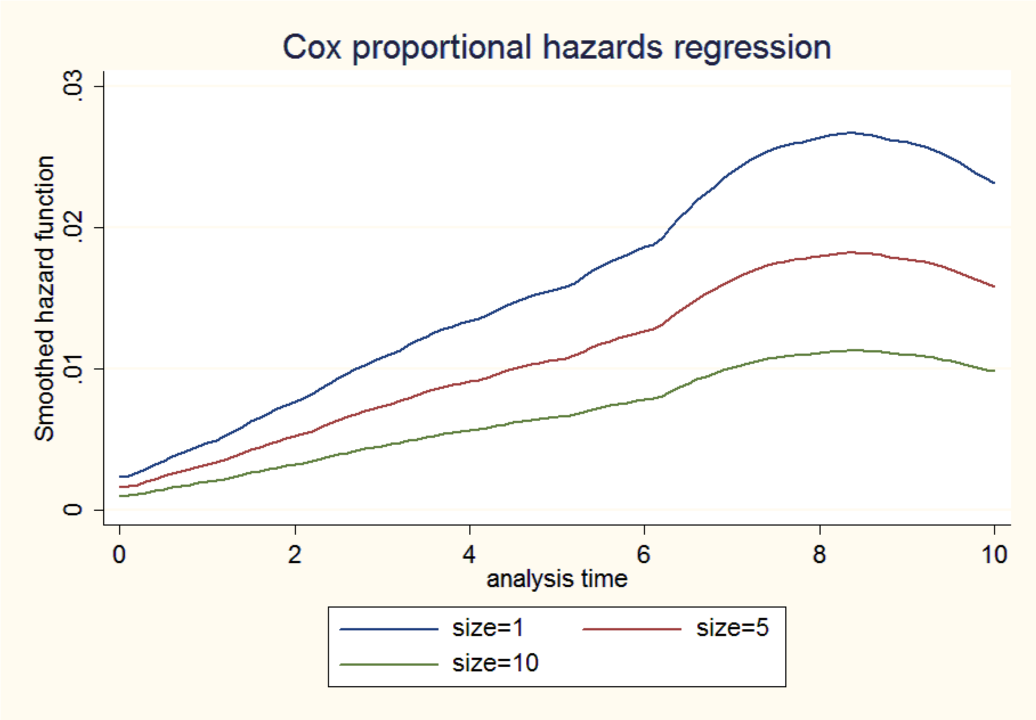


Figure 2s: Hazard Function for different sizes of service firms in Veneto

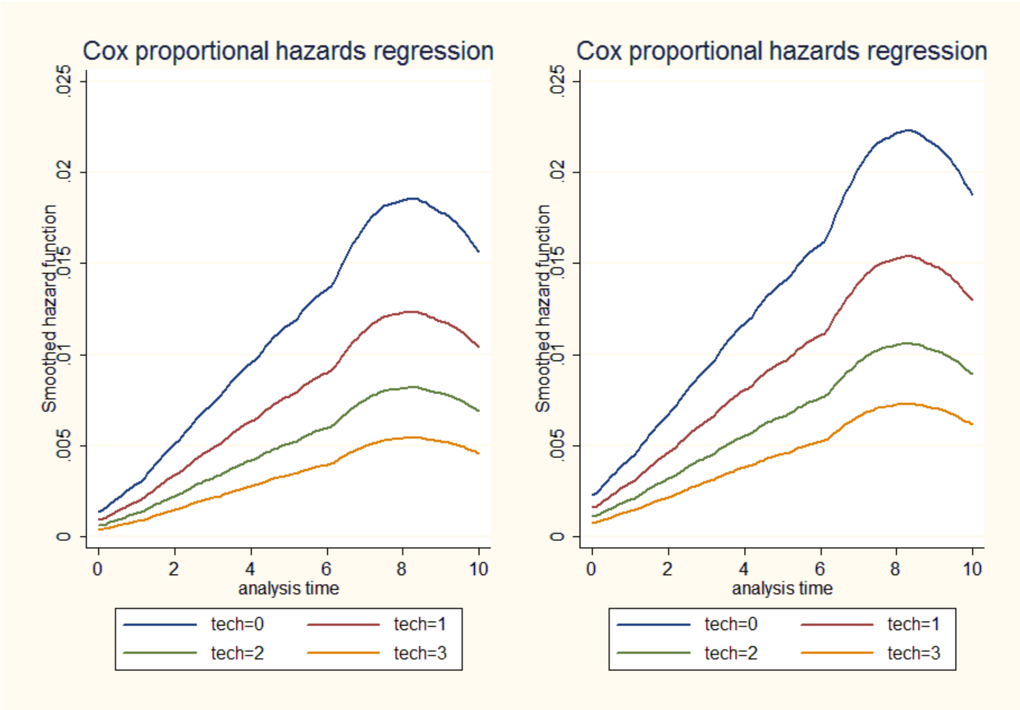


Figure 3s: Hazard Functions for different technological levels of service