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Effects of organizational aging on organizations – Overview and suggestions for future

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Abstract

Effects of organizational aging on organizations - Overview and suggestions for future Susanna Häggman, PhD Student at Jyväskylä University School of Business and Economics, University of Jyväskylä, Jyväskylä, Finland Year of enrollment: 2016, Expected final date: 06/2020, E-mail: susanna.haggman@jyu.fi Abstract This paper reviews the research conducted on the effects of organizational aging on organizations. The important theories and popular topics of empirical research applied in the field are introduced. In the discussion section, the shortcomings and strengths of previous research are addressed and suggestions are made for the direction of the research on the field in the future. State-of-the-art: Aging is an inevitable process faced by all organizations. Due to its ubiquitous nature, organizational aging is more or less related to everything that an organization does. Hence, the topic has been widely studied by academics for decades. Especially the literature streams of organizational ecology and industrial economics as well as the management literature have made a significant contribution in the theoretical understanding of how aging affects organizations. The most popular topics of the empirical research in the field have been the effects of organizational aging on the survival and growth of organizations and also the relationship of organizational aging and change has been a popular topic among the scholars. Research gap: Despite the vast amount of research conducted on the topic, surprisingly, or maybe just due to this great amount of studies, there has been no attempt to review the broad topic of the effects of aging on organizations. This review paper builds a broad picture of the topic by presenting the traditionally important themes in the research field as well as some newer themes. Theoretical argument: The studies on the effects of organizational aging on organizations cover decades of research, but the scholars on field have still not fully agreed on what the effects actually are and how the mechanisms behind them work. This paper claims that this is partly due to the oversimplification of this complex phenomenon in many of the studies, but also due to the inconsistency of the definitions and methodological choices between the studies. Method: The method selected for this paper is a selective review. Due to the broadness of the topic and the vast amount of research conducted in the field, this approach was chosen in order to build a broad picture of the field. The main theoretical approaches applied in the field are introduced, followed by the presentation of the most popular empirical topics addressed in the studies. In the discussion of these popular topics, the results of the early work on each topic is discussed, but the main focus is on the recent work on each topic. This choice of focusing on more recent studies was made in order to build an understanding of the current state of the

research. Due to the broadness of the topic and the great amount of previous studies falling under this topic, the choice of conducting a selective review was natural in order to be able to cover the whole topic in one paper. Results: The study responds to the lack of a comprehensive review on the broad topic of the effects of organizational aging on organizations. Based on the recognized strengths and weaknesses of previous research, suggestions for the future direction of the research on the field are made. The main conclusions are that the research on the field is inconsistent in the applied definitions and methodological choices between the studies. This hinders the progress of the research in the field as comparison of results is difficult. Also, the theoretical approaches to the topic greatly simplify the complex phenomenon. It is suggested that the future research should focus on unifying the applied definitions and aim to pursue to build a comprehensive theoretical framework that would combine the views of different theoretical approaches and explain the contradictory results of previous empirical research.

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1. Introduction

Aging is an unavoidable process for all organizations. Probably due to this reason, business and management scholars have been intrigued by the topic of organizational aging, and it has been broadly studied over the years. The purpose of this paper is to introduce the broad field of organizational aging research, with a specific focus on how aging affects organizations, by presenting the underlying theories and some recent findings on the popular topics of the empirical work on the field.

The organizational ecology literature has explained the effects of organizational aging on organizations through three different age dependency patterns: the liabilities of newness, adolescence, and obsolescence. These theories base, on one hand, on the idea that young organizations are lacking important resources, and, on the other hand, on the idea that old organizations become increasingly inert. (Hannan, 1998.) In the industrial economics literature, the age dependency patterns are explained through technological change by distinguishing between industry entrants and incumbents (e.g. Abernathy & Utterback, 1978; Tushman & Anderson, 1986) and through learning-by-doing effects (Jovanovic, 1982). In the capability studies of the management literature, the age related discussion has usually been linked to the ideas on capability development (e.g. Teece, Pisano & Shuen, 1997; Zollo & