

# THE IMPACT OF AGE ON FIRM PERFORMANCE: A LITERATURE REVIEW

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## Abstract

In the last thirty years the link between firm age and performance has fascinated a lot of scholars. In fact, since 1990 there has been a major attention on management studies on this topic. But the debate on this theme have produced mixed results, which resulted in extensive economics discussion, albeit without a systemic vision. The firm age literature has not yet developed a paradigm. Starting to a simple question: “age benefits performance?”, the purpose of this paper is to present a systematic review of the existing literature. The critical examination of the relation between firm age and performance provides new insights for executives.

**Keywords:** Firm Age, Longevity, Old Firms, New Firms, Innovation Performance, Financial Performance, Organizational Impact

## 1. INTRODUCTION

In biology, aging is a process related with a decline in the physical functioning of a body, such as the capability to remember, move, and hear (Loderer and Waelchli, 2010). Some scholars have proposed a life-cycle theory of the firm. Biological arguments in economics go back to Marshall's “trees in the forest” analogy. A life-cycle argument, for example, has been offered to explain dividend payments (see Fama and French, 2001; DeAngelo et al., 2006) and financing decisions (Berger and Udell, 1990). However, in these studies life cycles are defined based on specific patterns in firm profitability, investment opportunities, and size, not age.

For these reasons, it is interesting to know whether firms also weaken/strengthen and increase/lose their ability to compete over time, and to know why that happens.

Early empirical work on firm dynamics looked at firm size but not firm age. In fact, the seminal work by Gibrat (1931) led to interest in the firm size distribution (FSD) (e.g. Hart and Prais, 1956; Simon and Bonini, 1958) and also in the relationship between firm size and growth rate (e.g. Hall, 1987; Hart and Oulton, 1996). However, later on interest in firm age began to grow, as some studies included age as an explanatory variable in regressions that investigate differences in firm performance. Nevertheless the relevance of age to firm dynamics has attracted comparatively little attention (Stinchcombe, 1965; Dunne et al., 1989; Singh and Lumsden, 1990; Brüderl and Schüssler, 1990; Barron et al., 1994; De Geus, 1997; Caves, 1998; Hannan, 1998; Hannan, Pólos, and Carroll, 2003a, b; Rossato, 2013), except in the management literature.

Finally, firm age appears in some studies in the empirical finance literature. It is a control variable in papers on corporate diversification (Campa and Kedia, 2002; Villalonga, 2004) and on financial constraints (Kaplan and Zingales, 1997). But, none of these studies has focused on age directly.

“The prior belief would seem to be that age benefits performance. For one thing, firms learn about their abilities and about how to do things better as they get older. For another, the available empirical evidence shows that life expectancy increases with age, and that better firms survive. There are, however, reasons to disagree” (Loderer and Waelchli, 2009: 4).

The paper is organized as follows. Next section outlines a general literature review on firm age and firm performance. The others subsections analyze the review of literature on specific themes: longevity and organizational change, firm age and innovation performance, and longevity and financial performance. Finally paper presents the conclusions and managerial implications.

## 2. FIRM AGE AND PERFORMANCE: A LITERATURE REVIEW

The relationship between firm age and survival has been investigated by a growing number of scholars (Evans, 1987a,b; Collins and Poras, 1994; Fariñas and Moreno, 2000; Mata and Portugal, 2004; Bartelsman et al., 2005; Marcus, 2006), but the results have not been clear-cut.

An early contribution coined the term “liability of newness” to describe how young organizations face higher risks of failure (Stinchcombe, 1965). He coined this term to highlight that young firms are obligated to promote social interactions within their organizations, and with external organizations in order to sustain the additional learning costs involved in new roles and new tasks. For Thornhill and Amit (2003) the liability of newness may extremely compromise firm growth rates and eventually lead to mortality.

More recently, however, authors have referred to the “liability of adolescence” (Brüderl and Schüssler, 1990; Fichman and Levinthal, 1991).

For Bruderl and Schussler (1990) it's possible to distinguish "two periods of an organizational life cycle. In an early phase, referred to as adolescence, death risks are low, because decision makers are monitoring performance, postponing judgment about success or failure. Meanwhile, organizations often live on a stock of initial resources. In a later phase, initial monitoring has ended and organizations are subject to the usual risks of failure" (Bruderl and Schussler, 1990: 530).

Fichman and Levinthal (1991) develop a research on liability of adolescence that explain why firms face an initial honeymoon period in which they are buffered from sudden exit by their initial stock of resources.

It's possible to underline two different vision in the organization evolution of firms: the first one suggests that old and large organizations become increasingly dominant over their environment, the second one suggests that as organizations age they become less able to respond to new challenges.

Barron et al. (1994) investigate "which of these visions best characterizes the evolution of state-chartered credit unions in New York City from 1914 through 1990 by analysing the effects of organizational age, size, and population density on rates of organizational failure and growth. The authors find evidence that old and small institutions are more likely to fail, while young and small organizations have the highest growth rates" (Barron et al., 1994: 381). They identify "liabilities of senescence and obsolescence" according to with older firms are expected to face higher exit hazards once other influences (such as firm size) are controlled for.

Despite the extreme fragmentation of the literature, it is possible to divide the literature on longevity and performance into three main areas:

- (1) studies that analyse the relation between firm age and organizational change;
- (2) research that examine longevity and innovation performance; and
- (3) studies that analyse economic and financial performance in correlation with firm age.

## 2.1. Longevity and organizational change

Various studies in the Industrial Organization literature, report that life expectancy increases with age (Dunne et al., 1989), and better firms survive (Baker and Kennedy 2002). The general thrust of the literature on the survival of firms has taken two directions. One starts from the process of learning by doing and examines the impact of learning on survival firms (Jovanovic, 1982). He affirms that the longer a firm remains in the market, the more it learns about its true costs and its relative efficiency and the less likely it is to fail.

An alternative, complementary approach is reflected in the work of Gort and Klepper (1982). They view variations in survival as consequences of changes in the rate and character of technological change as an industry evolves over the life cycle of its principal products. This approach is confirmed and extended by Jovanovic and MacDonald (1994a).

Also other studies sustain this point of view. In fact, there is ample empirical support for the proposition that survival and age have a positive relation. Dunne et al. (1989), using Census of

Manufactures data for sixteen years (1972-87), find a positive relation between firm age and survival throughout the observed age range. Baldwin and Gorecki (1991) examine entry in Canadian manufacturing industries in the 1970-81 period and find high mortality among entrants. Audretsch (1991) analyse the experience of 11,000 manufacturing firms over a ten year period; he reaches a similar conclusion about the relation of age and survival.

Two studies that underline why age could impair performance are Hannan and Freeman (1984) and Leonard-Barton (1992). For these scholars there are different reasons why age could harm performance. In fact they sofferme their attention on the organizational rigidities and inertia. In their perspective age can have adverse effects on performance also because of the organizational rigidities and inertia it brings about and because it impairs the ability of firms to perceive valuable signals. This conduct often makes sense, because it helps firms focus on their core skills and raise reliability and accountability (Hannan and Freeman, 1984). Codification makes it hard to recognize, accept, and implement change when doing so would be appropriate. Also age reduces flexibility and discourages change. At the same time, whatever learning benefits the firm can capture in its established lines of business, they probably decline over time. As pointed out above, the stock of learning might increase at a decreasing rate. Overall, older firms could therefore lose their competitive edge.

More recently, another researcher have analysed the role age plays in the performance of surviving firms (Garnsey et al., 2006). They explore processes and paths of new firms growth. They "find that new firm growth is non-linear and prone to interruptions and setbacks to an extent overlooked in the literature. From the model of development used, five propositions are drawn concerning measurable features of new firms' growth paths; these relate to patterns of survival, continuousness of growth, turning points, reversals and cumulative growth" (Garnsey et al., 2006: 1).