firms in Emilia Romagna (left panel) and Lombardia (right panel)

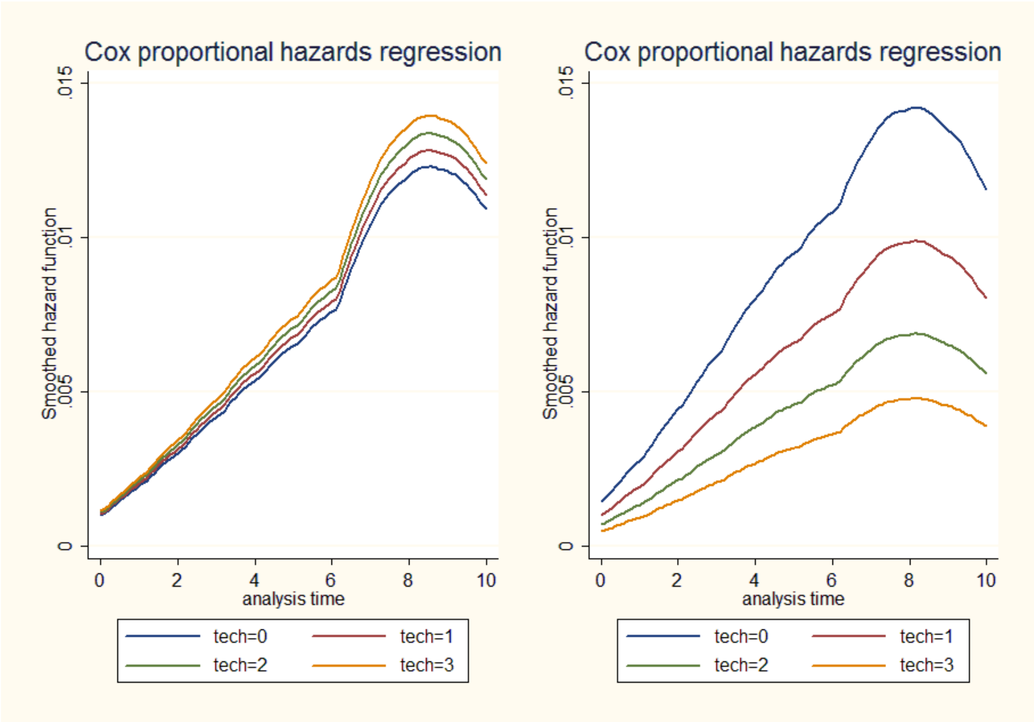


Figure 4s: Hazard Functions for different technological levels of service firms in Puglia (left panel) and Toscana (right panel)

