Papers in Evolutionary Economic Geography

17.07

The spatial evolution of the Italian motorcycle industry (1893-1993): Klepper's heritage theory revisited

Andrea Morrison, Ron Boschma

Utrecht University
Urban & Regional research centre Utrecht

The spatial evolution of the Italian motorcycle industry (1893-1993):

Klepper's heritage theory revisited

Andrea Morrison*[1] and Ron Boschma*#

*Utrecht University, Department of Human Geography and Planning, r.a.boschma@uu.nl; a.morrison@uu.nl

Center for Innovation, Research and Competence in the Learning Economy (CIRCLE)-Lund University, ron.boschma@circle.lu.se

[1]ICRIOS-Bocconi University

9 March 2017

Abstract

This paper investigates the spatial evolution of the Italian motor cycle industry during the period 1893-1993. We find support for both the heritage theory of Klepper and the agglomeration thesis of Marshall. Indeed, being a spinoff company or an experienced firm enhanced the survival rates, but we also found a positive effect of being located in the Motor Valley cluster in Emilia Romagna. Interestingly, this beneficial effect of a cluster could not be found outside the Emilia Romagna region. This might indicate the importance of a favourable local institutional environment, as propagated by the Emilian district literature.

Key words: spinoff dynamics, agglomeration economies, clusters, industrial districts, Emilian model, evolutionary economic geography

JEL-codes: B15, B52, O18, R11

1. Introduction

The work of Klepper and colleagues challenged the traditional cluster literature, suggesting that Marshallian externalities play no or a minor role in the agglomeration process of an industry (Klepper 2002a, 2002b, 2002c, 2007, 2009, 2011; Klepper and Thompson, 2009; Klepper and Buenstorf, 2010). Based on the empirical investigation of a disparate set of industries that are strongly concentrated in space (e.g. automobiles in Detroit, tires in Akron, semiconductor in Silicon Valley), they argued that the spin-off process is the main driver of the formation of an industrial cluster. These studies show that geographically concentrated industries grow thanks to the presence of a few successful early entrants (e.g. Old Mobile in Detroit, Fairchild in Silicon Valley), which give birth to a disproportionate number of spin-offs. These spin offs tend to locate close to their parents and become successful by inheriting the superior routines of their parents.

The heritage theory of Klepper has influenced how economic geographers look at industrial clusters and their dynamics. This literature has provided robust evidence showing the key role of organisational reproduction and routine inheritance in the formation and success of industrial clusters. However, as pointed out in recent reappraisals of Klepper's work, the heritage theory is not necessarily incompatible with the Marshallian externality theory (Boschma 2015; Cusmano et al. 2015). On this point, it is worth noting that Klepper himself indicated that the spin-off process might not be the only reason of why spin-offs locate in clusters. Klepper (2007) recognised that spin-offs, besides inheriting superior capabilities from their parents, are more capable of taking advantages of local externalities and therefore outperform other firms. And although Klepper's work fundamentally challenged the idea that culture and institutions matter in explaining the success of clusters like Silicon Valley, Klepper (2009) also did not exclude the possibility that institutions can play a role. He argued that the presence of relational capital or social networks, which are well known levies of financial and knowledge capital, can influence the spin-off's decision to locate nearby its parent. Some recent studies show that once institutions are included in the Klepper's spin-off framework, significant differences across countries appear (Menzel and Kammer, 2012).

The aim of this paper is twofold. First, we empirically address the question if the heritage theory is compatible with a Marshallian theory of industrial clusters in the context of the Italian motorcycle industry. This is an interesting industry as it shares features with the automobile sector investigated by Klepper. We test whether our findings of the survival of motorcycle firms supports the heritage theory, the Marshallian theory, or both. Second, we assess the possible role of local institutions for the spatial clustering of an industry. The Italian motorcycle industry concentrated in the Motor Valley in the Emilia Romagna region, whose economy is populated by a type of industrial agglomerations known as 'neo-Marshallian industrial districts' (Becattini, 1990). Cusmano et al. (2015) argued that the typical Italian district is characterized by a "social milieu (that) provides relevant knowledge about market opportunities and access to resources that can benefit a broader group of would-be entrepreneurs" (p. 15), besides spin-offs. We test the claim of the Italian industrial district literature, and the Emilian district model in particular (Brusco, 1982) whether the combination of flexible specialisation with cultural and social proximity generated a favourable environment for entrepreneurial activities and knowledge sharing that enhanced the survival of Italian motor cycle firms, irrespective of the background of the entrepreneur.

The paper is organised as follows. In Section 2, we present the theoretical arguments of the two competing approaches: heritage theory and Marshallian agglomeration economies. This section also discusses the peculiarity of the Emilian district model. Section 3 presents the data, variables and methods used in the empirical analysis. Section 4 discusses the empirical findings of the survival analysis. Section 5 concludes.

2. Heritage theory versus agglomeration theory

The heritage theory of Klepper identifies the spin-off process as the main mechanism of knowledge/routine transmission. The key idea is that the set of capabilities of a new venture is strongly shaped by the working experience of the founder, that is, the background of a founder strongly influences the success of a start-up. In this framework, the spin-off process is interpreted as an evolutionary mechanism of knowledge transmission between parents and off-springs (i.e. spin-offs) (Nelson and Winter, 1982), whereby founders of new ventures inherit the competences and skills they have acquired during their prior work experience in the parent company that is either active in the same industry or a related industry. From this, it follows that a prospective spin-off working at a parent with successful routines will acquire superior skills, which can be applied and replicated in the new venture. A central tenet in this literature is that successful firms generate more spin-offs, which are also more successful on average (Klepper and Sleeper, 2005). Therefore, according to Klepper (2010), the higher performance of firms in clusters, as compared to firms outside clusters, does not descend from the benefits of local externalities, but rather from the inherited routines these firms possess at the time of entry. This implies that the tendency of an industry to agglomerate is driven by the spin-off process, as spin-offs' founders tend to locate close to their parents. The growth of a cluster happens when one or more early outstanding entrants (like Fairchild in Silicon Valley) spur many successful local spinoffs. Although agglomeration forces can play a role in attracting firms to a cluster, it is the inheritance of successful routines from the parent that explains the performance of the spin-off, according to Klepper.

The heritage theory goes against the seminal work of Marshall (1920) stating that the geographical concentration of economic activities should be understood essentially in terms of agglomeration economies. The core of this approach suggests that industries tend to concentrate in space due to the presence of scale economies that are external to the firm but internal to a bounded geographical area. The co-location of a pool of specialised workers, along with a specialised local market of suppliers generate pecuniary externalities. Geographically proximate firms can access these at lower costs than firms outside such agglomerations. Agglomerations can also favour knowledge spillovers (Audretsch and Feldman, 1996; Maskell and Malmberg, 1999)[1]: firms and workers can match their (often idiosyncratic) characteristics and disseminate knowledge via labour mobility (Breschi and Lissoni, 2009), imitation (Maskell, 2001), user-producer interactions (Lundvall, 1992) and informal know how bartering (von Hippel, 1987). The fast and wide circulation of tacit knowledge among co-located firms contributes to collective learning, which becomes embedded in the social glue of firms and people living in the same territory (Becattini, 1990; Capello and Faggian, 2005; van der Panne and van Beers, 2006).

Agglomeration economies can arise from various sources and hence differ in nature. A way to disentangle them is to distinguish between localization and urbanization economies

[1]An alternative argument, inspired by Jacobs (1969), identifies inter-industry agglomeration forces, highlighting the knowledge exchange across firms in different sectors.

(Henderson et al., 1995). Localization economies (Glaeser et al., 1992) occur when firms in the same industry or in related sectors cluster in space. To avoid confusion in the definition of localization economies that is quite common, we refer to the 'narrow version' of localization economies when it concerns externalities derived from co-located firms in the same industry, while the 'extended version' of localization economies, or 'related externalities' (Neffke et al. 2011a) would include the co-location of firms from sectors related to the principal industry. Urbanization economies arise from the size and diversity of an urban economic structure and the availability of a wide range of collective goods (e.g. educational infrastructure), so it is the advantage of being located in a densely populated area, where many different industries and services are also present (Jacobs, 1969). In sum, the Marshallian agglomeration thesis claims that firms will benefit from agglomeration economies by simply being co-located.

