FIRMS’ SURVIVAL AND COMPETITIVENESS:  
A CASE STUDY IN TUSCANY

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Abstract

Survival rates of firms is one of the most interesting determinants of their competitiveness in modern economies. This paper aims at identify the relationships among some firms’ characteristics and their survival in the market. We use a high level of sectors disaggregation and we study Tuscan firms behavior between 2000 and 2005 both in manufacturing and service sectors as a case study to capture recent market dynamics. The empirical analysis shows that firms on average are characterized by small size and low technological intensity. Both in manufacturing and service sectors the survival rates for large size firms are significantly higher than those of smaller firms while the survival rates after few years are very low. Service firms show higher survival probability than manufacturing firms and their hazard rates turn out to be less sensitive to size. Furthermore, we find evidence of technological niches in traditional sectors that foster competitiveness of this region.

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

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1. INTRODUCTION

In recent years, the economic literature has focused on the birth of new firms and their survival rates as crucial variables for economic growth and competitiveness (Bartelsman, Scarpetta and Schivardi, 2003, Bartelsman, Haltiwanger and Scarpetta, 2004, Audretsch et al. 2006). For instance, ISTAT Annual Report (2006) shows that the low Italian economic growth and competitiveness between 1999 and 2004 depends on three main factors: low firms’ productivity, sectoral composition and business demography. In Italy, firms’ size is half the European average and their productivity is 10% lower. Moreover, 4 years after birth, only 60% of the Italian firms survive; they specialize in traditional sectors with low productivity and low technological intensity.

This paper focuses on firms’ survival and identify the relationships among some firms’ characteristics and demographic dynamics and survival in their markets (6-digit). We use firm-level data from AIDA dataset (Bureau Van Dijk Database) for Tuscan firms both in manufacturing and service sectors. Tuscany, indeed, is one of the most dynamic regions in Italy: it includes both large firms and industrial districts, a large tourist sector and several “Made in Italy” brands and it can be considered as a good proxy for the Italian performance during 2000 and 2005.

In this paper, we analyze, firstly, the differences in the likelihood of survival between large and small firms and, secondly, the effects of the size and technological context on the regional likelihood of survival. The following section surveys the literature on business demography, section 3 introduces the database and the estimation techniques, section 4 presents the empirical results and section 5 draws some conclusions.

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2 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).

3 Nearly 387 thousand firms work in Tuscany, 98.7% of which have fewer than 20 employees, manufacture textiles, hides, footwear, clothing, handbags and jewelry. There are small ateliers and large enterprises such as Ferragamo, Gucci and Prada. Prato is the home of a renowned textile manufacturing industrial district; Arezzo is famous for its gold jewelry; Montelupo is one of the key ceramic making centers in the country. The area around Santa Croce sull’Arno, in the province of Pisa, carries on the great tradition of tanning. The old crafts of working iron, alabaster, straw or leather are not merely surviving and they are being rediscovered by the new generations. This region is Italy’s third major manufacturing center, after Milan and Turin. Tuscany also manufacturers chemicals, foods, steel, metals, glass and pharmaceutical: Galileo, Nuova Pignone and Breda are the most famous Tuscan mechanical and advanced technology companies.
2. THE DEMOGRAPHY OF FIRMS: A FRAMEWORK FOR THE ANALYSIS

Since the empirical evidence proposed by Gibrat in 1931, the economic literature deals with birth and survival of firms (Bottazzi et al., 2007; Bartelsman et al. 2004; Bartelsman et al., 2003; Bottazzi, Secchi, 2004). Recent empirical studies suggest to use survival models (Cox Models) to investigate this phenomenon showing that, on average, smaller firms have a lower probability of survival but those who survive grow proportionately faster than larger firms (Evans, 1987; Hall, 1987, Agarval, Audretsch, 2001). This approach focuses on the way firms enter an industry, grow, survive or exit from the markets (Geroski, 1995, Sutton, 1997) showing the existence of strong relationships between the likelihood of survival and the firm’s size (Dunne et al., 1988, 1989; Audretsch, 1991, 1995; Agarval, 1997; Mata, Portugal, 1994; Agarval, Audretsch, 2001; Eurostat, 2005; Audretsch et al. 2006). These empirical studies also suggest 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 number of entrants can be a proxy for the number of innovations in an industry and evolves over the life-cycle. Moreover, according to the theory of strategic niches (Porter, 1979, Caves and Porter, 1977; Caves, 1998), they show that firms remain small because they occupy product niches that are not accessible to their larger counterparts Audretsch et al. 2006). 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. DATA AND STATISTICAL MODEL

3.1 DATA

This study uses data on 6-DIGITS manufacturing and services firms from AIDA dataset (Bureau Van Djck Dataset) between 2000 and 2005. AIDA collects digital balance sheets of Italian companies whose production value is greater than 100,000 euros (around 600,000 firms) since 1996. Other information are also accessible: economic activity (ATECO code), geographical location, identification codes, legal form, etc.. The interest in using this database is due to production of data at local level in Italy and it is useful for modelling dynamic economic behavior using micro data. However, data from AIDA have to be carefully checked because values out of range, missing and duplicated data are present and affect
the reliability of the estimates (see for instance, Calia, Filippucci, 2006)\footnote{To test the reliability of the dataset, internal checks have been performed on the variables (sales, economic activity code, legal form, date of birth and end date of financial statement). Few problems on missing data have been detected but for some companies fiscal codes (CCIAA) are duplicated. Double check on the dataset rarely shows the existence of different geographical location, different legal form or different economic activity code for the same company in two successive years. Direct control for larger companies allows to correct (when necessary) and keep the record. Unfortunately, when duplication or incoherences are found for smaller firms records have been dropped because relevant information for direct controls are not usually available (less than 0.5% of data).}

In this paper, we consider firms in their first 10 years of life, between 2000 and 2005, including firms that entered the market between 1990 and 2005. This allows to capture the firms’ dynamics during the early stages of life, the more risky ones. We measure the size of the firm by the total sales - 2005 prices adjusted-and we classify firms according to ten size classes. Because the firms’ size distribution is highly skewed, equally-sized classes do not allow to distinguish between “small” and “large” firms: the result would be a polarized distribution (huge number of “very small firms” and only few “big firms”) \footnote{See, for instance, Bottazzi et al., 2007.}. To avoid this, we adopted the procedure introduced by Geweke, Marshall and Zarkin (1986), to eliminate inconsistency problems in the axioms at the basis of the discrete Markov Chains theory (Fractile Markov Chains). They propose to use equally represented and not equally sized classes. In other words, $\forall t$ and $\forall j : 1, 2, \ldots, n$, 

$$\pi_{j,t} = n^{-1}$$

where $t$ is 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 classes such that the proportion of the population (firms) in each class $j$, 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 units mobility. Hence, following the procedure described, we derive the following 10 fractile classes (Table 1).

Finally, we classify markets by technology levels distinguished by low, medium-low, medium-high and high technological intensity. This classification captures innovations occurring in the formative or in the mature stage of the life cycle of the markets. We use the classification proposed by the OECD Science and Technology Scoreboard (2005, 2006, 2007) for manufacturing firms and the classification based on the definition of Knowledge Intensive Business Sectors (KIBS) proposed by Miles (1995) and Nählinger (2002), for services (see Appendix A).
Tab. 1: Classes of Sales in Manufacturing and Service Sectors (Euro).

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

3.2 STATISTICAL MODEL

To study the determinants of likelihood of survival of firms we use the analysis of duration (Lancaster, 1990). Following this approach, the variable of interest 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). For this type of data, the analysis of duration allows to estimate the probability that the event “failure” appears in the following 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.

Life-table analysis and Cox regressions can be performed to study life course of firms. Life table analysis shows firms survival and failure rates and estimates the survival rate at time $s$, where $s$ is derived by 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: they represent the probability of failure given that the firm has survived $s$ years.

Let $T$ be a random variable with a cumulative probability

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

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

$$S(t) = 1 - F(t) = P(T \geq t)$$
and the probability that the phenomenon will end the next short interval of time $\Delta$ is

$$I(t,\Delta) = P(t \leq T < t + \Delta \mid T \geq t)$$

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

$$\lambda(t) = \lim_{\Delta \to 0} \frac{P(t \leq T < t + \Delta \mid T \geq t)}{\Delta} = \lim_{\Delta \to 0} \frac{F(t + \Delta) - F(t)}{\Delta S(t)} = \frac{f(t)}{S(t)}$$

which is the rate at which spells are completed after duration $t$, given that they last at least until $t$. $\lambda$ 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

$$h_i(t) = h(t, x) = h_0(t) \exp(x_i^T \beta)$$

$h_0(t)$ 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 $\beta$ 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.

4. SURVIVAL ANALYSIS: A COMPARATIVE PERSPECTIVE

This section analyzes the relationship between firms likelihood of survival and their size and technological level to investigate whether being a large 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.

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6 This function is unspecified for generality purposes and ease of interpretation.

7 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. They are available from the authors upon request.
Firstly, we present the results from manufacturing firms and, secondly, the results from service firms. For each, we include descriptive statistics and discuss the results of life table analysis and Cox regressions.

4.1 MANUFACTURING

In Table 2 and Table 3 descriptive statistics are presented. Table 2 shows the data structure. The vast majority of firms are small (60% in Tuscany) and low technology intensive (62%). From this preliminary analysis, it turns out that Tuscan forms, as expected, are small and traditional, often craftsmanship firms, but what does it mean in terms of their survival and, consequently, in terms of their competitiveness in the market? Table 3 shows that 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 sales). As expected, the number of small firms is higher than the number of large firms, as well as the number of firms in traditional sectors is much higher than the number of firms in high tech sectors.

Tab. 2: Percentage of Firms in each group in Tuscany.

<table>
<thead>
<tr>
<th>Group</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small Firms</td>
<td>59.99</td>
</tr>
<tr>
<td>Medium Firms</td>
<td>19.98</td>
</tr>
<tr>
<td>Big Firms</td>
<td>20.04</td>
</tr>
<tr>
<td>Low-Tech Firms</td>
<td>62.07</td>
</tr>
<tr>
<td>Medium-Low Firms</td>
<td>21.18</td>
</tr>
<tr>
<td>Medium-High Firms</td>
<td>13.16</td>
</tr>
<tr>
<td>High Firms</td>
<td>3.59</td>
</tr>
</tbody>
</table>

Note: for classes of sales, see Table 1.

Tab. 3: Descriptive Statistics: Manufacturing Firms in Tuscany.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>Std.Dev.</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size</td>
<td>5.50</td>
<td>2.87</td>
<td>1</td>
<td>10</td>
</tr>
<tr>
<td>Span</td>
<td>5.33</td>
<td>2.64</td>
<td>1</td>
<td>10</td>
</tr>
<tr>
<td>Tech</td>
<td>0.58</td>
<td>0.85</td>
<td>0</td>
<td>3</td>
</tr>
</tbody>
</table>

Note: Sample Size: 4901 observations.

Figure 1 presents results from the life table analysis. Survival rate after 4 years is 60%, confirming what assessed by ISTAT in the Annual Report (2006). Survival rates for large firms are always significantly higher than for the smaller ones; this confirms the hypothesis on the positive relationship between firms’ size
and their likelihood of survival (Audretsch, 1991, 1995). Only 55% of small firms survive four years compared to 73% of the large firms and the difference is even more evident after seven years (21% vs. 36%). Figure 1 also shows that likelihood of survival 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 after birth, only 65% and 30% of high tech firms are still active in Tuscany, respectively (the likelihood of survival after 4 years is 65% and after 7 years it is 30%).

Fig. 1: Survival Rates of Manufacturing Firms in Tuscany.

Table 4 presents the results from Cox proportional hazard regressions to assess the effect of regressors on the hazard rate function and to measure the risk ratio associated to each variable. 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 from 1.