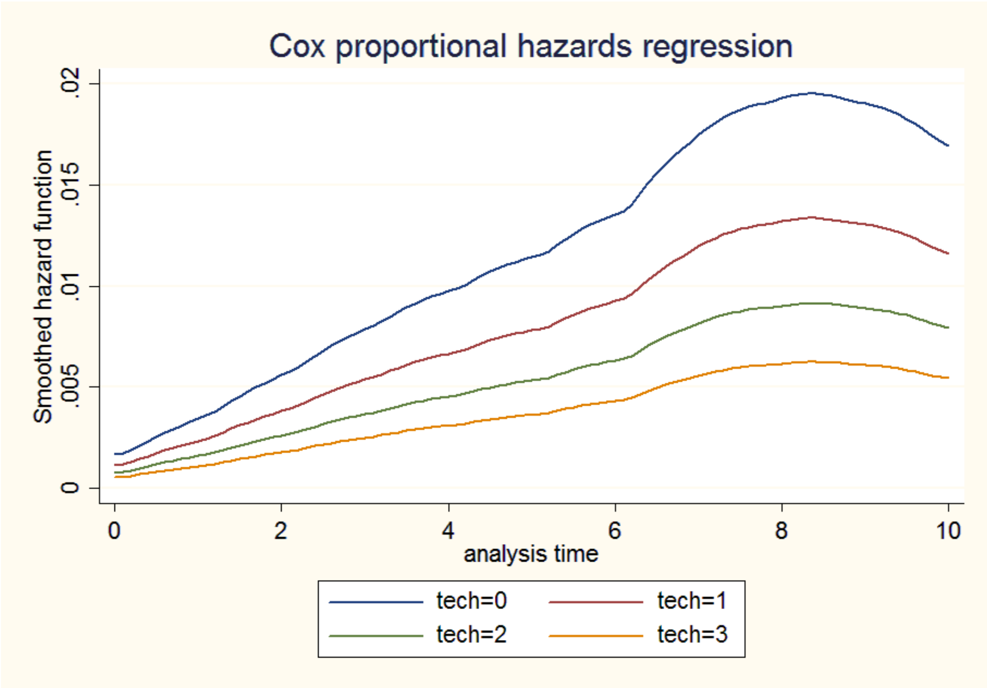


Figure 5s: Hazard Function for different technological levels of service firms in Veneto

5. Conclusive Remarks

Competitiveness is commonly considered one of the most important factors of growth and development, and its is usually described as a crucial point for the recent slow performance of Italian economy. This paper focuses on business demography of Italian firms to identify the relationships among firms characteristics (size and technology intensity) and their competitiveness using, as a proxy, their demography and survival in their markets. We use 6-digit level of aggregation to capture market and not only industry dynamics and we compare five Italian regions (Toscana, Emilia Romagna, Lombardia, Veneto, Puglia) between 2000 and 2005 both for manufacturing and service sectors.

From the empirical analysis we find that firms are characterized by a small size and a low technological intensity in all regions. Both for manufacturing and service sectors the survival rates for large size firms are significantly higher than those of smaller entrants and, on average, the survival rates after four or seven years are very low.

From Cox regressions we find that entering a high tech market reduces a firm's hazard rate as well as a larger size reduces the failure risk. In particular, in Emilia Romagna, Toscana and Puglia we find that size matters in low tech sectors, but smaller firms have an hazard similar to their larger counterparts in high tech sectors. This confirms the existence of technological niches in these regions: size represents an advantage in increasing the likelihood of survival in mature, traditional markets, but not in formative, high technology intensive markets.

Similar results are derived for traditional and knowledge intensive services. Service firms live longer than manufacturing firms and their hazard rates turn out to be less sensitive to size. In services there's no evidence of strategic niches.

As to the regions, firstly, contrary to the conventional wisdom, they show a very similar structure, at least in terms of size, technological intensity and survival probability. Firms operating in Lombardia, for example, do not appear to have an advantage (both in terms of technological intensity or survival probability) if compared to those operating in Toscana or in Puglia. Secondly, firms hazard rate in Toscana and Emilia Romagna seem to be extremely sensitive to size and technology, so any improvement in terms of technological intensity would increase substantially their survival in their market. From Cox regression we find evidence of technological niches in Emilia Romagna, Toscana and Puglia.