So, the heritage theory of Klepper and the agglomeration theory of Marshall provide alternative explanations for why firms might do well in clusters. Empirical studies show a mixture of findings (Boschma, 2015; Frenken et al., 2015). Some studies found support for Klepper's heritage theory, like the UK car industry (Boschma and Wenting, 2007), the Dutch publishing industry (Heebels and Boschma, 2011) and the German machine tool industry (Buenstorf and Guenther, 2011). Other empirical works found evidence of agglomeration economies, though not always positively. A positive effect of localization economies was found in the plastic injection moulds industry (Costa and Baptista, 2011) and the global video game industry (De Vaan et al. 2013), while Boschma and Wenting (2007) found negative effects of clustering on survival in the UK car industry. This negative effect shows that spatial clustering may turn into an obstacle for further agglomeration if firms perceive tight local competition and have to bear high local costs such as labour and land costs as a result of agglomeration. This is in line with studies showing that firms' survival is negatively affected by increasing local density, meaning a higher number of firms in the same industry in a location (Sorenson and Audia, 2000; Staber, 2001; Cattani et al., 2003; Wezel, 2005).

Though providing alternative explanations for spatial clustering, the heritage theory is not necessarily incompatible with the Marshallian externality theory (Boschma 2015; Cusmano et al. 2015). First, Boschma and Frenken (2003) stated the possibility that spinoff activity induces spatial clustering at the formative stage of an industry, after which Marshallian externalities support the further growth of the cluster (positive externalities), or set in a process of decline (negative externalities). Second, Klepper himself indicated that the spin-off process might not be the only reason of why spin-offs locate in clusters. More than that, he did not discard completely (though he did not test it empirically) that the superior performance of spin-offs in a cluster (as opposed to those outside clusters) is compatible with the Marshallian externality argument. Klepper recognised that spin-offs, besides inheriting superior capabilities from their parents, are outperforming other firms because these firms are more capable of taking advantages of local externalities. In his words, "it is possible that agglomeration economies in the Detroit area were significant but only benefitted spinoffs, perhaps because only they had suitable pre-entry backgrounds to benefit from agglomeration economies. It is hard to rule out such a theory…" (Klepper 2007, p. 629).

What has been understudied in this Klepperian framework so far is the explicit recognition that local institutions may play a crucial force in making industries agglomerate, or not, in certain places. There are some studies that have focused on this particular point. Wenting and Frenken (2011) suggested that cultural factors are important to explain why ready-to-wear businesses in the fashion industry did not take off in Paris after WWII. Menzel and Kammer (2012) showed that national institutional factors could explain the success of the Danish wind industry in terms of firm survival, as compared to the US. Cusmano et al. (2015) examining a typical Marshallian industrial district in Italy, found that spin-offs did not outperform other local firms in the district, and suggested that non spin-off firms may have benefited from local institutional factors. But there are few studies to date that take local institutions on board when analyzing spatial clustering of an industry in a Klepperian framework

Interestingly, the Italian industrial district literature (or at least part of that literature) has made a connection between Marshallian external economies and the importance of institutional factors to explain spatial clustering of industries (Piore and Sabel 1984; Bellandi 1989; Becattini 1990; Harrison 1992; Markusen 1996; Hart 2009; Loasby 2009). In the historical experiences of industrial districts, which are characterized by thick institutions of governance, density is associated with embeddedness and cooperation that enhance (instead of lowering) the survival of firms. The presence of thick institutions and specialised organisations contributes to the supply of local "collective goods", such as vocational training education, R&D centres, technical and financial services and institutions of governance, which reduce uncertainty and transaction costs and lower the entry barriers for new enterprises. Moreover, cooperation, informal know-how sharing and the easy of doing business is enhanced by a shared common culture, which is advocated as a quintessential feature of industrial districts (Dei Ottati 2002; Becattini et al. 2009). These characteristics have featured prominently in Italian industrial districts, whose competitiveness is explained in terms of Marshallian *industrial atmosphere* and good governance (Pyke et al. , 1990).

The industrial districts of Emilia Romagna, with well-known examples like ceramic tiles in Sassuolo and packaging machinery and motor cycles in Bologna, have been regarded as a paradigmatic case (Bianchi and Gualtieri 1990). They are part of the so-called *Emilian model*, as popularised by the work of Brusco (1982): a socio-economic model of territorial development combining flexible specialisation with social cohesion and high quality of government (Amin 1999). This model emerged in the early nineteen century, when socialist ideas diffused in the urban and rural areas of the region, which soon led to the creation of cooperatives of workers and artisanal associations. These organised group of worker, along with some progressive entrepreneurs initiated several technical and vocational schools, which soon spread around in urban areas and contributed to the formation of a sizable class of technicians and a scientific culture (Capecchi, 1992: 23). Rural areas were characterised by share-cropping and proto-industrial activities in which many agricultural workers set up small entrepreneurial farming businesses. After WW2, the entrepreneurial climate was strongly supported by new local political elites that were dominated by the local communist party. Members of the party were present in trade unions, association of artisans, cooperatives and farming associations, which, according to Capecchi (1992) "…became extremely important centres of economic power, and served as bases for training in business and in the management of small enterprises" (p. 28). This coalition of entrepreneurs, workers and politicians generated a cohesive and progressive political community, which contributed to the diffusion of an entrepreneurial culture and a resilient local economy.

This paper will investigate the spatial evolution of the Italian motor cycle industry during the period 1893-1993. Interestingly, this industry concentrated in three clusters, one of them located in the heartland of Emilia Romagna. We examine whether the heritage theory, the agglomeration theory, or both, can explain survival rates of firms. In addition, we test whether firms in the Emilia Romagna cluster, as suggested by the Emilian district model, outperformed firms located in the other two clusters outside Emilia Romagna.

3. Data and methods

The study is based on an original dataset of 667 motorcycle companies in Italy in the period 1893-1993. The dataset draws on two sources: "Moto Italiane, i primi 50 anni 1895 - 1945" (Milani, 1998) and "Enciclopedia della motocicletta" (Wilson, 1996)[2], which are two encyclopedia of motorbike companies providing rich and systematic information on the year of foundation of a company, the ending year of production or when a major re-organization or ownership change occurred, and the location of the company (city level). With this information at hand, it was possible to reconstruct the historical evolution of the industry and its geographical distribution. Milani (1998) and Wilson (1996) are also the key sources of information to detect the origin and background of firms. They provide information on the name of the founder, and in some cases about organizational changes that a company went through. Additional information on firms' founders was searched in specialized magazines and company websites. Economic and social data on population have been extracted from statistical publications and databases at the Italian statistical office (ISTAT, 2011) and the Bank of Italy (Nuzzo, 2006). Historical census data on regional employment in the Italian manufacturing sector were extracted from Cainelli and Stampini (2002)[3]. Historical data on school enrollment and regional GDP were taken from statistical appendix of Felice (2013).

Following other studies, the Cox proportional hazard regression model has been used to test the survival of firms. This model allows to regress the survival rate of a population (i.e. the hazard function) to a set of explanatory variables. More in details, the hazard function, h(r), indicates the probability that an observation will experience a given event (in this case, failure) in a small time interval, which can be interpreted as the risk of failing at the time of

---

[2] When these two sources did not provide relevant information about the founding year or the background of founders, additional search was conducted on various sources, including specialized magazines, blogs of riders and fan club of historical motorbikes. As far as internet sources are concerned, we mainly relied on the following websites: *Moto Club Storico Conti, Wheels of Italy, Moto di Lombardia, Motorvalley*, and the company websites for companies that are still alive.

entry. Therefore, the higher the hazard rate, the lower the probability of surviving. Hence, having n explanatory variables x_n, the hazard risk at time t is expressed as:

$$h(t) = [h_0(t)]e^{(B_1X_1+B_2X_2+...+B_nX_n)}$$

The quantity $h_0(t)$ is the baseline or underlying hazard function, corresponding to the probability of failure when all the explanatory variables are zero. The regression coefficients B_n of each explanatory variable indicate the proportional change of the hazard rate due to a change in the explanatory variables. The model is based on the assumptions that observations are independent and the hazard rate is constant over time, hence a constant relationship is assumed between the dependent and the explanatory variables. Moreover, a Cox regression exploits the information of censored cases which are observations for which the event of interest occurred after the period of observation. In this case, censored cases are firms that were still active after 1993. The Cox model is semi-parametric, hence, different from other parametric models (e.g. exponential): it does not impose any restriction on the shape of the hazard function, which is an advantage, since there is no need to make an a priori hypothesis.