A set of regressions has been run, testing for the effect of size and technological level for small firms (regression 1), medium-sized firms (regression 2) and large firms (regression 3). Then, a focus on technological level has been implemented, testing for the effect of size on low-tech firms (regression 5), medium-low tech firms (regression 6), medium-high tech firms (regression 7) and high-tech firms (regression 8). All coefficients are negative and strongly significant in regression 1: hazard rates are lower in high tech markets and for larger-size firms. Entering a high tech market reduces a firm’s hazard rate (40% in Tuscany) as well as a larger size reduces the failure risk (15% in Tuscany). Regression 2 and 3 on small
and medium firms confirm the results obtained in the whole sample: size gives an advantage to large size firms, producing high tech goods. Regression 4 focuses only on the largest firms of the sample showing that their survival is less sensitive to further increase in size or technological intensity. In other words, size has a non-linear effect on the firms’ likelihood of survival. Focussing on regressions from 5 through 8, 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 is in line with the existence of technological niches in traditional sectors in Tuscany (leather goods, fashion, gold are all craftsmanship goods): 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). Figure 2 reports a graphical representation of hazard rates for different firms’ size and technological level.

### Tab. 4: Cox Regressions: Manufacturing Firms.

<table>
<thead>
<tr>
<th></th>
<th>H.R.(p-value)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Size 0.85 (0.000)</td>
</tr>
<tr>
<td></td>
<td>Tech 0.60 (0.000)</td>
</tr>
<tr>
<td>2</td>
<td>Size 0.94 (0.222)</td>
</tr>
<tr>
<td></td>
<td>Tech 0.63 (0.000)</td>
</tr>
<tr>
<td>3</td>
<td>Size 0.94 (0.886)</td>
</tr>
<tr>
<td></td>
<td>Tech 0.46 (0.054)</td>
</tr>
<tr>
<td>4</td>
<td>Size 0.37 (0.061)</td>
</tr>
<tr>
<td></td>
<td>Tech 0.47 (0.093)</td>
</tr>
<tr>
<td>5</td>
<td>Size 0.86 (0.000)</td>
</tr>
<tr>
<td>6</td>
<td>Size 0.84 (0.012)</td>
</tr>
<tr>
<td>7</td>
<td>Size 0.70 (0.003)</td>
</tr>
<tr>
<td>8</td>
<td>Size 0.89 (0.602)</td>
</tr>
</tbody>
</table>

Note: All firms (1), Small firms (2), Medium firms (3), Big firms (4), Low tech firms (5), Medium-low tech firms (6), Medium-high tech firms (7), High tech firms (8).

### 4.2 SERVICES

Descriptive statistics for service firms are presented in Table 5 and Table 6. Firstly, service firms are more numerous than manufacturing firms (14,483 versus 4,901 in Tuscany). Also, the majority of them is classified as small and low technology intensive: they are traditional business services like retail trade or hotels and restaurants (tourist services in Tuscany are well developed), not knowledge intensive business services. Tables 5 and 6 show that service firms, on average, are larger but technologically less intensive than manufacturing firms (on average, 0.21).
Fig. 2: Hazard Rates of Manufacturing Firms in Tuscany. Different Sizes.

Figure 3 presents results from the life table analysis. Survival rates for service firms are higher than the corresponding rates for manufacturing firms. Also for service firms, survival rates decrease substantially after four years while large firms show rates that are always significantly higher than those of small firms. In particular, 61% of large Tuscan firms survive after 4 years from birth, while only 50% of small service firms still work after four years (very close to the value derived for small manufacturing firms), confirming the positive relationship between size and survival in manufacturing. The same Figure shows, 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 probability of survival after 4 years is 55% for P-kibs firms and 61% for T-kibs firms.