Other research has focused on differences in performance and behaviour across firms of different ages. For example, it has been suggested that the age of a firm is positively related to its productivity levels: "In our sample of long-lived large firms, we find that differences in the mix of workers across businesses are significantly related to differences in productivity levels across businesses, but there is little discernible relationship between changes in productivity and changes in worker mix" (Haltiwanger et al., 1999: 97).

Brown and Medoff (2003) investigate the relationship between how long an employer has been in business (firm age) and wages. They find that firms that have been in business longer pay higher wages: "Another interesting (though, given the size of our sample, somewhat tentative) conclusion is that the relationship between firm age and wages is not monotonic. Wages fall as firm age increases, but this relationship appears to be reversed among older firms" (Brown and Medoff, 2003: 694). The seniority rules in the organization was studied by Loderer and Waelchli (2009). In many firms, under a seniority principle, employees who

have been with the organization longer have benefits at the expense of rookie employees. Whatever the reason for their existence and acceptance within the organization, seniority rules in compensation can provide inadequate incentives for managers to perform. If so, the performance of older firms could deteriorate with the age of the organization (Loderer and Waelchli, 2009: 7).

A relation between firm age and performance could also be induced by the age and tenure of the managers within the organization. Finkelstein and Hambrick (1990) underline three different reasons why older managers could be responsible of organizational inertia:

1. "as individuals spend time in an organization, and particularly as they succeed and climb the organization's hierarchy, they become convinced of the wisdom of the organization's ways" (Finkelstein and Hambrick, 1990: 486),

2. "Related to the effects tenure has on commitment to the status quo are those it has on risk taking. At one level, commitment derives from certain "psychological risks" of change" (Finkelstein and Hambrick, 1990: 487), and

3. "Finally, tenure tends to restrict information processing. Over time, organization members develop habits, establish "customary" information sources, and rely more and more on past experience instead of on new stimuli" (Finkelstein and Hambrick, 1990: 487).

Bartelsman et al. (2005) realize a comparative analysis of firm demographics and survival in OECD countries. "While average firm size differs across countries, due to both sectoral specialization and within-sector characteristics, we find similar degrees of firm churning across countries. In most of them, about 20% of firms enter and exit most markets every year; and about 20-40% of entering firms fail within the first 2 years of life. However, post-entry growth of successful entrants is much higher in the USA than in Europe, which may be indicative of barriers to firm growth as opposed to barriers to entry" (Bartelsman et al., 2005: 365).

An interesting research was developed by Bellone et al. (2008). They examine market selection - in French manufacturing in the nineties - along the firm life cycle. This article "argues that the determinants of firm survival have different effects depending on firm age. Results show that exiting firms display low levels of profitability and productivity. This selection process is more severe for young firms because industry structures favour the survival of mature firms" (Bellone et al., 2008: 753).

## 2.2. Firm age and innovation performance

Calvo has investigated age effects by focusing specifically on samples of young firms. In his article he tests Gibrat's Law for small, young and innovating Spanish firms: "All the results reject Gibrat's law and support the proposition that small firms have grown larger. Additionally, the results show that old firms grow less than young ones, and innovating activity - both process and product - is a strong positive factor in the firm's survival and its employment growth" (Calvo, 2006: 117).

Another important analysis on the role age plays in the performance of surviving firms was

conducted by Stam and Wennberg (2009). They present empirical evidence on the effects of research and development (R&D) on new product development, interfirm alliances and employment growth during the early life course of firms. "The main finding of this study is that R&D plays several roles during the early life course of high-tech as well as high-growth firms. The effect of initial R&D on firm growth seems to be through increasing levels of interfirm alliances in the first post-entry years. R&D efforts enable the exploitation of external knowledge" (Stam and Wennberg, 2009: 85).