Our study tests the impact of a set of explanatory factors on the performance of firms, measured as survival time. The construction of the explanatory variables and the dependent variable closely follows the methodology used in similar studies (Klepper 2002b and 2007; Boschma and Wenting, 2007).

Dependent variable

The survival of the firm, or firm age, is the dependent variable on which the hazard rate is computed. This is a duration variable computed as the difference between the year of exit (i.e. last year of production) and the year of entry (i.e. first year of production). It is worth noting that takeovers are treated as exits, and the year of acquisition as the time of exit. Mergers are treated as exit if the company name disappears or the location of the firm changes, while the firm is treated as continuing if the company name is still in use and its location stays the same. In the rare cases in which a firm changes name for reasons different from merger or acquisition (e.g. when one of the founders leaves the firm), the firm is treated as continuing.

Explanatory Variables

Heritage model: Firm Background

Klepper identifies three types of backgrounds of founders, which correspond to four types of entrants: (1) *spinoffs*, which are firms founded by employees of firms which were already active in the same industry. Spinoffs directly inherit the routines of the parent firm via the founder, so if the parent had superior routines, and accordingly superior performance, also the spin-off is expected to be successful (Klepper, 2007). Empirical evidence shows that more successful firms have indeed higher spinoff rates and more successful spinoffs (Klepper and Sleeper, 2005); (2) *experienced firms* and *experienced entrepreneurs*: these are firms (or entrepreneurs) which enter an industry by diversifying their portfolio of products/activities

(Carroll, et al. 1996; Klepper, 2002b; Boschma and Wenting, 2007). Due to the cumulativeness of knowledge production, innovation and diversification are path dependent processes (Dosi, 1988), therefore firms tend to develop new activities around those they are good at. Empirical evidence confirms that the diversification process from related sectors is the main avenue to enter (and succeed) into new economic activities (Neffke et al. 2011b; Boschma et al. 2013). In particular, new firms with a background in closely related sectors should perform better than other diversifying firms; (3) *inexperienced firms*: this category includes firms and entrepreneurs with no prior work experience in the same or related industries. Since in most studies it is not always possible to track back the experience of the founder, this category includes also firms whose founders' background is unknown. According to Klepper's entry model (Klepper 2002c), these firms show the lowest R&D productivity because they lack industry specific capabilities, resulting in lower performance at any age and time of entry.

Firm background refers to a set of binary variables defined according to the previous experience of the company founder (*spinoff, experienced entrepreneur, experienced firm and inexperienced firm*). They get value 1 if the founder of the firm falls in one of the background categories and zero otherwise. A firm is treated as a spinoff if the founder was a previous employee of an incumbent motorbike firm. In case the founder worked for more than one incumbent, the last firm is considered as the parent company. For each spinoff, a performance variable of the parent (*Parent duration*) has been constructed, which indicates the number of years of production of the parent firm. If the parent is a foreign firm, hence it is not included in the dataset, the background is assigned as spin-off and the age of the foreign parent recorded in the variable *Parent duration*.

The *Experienced entrepreneur* variable refers to a new start-up founded by individuals who worked in closely related activities, such as technicians in motorbike repair workshops, sellers and importers of foreign motorbike brands, organisers of or riders in motorbike races, and army officers with expertise in motorbikes or its components. The variable *Experienced firms* refers to firms that diversified in the motorbike industry from related sectors such as automobile, bikes, carriages, engines or other components. This type of firms mainly consists of bike producers, in particular in the early years of the industry, and suppliers of core inputs, like engines. The *Inexperienced firm* variable includes all firms for which the founder background is either unknown or unrelated to the sector. All the above variables are used to test the *heritage model.*

In addition to firm background, the heritage theory argues that the *time of entry* affects firm performance. Following the industry life cycle (Klepper 1997), three phases of an industry are identified. The emergency phase, when few firms populate the industry, is characterised by technological turbulence and high rates of innovation. Second, as a technology becomes more diffused, the number of firms in the market grows considerably and a dominant technology emerges. During the last maturity phase, a shakeout occurs in the industry: firms with the fittest routine will survive, while the others exit the industry, and the industry becomes concentrated. In this model, it is argued that early entrance brings an advantage because of increasing returns to R&D. It is assumed that it is easier to enter an emerging industry than a mature industry, since entry barriers grow over time along with the growing costs of R&D. Three time cohorts have been created to account for the shakeouts that occurred in the industry. They indicate at which age a firm/entrepreneur entered the industry. The first dummy (i.e. *preWWI*) includes firms entering before WWI, between the years 1893 and 1915. The second dummy stands for firms entering between the years 1916 and 1945 (i.e. *preWWII*), and the last cohort includes all firms starting from year 1945 (i.e. *postWWII*).

Since the effect of time of entry on the hazard is not constant overtime, we included time varying co-variants in our model, which are given by the interaction of *time of entry* variables with time (i.e. *preWWI*t; preWWII*t; postWWII*t*).

Agglomeration economies and district effects

In order to test the role of agglomeration economies, three variables were constructed. First, we measure the narrow version of localization economies (*regdensity*) using the number of active firms in the motor bike sector at time of entry in the region. Second, the role of agglomeration externalities derived from the local presence of sectors related to the motor bike industry (or related externalities) has been captured by regional employment (total employment in the region) in the mechanic sector (*relvar*). Third, urbanization economies (*pop*) was measured with the number of inhabitants in the region at time of entry.

In order to account for an additional institutional district effect on top of agglomeration economies, like the presence of local common goods, social institutions or good government, which the literature suggests to play a crucial role in the Emilia Romagna region (Brusco, 1982), a geographical dummy (*MotorValley*) was created. This variable is equal 1 if a firm is located in the provinces of Bologna and Modena, zero otherwise. Other geographical dummies were constructed to control for district effects in the two other large agglomerations in the industry: *Torino* for the Torino province, and *Milanarea* for the provinces of Milano, Varese and Pavia.

In order to test if firm background and parental heritage affect differently firms in and outside the Motor Valley district, several interaction terms have been created by multiplying the location dummy with the variable of interest. To gauge the effect of the background of firms (i.e. spinoffs, experience entrepreneurs and experienced firms) in the Motor Valley relative to firms located elsewhere, three interaction terms were created (i.e. *spinoffmotorvalley, expentrmotorvalley, expfirmmotorvalley*) by multiplying the dummy *motorvalley* with the backgrounds dummies: spin-off, experienced entrepreneurs and experienced firms respectively. The effect of parental heritage for firms in the Motor Valley is given by the variable *parentmotorvalley,* which interacts the age of the parent (i.e. *parentduration*) with the dummy *motorvalley.*

An additional variable, i.e. *edu*, which measures the school enrollment rate in regions, has been included to control for the role of human capital. Moreover, a variable of regional GDP per capita (i.e. *reggdp*) has been added to control for the level of economic development.

The correlation coefficient of the above variables is presented in Table A3 (see Appendix). It is worth noting that a high correlation exists between the variable *pop* (number of inhabitants at regional level) and the variables *relvar* (number of employees in the mechanical sector at regional level) and *regdensity* (number of motorbike firms at regional level) (0.84 and 0,60 respectively). Since this might signal multicollinearity among these predictors, we check for it by using the VIF (Variance Inflation Test) command in STATA 14.2. The findings seem to indicate the absence of collinearity (VIF: *pop*= 4.37; *relvar*=3.45; *regdensity*: 1.63).