Thirdly, high tech service firms in Puglia and Veneto have an extremely small size, but they are much more numerous than high tech manufacturing firms. Finally, a very large majority of service firms are traditional business services like retail trade or hotels and restaurants, not *knowledge intensive business services*.

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Appendix A: Technological Intensity Classification

Manufacturing:

Source: OECD: ANBERD and STAN databases, May 2005
(ATECO 2002 in parenthesis)

High-technology industries

Aircraft and spacecraft (353000)
Pharmaceuticals (242000-242300)
Office, accounting and computing machinery (300000-300100-300200)
Radio, TV and communciations equipment (321000-322010-322020-323000)
Medical, precision and optical instruments (331010-331020-331030-331040-332010-332020-332030-332040-332050-333000-334010-334020-334030-334040-334050)
Medium-high-technology industries
Electrical machinery and apparatus, n.e.c. (310000-311010-312010-312020-313000-314000-315000-315001-315002-316000-316200-316210-316220)
Motor vehicles, trailers and semi-trailers (340000-341000-342000-342001-342002-342003-342004-343000)
Chemicals excluding pharmaceuticals (24 excl. 2423000)
Railroad equipment and transport equipment, n.e.c. (352000 + 359000)
Machinery and equipment, n.e.c. (290000-291000-291200-291300-291410-292000-292120-292210-292211-292212-292220-292310-292410-292420-292430-292431-292432-

292440-292450-292460-293000-293110-294000-294300-294200-295100-295200-295300-295410-295420-295500-295610-295611-295612-295630-295640-297000-297100)

Medium-low-technology industries

Building and repairing of ships and boats (351000)

Rubber and plastics products (250000-251000-251300-252000-252100-252200-252300-252301-252302-252400)

Coke, refined petroleum products and nuclear fuel (231000-232000-232020-232030-232040)

Other non-metallic mineral products (261000-261200-261202-261300-261400-261500-261510-261520-261530-262000-262100-262200-262300-262400-265000-265100-265200-266000-266101-266301-266302-266500-266600-267000-268100-268200)

Basic metals and fabricated metal products (270000-271000-272000-273000-273300-274000-274200-274500-275000-275100-275200-275300-275400-280000-281000-281100-281210-281220-284000-284010-284020-284030-284030-285100-285200-286100-286200-286300-287100-287300-287420-287510-287530-287550)

Low-technology industries

Manufacturing, n.e.c.; Recycling (360000-361000-361120-361121-361122-361200-361411-362210-363000-364000-365010-366200-366320-366350-366352-370000-371010-372010-372020)

Wood, pulp, paper, paper products, printing and publishing (all sectors: 20-22)

Food products, beverages and tobacco (all sectors: 15-16)

Textiles, textile products, leather and footwear (all sectors: 17-19)

Services:

Source: Miles et al., 1995; Nählinder, 2002

The acronym KIBS means *knowledge intensive business services* and it has been introduced to better describe a set of activities that create high tech intangible goods requiring knowledge intensive skills to be produced (Bilderbeek et al. , 1998). Even if a common view does not exist, recently a good classification has been proposed by Nählinder (2002). Three classes have been created:

1. *Technology-Oriented KIBS (T-Kibs)*: more directly involved in high technology production processes
2. *Computer-Oriented KIBS (C-Kibs)*: including services involved in the use of ICT
3. *Professionally-Oriented Kibs (P-Kibs)*: including high professional skills activities but not directly linked to high technology production processes

KIBS that are liable to be mainly related to new technologies include:

• Computer networks/telematics services (e.g. Internet Service Providers, VANs, on-line databases);
• some Telecommunications (especially new business services);
• Software;
• Other Computer-related services - e.g. Facilities Management, Web support services, disaster recovery and business continuity services;
• Training in new technologies;
• Design involving new technologies;
• Office services involving new office equipment);
• those Building services that involving new IT equipment such a Building Energy Management Systems;
• Management Consultancy involving new technology;
• Technical engineering;