Firm life cycle, obsolescence and firm's original endowments are main topics of two important studies developed by Agarwal and Gort (1996, 2002). They report evidence that hazard rates initially fall and then rebound as firms get older. The authors see survival as the trade-off between obsolescence of a firm's original endowments, on the one hand, and net investments and learning-by-doing, on the other. Eventually, the increase in endowments falls below the obsolescence rate. This could be explained with two reasons:

- the first one is that the stock of learning increases at a decreasing rate (important lessons are learned first and there is only a finite stock of information to be learned about a technology);

- the second one is that the adaptability of old endowments diminishes and investment opportunities in new technology shrink as the product market ages.

In 1996, they examine entry, exit and the survival of firms in terms of evolutionary changes in the market from the first introduction of a product to maturity of the market. Agarwal and Gort (1996) show the key role that the evolutionary stage of the product cycle plays in determining entry, exit and survival rates of firms: "Entry rates appear to be affected profoundly by stage-related changes in both the rate of technical advance and the form that innovations take. Exit is determined largely by stage-related changes in the intensity of competition. Survival rates reflect both market and individual firm attributes. The role of market attributes, once again related to the stage of the product cycle, is reflected initially in rising hazard rates for early entrants in new markets. The power of market attributes is also reflected in the higher survival rates for new entrants than for incumbents for high-technology products" (Agarwal and Gort, 1996: 497).

In 2002, Agarwal and Gort starting from a simple question: "What is it, other than random shocks, that determines the probability of survival for a firm in a given market?" (Agarwal and Gort, 2002: 184), analyse Firm Life Cycles and Firm Survival. They show that "firm survival is crucially dependent on both the product and the firm life cycles. With regard to the firm life cycle, there appear to be two spans of time over which hazard rates decline. The decline continues until the obsolescence of initial endowments finally raises hazard rates. The relation of survival to age of the firm is not simply an empirically observed regularity, but follows an endogenously determined path predicted by the life cycle of the firm. The result that technology intensive industries are associated with higher hazard rates is explained by the faster obsolescence of initial endowments in such industries" (Agarwal and Gort, 2002: 190).

Huergo and Jaumandreu (2004a,b) have investigated how probability of innovation and productivity growth, change across the firm age distribution. In the first article they look at the probability of introducing innovations by manufacturing firms at different stages of their lives. Their results show that “the probability of innovating widely varies by activity, and that small size per se broadly reduces the probability of innovation, but also that entrant firms tend to present the highest probability of innovation while the oldest firms tend to show lower innovative probabilities” (Huergo and Jaumandreu, 2004a: 193). In a second article authors look directly at the impact of firms’ age and (process) innovations on productivity growth. They found “that firms enter the market experiencing high productivity growth and that above-average growth rates tend to last for many years, but also that productivity growth of surviving firms converges. Process innovations at some point then lead to extra productivity growth, which also tends to persist somewhat attenuated for a number of years” (Huergo and Jaumandreu, 2004b: 541).

Autio et al. (2000) observe that ‘born global’ firms, experience faster growth in international sales than their older counterparts. They interpret this finding as evidence that younger firms are better able to develop export capabilities because they are better able to learn how to succeed in uncertain environments. “The central contributions of this study include the introduction of the concept of “learning advantages of newness” and a confirmation of the usefulness of knowledge-based and learning views for understanding international expansion issues. We proposed that as firms get older, they develop learning impediments that hamper their ability to successfully grow in new environments and that the relative flexibility of newer firms allows them to rapidly learn the competencies necessary to pursue continued growth in foreign markets” (Autio et al., 2000: 919).

### 2.3. Longevity and financial performance

Hopenhayn (1992) develops a dynamic stochastic model for a competitive industry. “The paper extends long-run industry equilibrium theory to account for entry, exit, and heterogeneity in the size and growth rate of firms” (Hopenhayn, 1992: 1127). Author shows that, under plausible assumptions, older firms enjoy higher profits and value. Baker and Kennedy (2002) realize a study builds on research from both finance and industrial organization and is consistent with a Schumpeterian view of economic development. “The death of old firms and the subsequent birth of new ones thus greatly hastens economic development. Death by takeover allows a target firm’s management to redeploy the assets of the disappearing firm; death by bankruptcy and liquidation often puts those assets into the market for reallocation to new managers” (Baker and Kennedy, 2002: 351).