4. The historical evolution of the Italian motorbike industry

In Figure 1 the yearly number of entries, exists and the total number of producers is illustrated. The graph shows three cycles with the corresponding peaks and troughs. The first two troughs are in 1917 and 1944, which correspond roughly with the end of WWI and WWII. The third trough is around mid-sixties, when the Italian economic boom consolidated, and the transportation habits of Italian changed, with a shift from light-motorbikes (e.g. *Vespa* scooter) to small cars. After every trough, it can be observed a sharp growth of entrants, in particular after WWI. In the period 1916-1926, on average 16 firms were founded each year, reaching an absolute maximum of 132 companies active in the industry in 1926. After 1945 and till 1954, the number of entrants grew at a similar fast rate of 12 firms per year, reaching a peak of 119 firms in 1953.

FIGURE 1 AROUND HERE

Exit rates were low in the early and formative period of the industry (1893-1907). However, already before WWI, the number of exits overtakes the number of entrants (the first drop is in 1907, the year of the first worldwide financial crisis). After WWI, the exit rate is lower than the entry rate before each shakeout, but it grows immediately after, until the next shake out. This type of dynamics ends in the late 1970s, when the number of firms declines steadily till the early nineties, after which the number of firms stabilizes around 33 units in 1993.

The industry concentrated originally in three regions: the Piemonte region, around the city of Torino; the Lombardia region, in particular in the western provinces of Milano, Varese and Pavia; and the Emilia Romagna region, in the provinces of Modena and Bologna (i.e. Motor Valley). Figure 2 illustrates the entry-exit dynamics in the Motor Valley. The dynamics of the industry is very similar to the one observed at the national level, at least until mid-sixties. After WWII, the number of producers increases steadily moving from a low of 4 in 1945 to a high of 21 in 1954. After the shakeout in the mid-sixties, the local industry recovered and reached a new peak in 1978 (i.e. 23 companies). Since late 1970s, in line with the national trend, the number of firms declined, stabilizing around 7 firms in 1993.

FIGURE 2 AROUND HERE

As shown in Figure 3, the concentration of firms in the Motor Valley was initially low. It grew steadily over the years to reach a 10% share before WWII. In this period, Motor Valley ranked third after Torino and Milano. The geographical concentration around the Motor Valley grew at a faster rate in the post-WWII period, reaching a peak of 33.5% share in 1975. As for today, Motor Valley is the largest concentration of motorbike producers in Italy.

FIGURE 3 AROUND HERE

Background of the firms

In line with the work of Klepper, the background of the entrants in the industry is classified distinguishing between spin-off, experienced firms, entrepreneurial firms and inexperienced firms. Table 1 presents the geographical and temporal distribution of firms according to their background. The figures indicate that on average the largest group of entrants in the industry was represented by inexperienced firms with about 33% of the total. This also suggests, however, that the majority of entrants (about 60%) had some experience, since they were founded by either spin-offs, experienced entrepreneurs or diversifiers. Among these latter groups, the majority (circa 30% of the total) was represented by individual entrepreneurs, followed by experienced firms (circa 20% of the total) and spin-offs (around 11% of the total). The geographical distribution across the three largest motorbikes clusters (Motor Valley, Milano area and Torino) discloses some telling differences. Motor Valley had a larger share of spin-off entrants (about 20% of the total number of firms in the Motor Valley) as compared to Milano and Torino (16.49% and 10.69% respectively). Torino instead had the largest share of experienced entrepreneurs, as compared to the other two clusters, and the lowest share of experienced firms. Table 1 also presents the figures about the time of entry, which show a picture coherent with the typical dynamics of an industry, where spin-offs appear a few years after the kick-off of the industry. Indeed, before WWII only 6 out of 74 spin-offs were generated, and the entry dynamics was mainly driven in that period by inexperienced firms, diversifiers and start-ups of experienced entrepreneurs.

TABLE 1 AROUND HERE

Survival of firms: empirical findings

The theoretical framework set out in Section 2 is tested using four regression models. The estimates are presented in Table 2. The *heritage model* is first tested, following a stepwise procedure, in which explanatory factors (i.e. agglomeration economies, district effects) are added one by one to test the robustness of the heritage model. The estimates presented in Table 2 report the coefficients of the hazard model, where a negative coefficient indicates a decrease in the hazard, that is a higher probability of survival at time of entry, while a positive coefficient means a higher hazard. Hazard ratio are presented in Table A1 in the Appendix: they show the expected increase (or decrease) of the hazard rate for a unit change in the explanatory variable: a coefficient higher than 1 means that an increase in the explanatory variable lead to a higher hazard rate. In all specifications of the model, we included variables of regional GDP (i.e. *reggdp*) and education (i.e. *edu*) as controls.

Model 1 in Table 2 tests only the heritage effects, which includes the firms' background (i.e. *spinoff*, *expentr*, *expfirm*), the years of production of the parent (i.e. *parentduration*) and time of entry (i.e. *preww1* and *preww2*). Findings are in line with Klepper's predictions, all three background variables are highly significant and have negative impact on the hazard rate (as compared to *inexperienced firm*, the excluded reference category). In terms of annual hazards, these coefficients shows that spinoffs, experienced firms and experienced entrepreneurs have a 67%, 63% and 53% higher chance of survival than inexperienced firms. The coefficient estimate of the parent duration variable is also negative, though not significant. Time of entry is positive and strongly significant. The estimates indicate that firms founded before WW1 and between WW1 and WW2 have a hazard rate which is respectively 3 and 2,2 times higher than firms entering after WW2 (i.e. *postww2* is the excluded reference category) (see Table A1). Although this latter finding is at first glance contradicting the Klepper model, it is coherent with the peculiar dynamics of the motorcycle sector in Italy, which went through repeated shakeouts during its life cycle. Other studies testing the heritage theory in different industries than automobiles also found a negative effect of early entrance (Buenstorf and Guenther, 2011). Moreover, the coefficient of the cohorts interacting with time are significant and with a negative sign, suggesting that the hazard of time of entry changes with age. In particular, firms in the earlier cohorts (i.e. *preWWI* and *preWWII*) have a lower hazard at older ages as compared to those in the latest cohort (i.e. *postWWII*). This is not surprising since the formative periods of the industry were very turbulent, so those who were born and survived these two periods became more successful.

INSERT Table 2

In order to grasp the effects of agglomeration economies, in our second specification (see Model 2) three additional variables are included in the model. The coefficient estimate of the proxy of local related externalities (i.e. *relvar*) is positive, though with a very small coefficient, meaning that the presence of related sectors (i.e. industries classified in the mechanical and transport sectors) in the regional economy has no sizable effect on the survival of motorbike firms. Similarly, the coefficient estimate of urbanization economies, proxied by number of inhabitants in the region (i.e. *pop*), is negative and statistically significant, but with no sizable economic impact. More pronounced appears the effect of localisation economies, which is proxied by the density variable (i.e. *regdensity*), implying a higher hazard by 1,4%. This latter result is consistent with other studies that pointed towards the presence of negative localization externalities in contexts characterized by strong local competition (Frenken et al. 2015; Boschma 2015).

After having controlled for agglomeration economies and the role of education, in Model 3 we add a dummy (i.e. *motorvalley*) for Motor Valley, which captures an additional "district" effect associated with the Emilian model. The long tradition of local collaboration between local government and the business community and a pervasive culture of entrepreneurship in the region, in particular in the mechanical and automotive industry are factors which resonate in the dummy *motorvalley* (Brusco, 1982; Cavecchi, 1990; Amir, 1999). In order to further assess the robustness of this interpretation, two additional geographical dummies are included in Model 3 (i.e. *Torino*; *Milanarea*). These dummies identify the two other prominent clusters in the industry, located around the urban areas of Torino and Milan. The findings reported in Model 3 in Table 2 show that "district" effects are present only in the Motor Valley, while the coefficient estimates of the two other agglomerations (i.e. Torino and Milan area) are not significant. The coefficient estimate for the dummy *motorvalley* is negative and significant. Firms located in the motorbike cluster spanning the provinces of Modena and Bologna have a 25% lower hazard than firms located elsewhere (see Table A1). This latter finding appears to be robust to changes to the model specification.