• Environmental services involving new technology; e.g. remediation; monitoring;
• Scientific/laboratory testing services; R&D Consultancy

A list of professional KIBS which are not predominantly technology-based would include:
• Marketing, market research, and advertising;
• Training (other than in new technologies);
• Specialized Personnel Recruitment and headhunting;
• Design (other than that involving new technologies);
• some Financial services (e.g. securities and stock-market-related activities);
• Office services (other than those involving new office equipment, and excluding "physical" services like cleaning);
• Building services (e.g. architecture; surveying; construction engineering, but excluding services involving new IT equipment such as Building Energy Management Systems));
• Management Consultancy (other than that involving new technology);
• Accounting and bookkeeping;
• Legal services;
• and Environmental services (not involving new technology, e.g. environmental law; and not based on old technology e.g. elementary waste disposal services).

(Classification ATECO 2002 in parenthesis) :

Computer-Oriented KIBS

Hardware consultancy services (721000)
Software consultancy and supply services (722000)
Data processing services (723000)
Database activities (724000)
Maintenance and repair of office equipment (725000)
Other computer related activities (726010)
Computer and related IT services (726020)

Technology-Oriented KIBS

Research & (experimental) Development (73):

- R&D on natural sciences and engineering (731000)
- R & experimental D in social sciences and humanities (732000-732001-732002-732003-732004-732005-732006)
- Architectural and engineering activities and related technical (742)
- Technical testing and analysis (743001-743002)

Logistic services and related transport services (632000)
T-KIBS in telecommunications (642000)
Textiles Design and Styling (74845)

Professional-Oriented KIBS

Patent bureaux (74110.5)
Technology-related market research (741300)
Technology-related economic and management consultancy (741410-741420-741430-741440)
Technology-related labour recruitment and provision (745000)
Technology related training (Parts of 804200 / 802200 /803000)
Legal services (74111)
Accounting and book-keeping (741120-741210-741220)
Public Relations (741450-741460)

Finance Services (741500)
Advertising (744010)

Appendix B: Size Classes

In highly skewed distributions, equally-sized classes do not allow to distinguish between "small" and "large" firms, classifying almost all of them as "small" because of the high skewness of the Italian firms distribution; the result would be a big number of "very small firms" and only few "big firms". Therefore we adopted the procedure introduced by Geweke, Marshall and Zarkin (1986), to avoid inconsistency problems in the axioms at the basis of the discrete Markov Chains theory (*Fractile Markov Chains)*. They proposed to use not *equally sized* but *equally represented* states (classes); in other words, $\forall t$ and $\forall j:1,2,\ldots,n,\ \pi_{j,t} = n^{-1}$, t being time, j are the n classes and $\pi_{j,t}$ denotes the proportion of the population in state j at time t. Hence, we define a number of states such that the proportion of the population (asset size of the firms) in each state j, for each t, is constant and equal to n^{-1}. One of the attractions of the *fractile* model is that it abstracts completely from distribution, focusing on mobility. For our purposes is not particularly important the focus on mobility because we use the fractile classes only to classify the entry size and not to describe the evolution of the firms size over time but we need classes that allow to avoid the inconsistencies derived by the skewness of the firm size distribution. Hence, following the procedure described, we derive the following 10 fractile classes:

Class	Revenues in Services	Revenues in Manufacturing
1	100,000-149,600	100,000-166,800
2	149,601-211,040	166,801-254,300
3	211,041-286,230	254,301-359,100
4	286,231-392,800	359,101- 488,000
5	392,801-540,120	488,001-648,270
6	540,121-740,080	648,271-900,000
7	740,081-900,000	900,001-1,285,400
8	900,001-1,054,800	1,285,401-1,957,600
9	1,054,801-3,500,000	1,957,601-3,500,000
10	More than 3,500,000	More than 3,500,000