Stadler (2007) realises a paper to understand why some companies have managed to perform at a very high level over very long periods of time. The paper aims to answer to different questions: “What can we learn from their experience? What did they do that set them apart from other old, large

corporations that, while successful (else they would not have lasted so long), were not so extraordinary”. To answer these questions, he compares each firm in a sample of companies that had turned in exceptional performance over the past 50 years with another old company in the same industry whose performance was solid but not quite as good. The research shows the four principles of enduring success: Exploit before you explore, Diversify your business portfolio, Remember your mistakes, Be conservative about change.

Berger and Udell (2005) analyse the source of small business finance, and how capital structure varies with firm size and age. They identify some notable qualitative differences between the financing of small business in different age (infants, adolescent, middle-aged, old): “We identify four different source of equity and nine different sources of debt, and show how the capital structure changes with the size and age of the firm” (Berger and Udell, 2005: 50).

Similarly, Reid (2003) tracks small businesses in their first few years after inception and observes that the debt ratio decreases over time. He expounded a dynamic theory of the small firm “assuming entrepreneurs maximise business value over a finite time horizon”. He conducts a research on thirty-five key financial variables for one hundred and fifty new small business starts over a three year period after inception. Principal results are: “(a) Steady growth of output (sales), including some phases of consolidation, (b) Steady growth of capital, as measured by fixed assets, (c) Sensitivity of debt (observable also through gearing) to the interest rate on long-term debt, (d) Absence or deferral of dividend payments, (e) Retiral of debt when sales are consolidated. This could be attributed to a cheap equity regime, (f) Increase in debt when sales are rising. This could be attributed to a cheap debt regime, (g) Arguably a sensitivity of equity (observable also through gearing) to the relative costs of debt and equity” (Reid, 2003: 283).

Other scholars (Cabral and Mata, 2003; Angelini and Generale, 2008; Cirillo, 2010) have tracked the evolution of the firm size distribution overtime, for cohorts of ageing firms.

Using a comprehensive data set of Portuguese manufacturing firms, Cabral and Mata, (2003) show that the firm size distribution is significantly right-skewed, evolving over time toward a lognormal distribution. “Past conventional wisdom has held that expected firm growth rates are independent of size (Gibrat’s Law), and that the firm size distribution is stable and approximately lognormal. Recent empirical evidence, however, shows that the first of these facts does not hold when considering more complete data sets than those used in the past. In this paper, we show that the second fact a lognormal distribution of firm size also fails to hold in more complete data sets” (Cabral and Mata, 2003: 1083). Their paper document two stylized facts about the firm size dimension: the distribution of young firms is very skewed to the right (most of the mass is on small firms); and the skewness tends to diminish monotonically with firm age (the distribution of older firms is more symmetric than that of young firms). Their paper presents a simple theoretical model in which financial constraints determine the observed FSD evolution, and provides

supporting empirical evidence. Starting from this article Angelini and Generale (2008) focus the attention on the evolution of firm size distribution. They develop a study based on a sample containing survey-based measures of financial constraints for Italian firms. Main results are: “Our main results, based on a sample containing survey-based measures of financial constraints for Italian firms, can be summarized as follows. First, the negative link between financial constraints and firm size is confirmed: firms that declare to be constrained are on average smaller than those that do not. Second, when narrow definitions of financial constraints are adopted, such constraints seem to be a real problem for a small minority of firms. Third, financial constraint problems are found to be relatively more frequent among very young firms, those up to six years of age, but not enough to alter the previous two conclusions” (Angelini and Generale, 2008: 435-437). Cabra and Mata contribution inspire also Cirillo’s research (2010). In fact, he realises a similar analysis with Italian firms using the CEBI database<sup>3</sup>, also considering firms’ growth rates.