Following Klepper (2007), we test in Model 4 in Table 2 whether the superior performance of firms in the Motor Valley area is confined to spinoffs, experienced firms or experienced entrepreneurs by adding three dummies to the previous specification (i.e. *spinmotovalley*, *expfirmmotorvalley*, *expentrmotorvalley*). The coefficients of the estimates of the three dummies are negative, though not significant. More importantly, and opposite to Klepper (2007), the coefficient estimate of the Motor Valley dummy (i.e. *motorvalley*) is still negative, sizable and significant. This latter finding suggests that the district effects have played a non-marginal role in survival of the local firms, besides the effect of the entrepreneurial background-specific features.

Robustness check

The robustness of our findings crucially relies on the method used for classifying the background of founders and, accordingly, the variables *spinoff, expfirm, expentr* and *inexpfirm*. Our classification of inexperienced firms is a residual category to some extent because we were not always able to identify the founders and/or classify their background. It is worth noting that this potential source of bias is also present in the work of Klepper. To address this, first we notice that the total share of inexperienced firms in our study is 38,8%

of the total number of entrants (Table 1), of whom almost one third is certainly an inexperienced entrant. Therefore, it is for about 25% of these inexperienced entrants that we lack information. This is far less than the 352 firms (out of a total of 752) that Klepper classified as inexperienced in his Detroit study (see Klepper, 2007: 621). And secondly, inexperienced firms were mainly active in the early stages of the industry: as shown in Table 1, 62,6% of them entered before WWI. It can be safely argued that these founders were unlikely to be spin-offs. In fact, spin-offs usually entered the industry after the initial period of industry development. This seems to be the case also in the Italian motorbike industry, where most spin-off entrants were founded after WWI (Table 1).

All in all, it is unlikely that we have systematically misclassified inexperienced firms. One way to rule out the potential source of bias generated by the misclassification of the residual category of inexperienced firms is to test the same models as in Table 2 but now excluding all inexperienced firms from the analysis (the reference category for the background of founders is experienced entrepreneurs, i.e. *expentr*). The coefficient estimates are presented in Table A2 in the Appendix. The findings are in line with the estimates presented in Table 2, where inexperienced firms are included in the analysis. In particular, the coefficient of *spinoff* is still negative, sizable and statistical significant (but in Model 4). Similarly, the coefficient estimates of the dummy variable *motorvalley* are keeping their sign and significance, confirming the importance of the *district* effects.

5. Conclusion

This paper has investigated the industrial and spatial dynamics of the motorbike industry in Italy over a period of 100 years since its infancy in 1893. Broadly speaking, findings show that the spatial concentration of the industry was driven by different mechanisms that conform to both the heritage theory of Klepper and the agglomeration thesis of Marshall. In line with Klepper, being a spinoff company or an experienced firm enhanced the survival rates. In line with Marshall, we found a positive effect of being located in the Motor Valley cluster in Emilia Romagna. Interestingly, this beneficial effect of clusters could not be found outside the Emilia Romagna region. This latter finding might indicate the importance of a favourable local institutional environment, as propagated by the Emilian district model. Accordingly, our study on the Italian motorbike industry shows that the heritage theory is not incompatible with agglomeration theory. Moreover, it shows that regional institutions may be important, affecting the spatial clustering of an industry. Finally, it shows that industry specificity does play an important role in explaining the spatial dynamics of industries, as there is no uniform pattern applicable to all industries (Boschma 2015).

There are also a few findings that are not fully in line with the predictions of Klepper's heritage model. First, experienced firms perform slightly better than spinoffs. The difference between the two is rather small though, so the evolutionary argument of routine inheritance still holds, but it shows that routines needed to start up a successful new venture can come from the same or a related industry, as found in other studies (see e.g. Boschma and Wenting

2007). Second, our finding shows that more successful parents do not necessarily span out better spinoffs. Third, our study shows that early entrance does not bring any advantage to firms. This may be explained by the fact that latecomers do not carry the weight of previous investments in outdated technologies (Perez and Soete, 1988). Latecomers can also free ride on incumbents and imitate their technologies at lower costs (Mitchell, 1991; Bryman, 1997).

From an agglomeration point of view, the various outcomes tell the following story. First, localization economies (taking the narrow definition of Marshallian externalities, as proxied by local density) has a negative effect on firm survival, which is at odds with the Marshallian argument. Second, related externalities (taking the extended definition of Marshallain externalities, as proxied by related variety) has no effect on firm survival either, again going against Marshall. Third, what is completely in line with Marshall is the finding that being in the Motor Valley cluster (but not in the other two competing clusters) enhances the performance of the local motor bike firms, even after controlling for heritage effects and other agglomeration effects. Accordingly, while we found evidence of negative Marshallian externalities in general, this is turned into a positive effect on survival in the case of the Motor Valley cluster. Fourth, contrary to the study on Detroit by Klepper (2007), the interaction variable SpinMotorValley was not significant, while the Motor Valley variable remained positive and significant. This indicates there is a positive cluster effect in the Motor Valley that applies to both spinoff and non-spinoff firms. Fifth, the positive cluster effect applies only to the Motor Valley cluster, and not to the Torino and Milan clusters. This shows there is something special about being located in the Emilian region which might indicate the importance of specific local institutions, as suggested by the Emilian district literature.

To conclude, the findings indicate that the heritage model can be reconciled with agglomeration arguments. However, the study suffers from a number of limitations. First, the longitudinal analysis is constrained by the availability of time-series data. For example, it would increase our understanding if we could have included additional (i.e. better) firm performance measures - next to firm survival – like productivity data. Second, we have accounted for the role of regional institutions referring to the Emilian model indirectly in the empirical study. This is a clear limitation but entirely due to the lack of longitudinal institutional data. To test more systematically for the role of regional institutions in this Klepperian framework, future work should try to use real institutional data, even though these are often available only at the national level (Menzel and Kammer 2012; Boschma and Capone 2015). Third, the variable inexperienced firm has been treated as a residual category in which it there is a lot of heterogeneity, which may shadow important heritage dynamics.

References

Amin, A. (1999). The Emilian model: institutional challenges. *European Planning Studies*, *7*(4), 389-405.

Audretsch, D.B., Feldman, M.P. (1996) Innovative clusters and the industry life cycle. *Review of Industrial Organization*, Vol. 11: 253-273.

Becattini, G. (1990), The Marshallian economic district as a socio economic notion, in Pyke, F., Becattini, G. and Sengenberger, W. (eds.) *Industrial Districts and Inter Firms Cooperation in Italy*, International Labour Organization (ILO), Geneva, 37–51.

Becattini, G., Bellandi, M. and De Propris, L. (eds) (2009). *A Handbook of Industrial Districts*, Cheltenham, Edward Elgar.

Bellandi, M. (1989) The industrial district in Marshall, in: E. Goodman and J. Bamford (eds.), *Small firms and industrial districts in Italy*, London: Routledge, 136-152.

Bianchi, P. and G. Gualtieri (1990), Emilia-Romagna and its Industrial Districts: The Evolution of a Model, in: R. Leonardi and R.Y. Nanetti (eds.), *The Regions and European Integration. The Case of Emilia-Romagna*, Pinter: London, 83-108.

Boschma, R. (2015). Do spinoff dynamics or agglomeration externalities drive industry clustering? A reappraisal of Steven Klepper's work. *Industrial and Corporate Change*, 24(4), 859-873.

Boschma, R. and Capone, G. (2015) Institutions and diversification: Related versus unrelated diversification in a varieties of capitalism framework, *Research Policy* 44, 1902-1914.

Boschma, R.A. and Frenken, K. (2003) Evolutionary economics and industry location, *Review for Regional Research (Jahrbuch fur Regionalwissenschaft)*, 23, 183–200.