### Tab. 5: Percentage of Firms in each group in Tuscany.

<table>
<thead>
<tr>
<th>Group</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small Firms</td>
<td>47.47</td>
</tr>
<tr>
<td>Medium Firms</td>
<td>18.7</td>
</tr>
<tr>
<td>Big Firms</td>
<td>33.83</td>
</tr>
<tr>
<td>Low-Tech Firms</td>
<td>88.36</td>
</tr>
<tr>
<td>Medium-Low Firms</td>
<td>4.25</td>
</tr>
<tr>
<td>Medium-High Firms</td>
<td>4.82</td>
</tr>
<tr>
<td>High Firms</td>
<td>2.58</td>
</tr>
</tbody>
</table>

Note: for classes of sales, see Table 1.
Tab. 6: Summary Statistics: Service Firms in Tuscany.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>Std.Dev.</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size</td>
<td>6.26</td>
<td>2.98</td>
<td>1</td>
<td>10</td>
</tr>
<tr>
<td>Span</td>
<td>5.14</td>
<td>2.52</td>
<td>1</td>
<td>10</td>
</tr>
<tr>
<td>Tech</td>
<td>0.21</td>
<td>0.64</td>
<td>0</td>
<td>3</td>
</tr>
</tbody>
</table>

Note: Sample Size: 14,483 observations.

Table 7 presents the results from Cox proportional hazard regressions\(^9\). Following the procedure implemented for manufacturing firms, we run a set of regressions, testing for the effect of size and technological level for small firms (regression 1), medium-sized firms (regression 2) and large firms (regression 3). Then, a focus on technological level has been implemented, testing for the effect of size on low-tech firms (regression 5), medium-low tech firms (regression 6), medium-high tech firms (regression 7) and high-tech firms (regression 8). Regression 1 shows that all coefficients are negative and strongly significant: size and technological intensity are 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 found for manufacturing firms even if the effect of size on the failure rate is lower (on average, size reduces the hazard rate only by 5%) while the effect of technology is stronger (on average it reduces the hazard rate by 65%) than for manufacturing firms. Regression 2 and 3 on small and medium firms confirm results sketched above for the whole sample: size gives an advantage to firms with larger size and intensive knowledge skills. Regression 4 focuses only on big firms showing that neither size nor technological intensity are significant in affecting the firm’s hazard rate. Regressions from 6 to 8 show that the effect of size on knowledge intensive firms is not significant, stressing that size is less relevant in reducing the risk of high-tech firms. On the contrary, size is important in reducing traditional and P-kibs firms hazard rate: in Tuscany the failure rate is reduced by 5%. Strictly speaking, in competitive markets firms in low skilled services sectors have to compete to survive: they can either increase their skills or their size. Figure 4 reports a graphical representation of hazard rates for different firms’ size and technological level.

\(^9\) Additional results and full diagnostic analysis is available upon request.
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Fig. 3: Survival Rates of Service Firms.

Tab. 7: Cox Regressions: Service Firms in Tuscany.

<table>
<thead>
<tr>
<th></th>
<th>Size</th>
<th>Tech</th>
<th>H.R.(p-value)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.95 (0.001)</td>
<td>0.69 (0.000)</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>0.99 (0.782)</td>
<td>0.63 (0.000)</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>1.04 (0.839)</td>
<td>0.89 (0.519)</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>0.93 (0.639)</td>
<td>0.72 (0.109)</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>0.95 (0.001)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>0.92 (0.302)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>1.04 (0.607)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>1.12 (0.444)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

5. CONCLUSIVE REMARKS

Firms’ dynamics are commonly considered one of the most important factors for economic growth and competitiveness of a modern economy. This paper studies the survival dynamics of firms in Tuscany between 2000 and 2005, both in manufacturing and service sectors, using a 6-digit level of aggregation to capture market and not simply industry dynamics from AIDA database.

The empirical analysis shows that firms are characterized by small size and low technological intensity. The survival rates for large firms are significantly higher
than those of smaller ones and, on average, the survival rates after four or seven years are very low both in manufacturing and service sectors. More specifically, from the analysis of duration, Tuscany shows that size matters in low tech sectors, but smaller firms have an hazard rate similar to their larger counterparts in high tech sectors. This confirms the existence of technological niches: size represents an advantage in increasing the likelihood of survival in mature, traditional markets like leather goods or apparel, but not in formative, high technology intensive markets, like bio-tech.