Coad (2010) studies the processes of firm growth by applying a vector autoregression model to longitudinal panel data on French manufacturing firms. He observes the coevolution of key variables such as growth of employment, sales, gross operating surplus, and labour productivity growth. “Preliminary results suggest that employment growth is succeeded by the growth of sales, which in turn is followed by growth of profits. Generally speaking, however, growth of profits is not followed by much employment growth or sales growth. Quantile regressions highlight some asymmetries between negative-growth and fast-growth firms” (Coad, 2010: 1677).

An interesting research was conducted by Coad et al. (2010). They analyse the firm performance related to firm age between 1998 and 2006, for Spanish manufacturing firms. They begin their work with a simple question: do firms deteriorate with age (like milk) or do they improve with age (like wine)? “In this paper we found evidence supporting both the milk hypothesis and the wine hypothesis. As evidence that firms improve with age, we found that ageing firms experience rising levels of productivity, profits, larger size, lower debt ratios, and higher equity ratios. Furthermore, older firms are better able to convert sales growth into subsequent growth of profits and productivity. On the other hand, we also found evidence that firm performance deteriorates with age. Older firms have lower expected growth rates of sales, profits and productivity, they have lower profitability levels (when other variables are controlled for), and also that they appear to be less capable to convert employment growth into growth of sales, profits and productivity. Analysis of the growth rate distributions for different age groups shows that older firms are less likely to experience fast growth, while they are just as likely as younger firms to experience rapid decline” (Coad et al., 2010: 26). Furthermore their results that younger firms are more successful at converting employment growth into growth of sales, profits, and productivity.

Meanwhile, older firms look to do better at converting sales growth into growth of profits and productivity.

A last interesting study was conducted by Capasso et al. (2015). They develop a research with a specific aim: to assess whether longevity can enhance the financial strength and economic results of firms operating in the wine industry. Capasso et al. observe a sample of 550 firms and test main hypotheses by applying a panel model with time fixed effects on firm performance measured from 2008 to 2011. Their main findings highlight that “the oldest wineries outperform the youngest wineries and that the longevity factor can significantly explain the difference in performance” (Capasso et al., 2015: 1037).

### 3. CONCLUSIONS

Although firm age has attracted the attention of a big number of scholars, results have often been mixed. The complexity of the phenomenon is attested to by the fragmentation of the literature, which has prevented the formulation of a general theory on this topic. In fact, the analysis of literature review shows that there isn’t an unique point of view on relationship between longevity and performance. This brief literature review has shown that, although progress has been made in our understanding of how firm age affects firm performance, there are still many opportunities remaining for improving our understanding of how firm behaviour changes as firms grow older.

Most of the existing researches has been empirical work.

These considerations are equally valid for the relation between firm age and firm performance. The large part of studies are focused generically on firm performance, only a little part of these studies are focused on financial performances. So, although firm age has attracted the attention of a big number of scholars, results have often been mixed. The complexity of the phenomenon is attested to by the fragmentation of the literature, which has prevented the formulation of a general theory on this topic.

In life, almost everything gets old and obsolete. Is this true whether firms suffer the same fate and become inefficient as time goes by? A priori, it’s impossible to answer. If anything, aging should decrease costs because of various learning effects within the firm and learning spillovers from other firms in the same or in other industries.

The heterogeneity of scholarly contributions in this field is also related to the difficulty of defining the subject of investigation: firm age can be studied referring to young firm or old firm. Also on performance the analysis can be conducted on innovation performances, organizational performances, financial performances, or other performances. However, all these considerations can explain only partially the excessive fragmentation of the literature. Naturally, literature fragmentation is not limited to the field of firm age and performance, but in this field it provides a clear opportunity for progress. To take advantage of this opportunity, however, it is necessary to conduct a comparison of the various themes, methods of investigation, and data used. Only in this way will it be possible to explore in depth this topic, which remains

<sup>3</sup> CEBI is a comprehensive database first developed by the Bank of Italy and now maintained by Centrale dei Bilanci Srl

controversial as far as methodology, objectives, and results are concerned because of its extreme complexity.

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