Boschma, R.A. and R. Wenting (2007) The spatial evolution of the British automobile industry: does location matter? *Industrial and Corporate Change*, vol. 16, no. 2, pp. 213-238.

Breschi, S., & Lissoni, F. (2009). Mobility of skilled workers and co-invention networks: an anatomy of localized knowledge flows. *Journal of Economic Geography*, lbp008.

Bryman, A. (1997). Animating the Pioneer versus Late Entrant Debate: An Historic Case Study. *Journal of Management Studies*, 34(3), 415-438.

Brusco, S. 1982. The Emilian model: productive decentralization and social integration, *Cambridge Journal of Economics*, vol. 6, no. 2, 235–61

Buenstorf, G., & Guenther, C. (2011). No place like home? Relocation, capabilities, and firm survival in the German machine tool industry after World War II. *Industrial & Corporate Change*, *20*(1).

Cainelli, G., & Stampini, M. (2002). I censimenti industriali in Italia (1911-1991). Problemi di raccordo ed alcune evidenze empiriche a livello territoriale. *Rivista di storia economica,* 18(2), 217-238.

Capecchi, V. (1990). A history of flexible specialisation and industrial districts in Emilia-Romagna. *Industrial districts and inter-firm co-operation in Italy*, *2*, 20-36.

Capello, R., & Faggian, A. (2005). Collective learning and relational capital in local innovation processes. *Regional studies*, *39*(1), 75-87.

Carroll, G.R., Bigelow, L.S., Seidel, M.L., Tsai, L.B. (1996) The fates of de novo and de alio producers in the American automobile industry 1885–1981. *Strategic Management Journal*, Vol. 17: 117-137.

Cattani, G., J.M. Pennings and F.C. Wezel (2003) Spatial and temporal heterogeneity in founding patterns, *Organization Science* 14, 670-685.

Cusmano, L., A. Morrison and E. Pandolfo (2015) Spinoff and clustering: a return to the Marshallian district, Papers in Evolutionary Economic Geography, *Cambridge Journal of Economics* 39(1): 49-66.

De Vaan, M., Frenken, K., Boschma, R.A. (2011) The downside of social capital in new industry creation: a contribution to organizational ecology. *Urban & Regional Research Centre*, Utrecht.

De Vaan, M., R.A. Boschma and K. Frenken (2013) Clustering and firm performance in project-based industries: the case of the global video game industry, 1972-2007, *Journal of Economic Geography* 13, 965-991.

Dei Ottati G., 2002. Social Concentration and Local Development: The Case of Industrial Districts, *European Planning Studies*, Vol. 10, no. 4. 449-66.

Dosi, G. (1988). Sources, procedures, and microeconomic effects of innovation. *Journal of economic literature*, 1120-1171.

Frenken, K., E. Cefis and E. Stam (2015) Industrial dynamics and clusters: a survey, *Regional Studies*, 49(1), 10–27.

Glaeser, E.L., Kallal, H.D., Scheinkman, J.A., Shleifer, A. (1992) Growth in cities. *Journal of Political Economy*, Vol. 100: 1126-1152.

Harrison, B. (1992) Industrial districts: old wines in new bottles? *Regional Studies* 26: 469-483.

Hart, N. (2009) External and internal economies, in: Becattini, G., Bellandi, M. and De Propris, L. (eds), *A Handbook of Industrial Districts*, Cheltenham, Edward Elgar, 90-102.

Heebels, B., & Boschma, R. (2011). Performing in Dutch book publishing 1880–2008: the importance of entrepreneurial experience and the Amsterdam cluster. *Journal of Economic Geography*, 11(6), 1007-1029.

Henderson, J.V., Kuncoro V.A., Turner, M. (1995) Industrial development in cities. *Journal of Political Economy*, Vol. 103: 1067-1090.

ISTAT (2011) *L'Italia in 50 anni. Sommario di statistiche storiche 1861-2010*. Roma: Istituto Nazionale di Statistica.

Jacobs, J. (1969) *The Economy of Cities*. New York: Random House.

Klepper, S. (1997) Industry life cycles. *Industrial and Corporate Change,* Vol. 6(1): 145-81.

Klepper, S. (2002a) The evolution of the U.S. automobile industry and Detroit as its capital. Paper presented at 9th Congress of the International Joseph A. Schumpeter Society, Gainesville, Florida, March 2002.

Klepper, S. (2002b) The capabilities of new firms and the evolution of the US automobile industry. *Industrial and Corporate Change*, Vol. 11: 645-666.

Klepper, S. (2002c) Firm survival and the evolution of oligopoly. *RAND Journal of Economics*, Vol. 33: 37-61.

Klepper, S. (2007) Disagreements, spinoffs, and the evolution of Detroit as the capital of the U.S. automobile industry. *Management Science*, Vol. 53(4): 616-631.

Klepper, S. 2009. Silicon Valley, a chip off the old Detroit bloc, pp. 79–115 in Acs, Z., Audretsch,D. B. and Strom, R. J. (eds), Entrepreneurship, Growth, and Public Policy, Cambridge, UK, Cambridge University Press.

Klepper, S. 2010. The origin and growth of industry clusters: the making of Silicon Valley and Detroit, *Journal of Urban Economics*, vol. 67, 15–32.

Klepper, S. (2011) Nano-economics, spinoffs, and the wealth of regions, *Small Business Economics*, vol. 37, pp. 141-154.

Klepper, S., Buenstorf, G. (2010) Submarket dynamics and innovation: the case of the US tire industry. *Industrial and Corporate Change*, Vol. 19(5): 1563-1587.

Klepper, S., Sleeper, S. (2005) Entry by spinoffs. *Management Science*, Vol. 51: 1291-1306.

Klepper, S., and Thompson, P. (2010). Disagreements and intra-industry spinoffs. International *Journal of Industrial Organization*, 28(5), 526-538.

Loasby, B.J. (2009) Industrial districts in Marshall's economics, in: Becattini, G., Bellandi, M. and De Propris, L. (eds), *A Handbook of Industrial Districts*, Cheltenham, Edward Elgar, 78-89..

Lundvall, B.-Å (ed.) 1992. *National Systems of Innovation: Towards a Theory of Innovation and Interactive Learning*, London, Pinter.

Markusen, A. (1996) Sticky places in slippery space: A typology of industrial districts, *Economic Geography* 72,3: 293-313.

Marshall, A. (1920) *Principles of Economics*. London: Macmillan and Co.

Maskell P. and Malmberg A. 1999. Localised learning and industrial competitiveness *Cambridge Journal of Economics,* Vol. 23, no. 2, 167-185.

Menzel, M.P. and J. Kammer (2012) Industry evolution in varieties-of-capitalism: a survival analysis on wind turbine producers in Denmark and the USA, Papers in Evolutionary Economic Geography, no. 12.20, Department of Economic Geography, Utrecht University, Utrecht.

Milani, S. (1998) *Moto Italiane, I primi 50 anni 1895-1945*. Pavia: Motone.

von Hippel, E. (1987). Cooperation between rivals: informal know-how trading, *Research Policy,* Vol. 16, 291–302.

Mitchell, Will (1991), Dual Clocks: Entry Order Influences on Industry Incumbent and Newcomer Market Share and Survival When Specialized Investments Retain Their Value, *Strategic Management Journal* , 12 (1), 85–100

Neffke, F., Henning, M.S., Boschma, R.A., Lundquist, K.J., Olander, L.O. (2011a) The dynamics of agglomeration externalities along the life cycle of industries. *Regional Studies*, Vol. 45(1): 49-65.

Neffke, F., M. Henning and R. Boschma (2011b) How do regions diversify over time? Industry relatedness and the development of new growth paths in regions. *Economic Geography* 87, 237-265.

Nelson, R.R. and Winter, S.W. (1982). *An Evolutionary Theory of Economic Change,* Harvard University Press.

van der Panne, G. and van Beers, C. (2006). On the Marshall-Jacobs Controversy: It Takes Two to Tango, *Industrial and Corporate Change,* Vol. 15, no.5, 877–90.