Similar results hold for traditional and knowledge intensive services. Service firms live longer than manufacturing firms and their hazard rates are less sensitive to size. The large majority of service firms are in traditional business services like retail, trade or hotels and restaurants and very few in knowledge intensive business services. In service sectors, there’s no evidence of strategic niches. On the contrary, service firms’ hazard rates in Tuscany seem to be extremely sensitive to technology: any improvement in terms of technological intensity would increase their survival rate in the market. In competitive markets, like advanced services, firms in low-tech sectors have to compete to survive: they can either increase their skills or their size.

The analysis shows strengths and weaknesses of the Tuscan industrial system and its competitiveness. Indeed, small, low-tech firms have a limited role in global markets and, because their survival rates are lower than their larger counterparts, their strategies are inevitably short-run strategies, affecting the competitiveness of the system as a whole. Of course, the firms’ behavior, dynamics and competitive-
ness are strongly related to their sector. In this paper, we propose an aggregate analysis (manufacturing and service firms) while a detail on specific sectors (e.g. made in Italy sectors or specific successful industrial districts) and internationalization mode of Italian firms is left for future research. Also, the analysis could easily be generalized to all Italian regions including other covariates and using a different, more reliable database.

6. APPENDIX A: TECHNOLOGICAL INTENSITY CLASSIFICATION

  - High-technology industries:
    - Aircraft and spacecraft
    - Pharmaceuticals
    - Office, accounting and computing machinery
    - Radio, TV and communications equipment
    - Medical precision and optical instruments
  - Medium-high-technology industries:
    - Electrical machinery and apparatus, n.e.c.
    - Motor vehicles, trailers and semi-trailers
    - Chemicals excluding pharmaceuticals
    - Railroad equipment and transport equipment, n.e.c.
    - Machinery and equipment, n.e.c.
  - Medium-low-technology industries:
    - Building and repairing of ships and boats
    - Rubber and plastics products
    - Coke, refined petroleum products and nuclear fuel
    - Other non-metallic mineral products
    - Basic metals and fabricated metal products
  - Low-technology industries:
    - Manufacturing, n.e.c.; Recycling
    - Wood, pulp, paper, paper products, printing and publishing
    - Food products, beverages and tobacco
    - Textiles, textile products, leather and footwear
Services: Source: Miles, 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:

- Technology-Oriented KIBS (T-Kibs): more directly involved in high technology production processes
- Computer-Oriented KIBS (C-Kibs): including services involved in the use of ICT
- 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;
– Environmental services (not involving new technology, e.g. environmental law; and not based on old technology e.g. elementary waste disposal services).

REFERENCES


SOPRAVVIVENZA E COMPETITIVITÀ DELLE IMPRESE:
UN CASO DI STUDIO IN TOSCANA

Riassunto

Nei recenti studi d’impresa, le dinamiche di sopravvivenza sono considerate uno degli elementi più importanti per lo sviluppo e la competitività del sistema economico di un paese. Lo scopo di questo lavoro è di identificare la relazione tra alcune caratteristiche delle imprese e la loro sopravvivenza nel mercato prendendo come caso di studio le imprese operanti in Toscana. L’analisi viene svolta con un modello Cox semiparametrico sulle imprese toscane (manifattura e servizi) usando un database con un livello di disaggregazione settoriale a 6-digit (AIDA, Bureau Van Dijk) per il periodo 2000-2005. L’evidenza empirica mostra che le imprese sono in media piccole, operano in settori tradizionali e con tassi di sopravvivenza mediamente molto bassi. Le grandi imprese, sia nella manifattura sia nei servizi, hanno tassi di sopravvivenza più elevati di quelle piccole. Le imprese dei servizi mostrano in media tassi di sopravvivenza più elevati di quelle manifatturiere e i corrispondenti tassi di rischio sono meno sensibili alla dimensione d’impresa. Infine, l’analisi mostra in alcuni settori tradizionali la presenza di nicchie tecnologiche che migliorano la posizione competitiva delle imprese toscane.