Perez C. And L. Soete (1988) Catching up in technology: entry barriers and windows of opportunity. In G.Dosi et al. eds. Technical Change and Economic Theory, London: Francis Pinter, pp. 458-479.

Piore, M. and Sabel, C. (1984). *The second industrial divide: Possibilities for prosperity*, New York: Basic Books.

Pyke, F., Becattini, G., & Sengenberger, W. (Eds.). (1990). *Industrial districts and inter-firm co-operation in Italy*. International Institute for Labour Studies.

Sorenson, O., Audia, P.G. (2000) The social structure of entrepreneurial activity: geographic concentration of footwear production in the United States, 1940-1989. *American Journal of Sociology*, Vol. 106: 424-462.

Staber, U. (2001) Spatial proximity and firm survival in a declining industrial district: The case of knitwear firms in Baden-Wuttemberg. *Regional Studies*, Vol. 35 (4): 329-341.

Wenting, R. and K. Frenken (2011), Firm entry and institutional lock-in: an organizational ecology analysis of the global fashion design industry, *Industrial and Corporate Change* 20 (4), 1031-1048.

Wezel, F.C. (2005) Location dependence and industry evolution: founding rates in the United Kingdom motorcycle industry, 1895-1993, *Organization Studies* 26, 729-754.

Wilson, H (1996), *Enciclopedia della Motocicletta*, Arnoldo Mondadori Editore, Milano.

Figure 1 Historical evolution of the Industry (entry, exit, total number of firms)

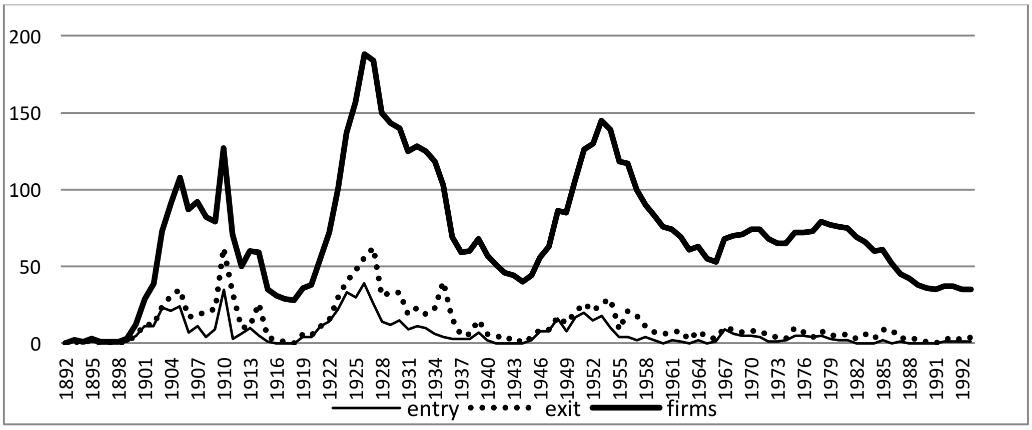

Figure 2 Motor Valley firms

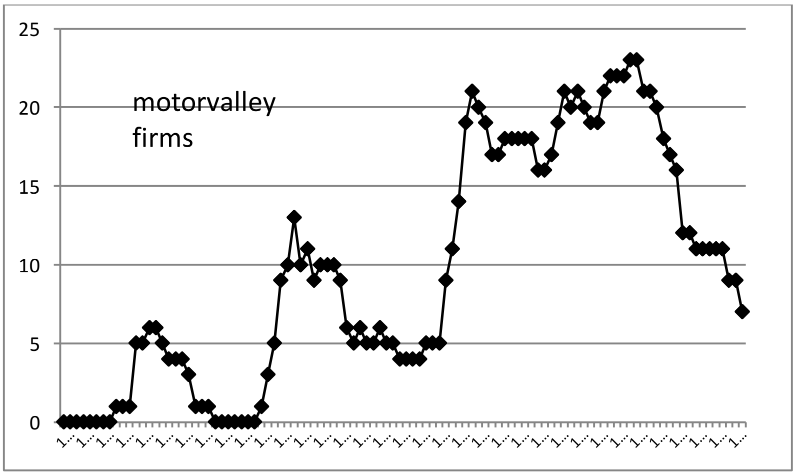

Figure 3 Percentage Motor Valley firms

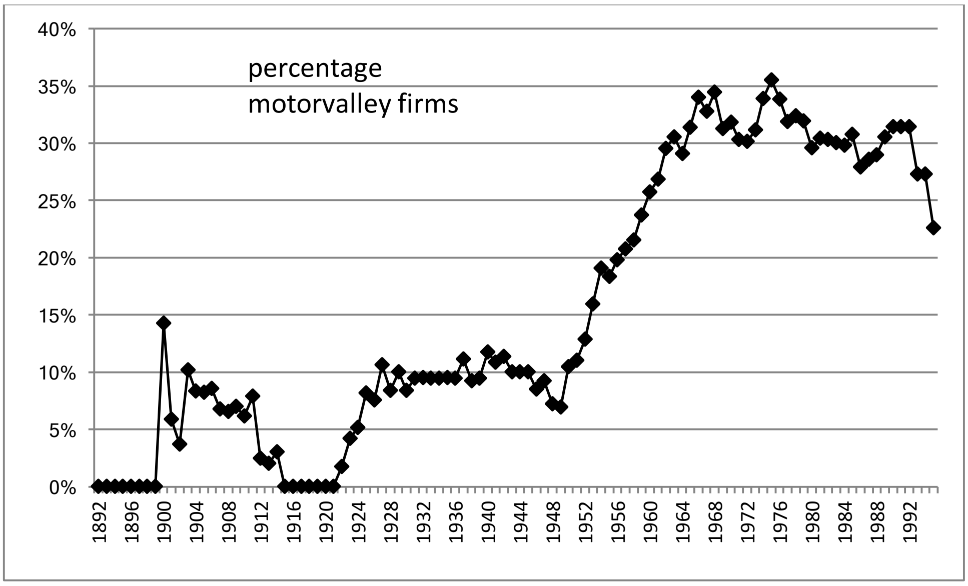

Table 1. Background of the firms by geographical area and time of entry (row percentages and absolute frequencies)

		Motor Valley	Milano area*	Torino area	Italy		preWWI	preWWII	afterWWII
Spinoff	N	14	30	11	74		6	40	28
	%	18.42%	15.54%	8.40%	11.09%		3.45%	13.94%	11.09%
Experienced Entrepreneur	N	23	52	53	204		34	112	57
	%	30.26%	26.94%	40.46%	30.58%		19.54%	39.02%	27.94%
Experienced Firm	N	16	48	23	130		25	44	60
	%	21.05%	24.87%	17.56%	19.49%		14.37%	15.33%	29.41%
Inexperienced	N	23	63	44	259		109	91	59
	%	30.26%	32.64%	33.59%	38.83%		62.64%	31.71%	28.91%
Total	N	**76**	**193**	**131**	**667**		**174**	**287**	**204**
	%	**10.94%**	**28.93%**	**19.64%**	**100%**		**26.11%**	**68.54%**	**30.86%**

*it includes the provinces of Milano, Varese and Monza Brianza.

Table 2 Coefficient Estimates of the Hazard Model, Motorcycle Producers in Italy, 1893-1993

VARIABLES	model 1	model 2	model 3	model 4
Spinoff	-1.108***	-1.057***	-1.010***	-1.021***
	(0.143)	(0.147)	(0.152)	(0.187)
Expentr	-0.746***	-0.715***	-0.699***	-0.704***
	(0.0529)	(0.0556)	(0.0559)	(0.0635)
Expfirm	-1.001***	-0.952***	-0.953***	-0.946***
	(0.0860)	(0.0797)	(0.0819)	(0.0910)
parentduration	-0.00517	-0.00559	-0.00638*	-0.00623*
	-0.00517	(0.00361)	(0.00383)	(0.00377)
Relvar		1.05e-06**	9.14e-07*	7.77e-07
		(4.62e-07)	(5.20e-07)	(5.03e-07)
Pop		-0.000140***	-0.000160***	-0.000138***
		(4.49e-05)	(5.96e-05)	(4.82e-05)
regdensity		0.0141**	0.0150***	0.0147**
		(0.00580)	(0.00558)	(0.00573)
motorvalley			-0.286***	-0.264**
			(0.0982)	(0.115)
Torino			-0.0840	
			(0.0815)	
milanarea			-0.0133	
			(0.0683)	
spinmotorvalley				0.0391
				(0.240)
expentrmotorvalley				0.00307
				(0.0822)
expfirmmotorvalley				-0.0908
				(0.148)
preww1	1.095***	1.250***	1.219***	1.226***
	(0.120)	(0.151)	(0.144)	(0.144)
preww2	0.807***	0.756***	0.706***	0.693***
	(0.137)	(0.157)	(0.152)	(0.147)
preww1*t	-0.0293***	-0.0339***	-0.0352***	-0.0357***
	(0.00756)	(0.00840)	(0.00864)	(0.00941)
preww2*t	-0.0196*	-0.0198*	-0.0206*	-0.0208*
	(0.0105)	(0.0103)	(0.0108)	(0.0112)
Edu	-0.887***	-1.003***	-1.095***	-1.193***
	(0.300)	(0.380)	(0.402)	(0.357)
Reggdp	0.00493*	0.00198	0.00256	0.00200
	(0.00260)	(0.00208)	(0.00208)	(0.00191)
Observations	643	637	637	637

Robust seeform in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table A1 Hazard ratios of the Hazard Model, Motorcycle Producers in Italy, 1893-1993

VARIABLES	model 1	model 2	model 3	model 4
Spinoff	0.330***	0.348***	0.364***	0.360***
	(0.0473)	(0.0510)	(0.0555)	(0.0672)
Expentr	0.474***	0.489***	0.497***	0.495***
	(0.0251)	(0.0272)	(0.0278)	(0.0314)
Expfirm	0.367***	0.386***	0.385***	0.388***
	(0.0316)	(0.0308)	(0.0316)	(0.0353)
parentduration	0.995	0.994	0.994*	0.994*
	(0.00321)	(0.00359)	(0.00380)	(0.00375)
Relvar		1.000**	1.000*	1.000
		(4.62e-07)	(5.20e-07)	(5.03e-07)
Pop		1.000***	1.000***	1.000***
		(4.49e-05)	(5.96e-05)	(4.82e-05)
Regdensity		1.014**	1.015***	1.015**
		(0.00588)	(0.00566)	(0.00582)
motorvalley			0.751***	0.768**
			(0.0738)	(0.0886)
Torino			0.919	
			(0.0750)	
Milanarea			0.987	
			(0.0674)	
spinmotorvalley				1.040
				(0.250)
expentrmotorvalley				1.003
				(0.0824)
expfirmmotorvalley				0.913
				(0.135)
preww1	2.990***	3.489***	3.384***	3.408***
	(0.359)	(0.526)	(0.486)	(0.491)
preww2	2.240***	2.130***	2.027***	1.999***
	(0.307)	(0.335)	(0.308)	(0.294)
preww1*t	0.971***	0.967***	0.965***	0.965***
	(0.00734)	(0.00812)	(0.00834)	(0.00908)
preww2*t	0.981*	0.980*	0.980*	0.979*
	(0.0103)	(0.0101)	(0.0106)	(0.0110)
Edu	0.412***	0.367***	0.334***	0.303***
	(0.124)	(0.139)	(0.134)	(0.108)
Reggdp	1.005*	1.002	1.003	1.002
	(0.00261)	(0.00208)	(0.00208)	(0.00191)
Observations	643	637	637	637

Robust seeform in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table A2 Coefficient estimates of the Hazard Model, Motorcycle Producers in Italy, 1893-1993 (inexperienced firms not included)

VARIABLES	model 1	model 2	model 3	model 4
Spinoff	-0.391***	-0.355**	-0.326*	-0.339
	(0.138)	(0.173)	(0.176)	(0.212)
Expfirm	-0.269***	-0.238***	-0.257***	-0.247**
	(0.0849)	(0.0883)	(0.0859)	(0.0959)
parentduration	-0.00500	-0.00557	-0.00631	-0.00614
	(0.00312)	(0.00376)	(0.00391)	(0.00387)
Relvar		1.64e-06*	1.37e-06	1.20e-06
		(8.51e-07)	(9.64e-07)	(8.20e-07)
Pop		-0.000219***	-0.000228**	-0.000201***
		(6.93e-05)	(0.000103)	(7.05e-05)
regdensity		0.0153*	0.0160**	0.0156**
		(0.00794)	(0.00790)	(0.00798)
motorvalley			-0.290**	-0.267**
			(0.122)	(0.106)
Torino			-0.0949	
			(0.130)	
milanarea			-0.0204	
			(0.0894)	
spinmotorvalley				0.0631
				(0.219)
expfirmmotorvalley				-0.0877
				(0.180)
preww1	0.945***	1.051***	1.048***	1.049***
	(0.275)	(0.221)	(0.215)	(0.209)
preww2	0.828***	0.759***	0.718***	0.700***
	(0.137)	(0.179)	(0.177)	(0.173)
preww1	-0.0207***	-0.0268***	-0.0287***	-0.0289***
	(0.00755)	(0.00867)	(0.00897)	(0.00988)
preww2	-0.0209*	-0.0212*	-0.0223*	-0.0224*
	(0.0109)	(0.0114)	(0.0118)	(0.0122)
Edu	-1.148**	-0.909*	-1.048*	-1.174**
	(0.468)	(0.470)	(0.550)	(0.489)
Reggdp	0.00902**	0.00461	0.00543	0.00471
	(0.00411)	(0.00513)	(0.00497)	(0.00487)
Observations	401	398	398	398

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table A3 Correlation coefficients

	spinoff	expentr	expfirm	inexperienced	parentduration	preww1	preww2	postww2	motorvalley	torino	milanarea	reggdp	edu	pop	relvar	regdensity
Spinoff	1															
Expentr	-0.2147	1														
Expfirm	-0.1569	-0.3198	1													
inexperien~d	-0.2711	-0.5525	-0.4036	1												
parentdura~n	0.666	-0.143	-0.1045	-0.1805	1											
preww1	-0.1129	-0.1168	-0.0659	0.2291	-0.0966	1										
preww2	0.1217	0.153	-0.055	-0.1719	0.0196	-0.3663	1									
postww2	-0.0228	-0.0531	0.1021	-0.018	0.0608	-0.4604	-0.6522	1								
Motorvalley	0.103	0.0018	0.0136	-0.074	0.046	-0.0598	-0.0675	0.1146	1							
Torino	-0.0529	0.0962	-0.0078	-0.0522	-0.0869	0.0699	0.1044	-0.1598	-0.1798	1						
Milanarea	0.0556	-0.0433	0.0439	-0.0276	0.0533	-0.0972	0.0666	0.0132	-0.2279	-0.3353	1					
Reggdp	0.1482	0.0375	0.0602	-0.1715	0.1038	0.1655	0.3053	-0.4307	0.0155	0.0137	0.0924	1				
Edu	-0.1118	-0.0444	-0.0496	0.1478	-0.1149	0.6055	-0.0349	-0.4564	-0.266	0.293	0.1356	0.0495	1			
Pop	0.072	0.0235	0.0403	-0.097	0.0796	-0.21	-0.0729	0.2382	-0.2011	-0.2413	0.6588	0.1957	0.0164	1		
Relvar	0.0826	0.0382	0.0624	-0.1347	0.111	-0.3109	-0.1406	0.3828	-0.1704	-0.1588	0.4714	0.1972	-0.2295	0.8409	1	
Regdensity	0.0313	0.0299	-0.0089	-0.0395	0.0211	-0.2125	0.2052	-0.0201	-0.1755	0.0431	0.5113	0.1936	0.2009	0.6058	0.4522	1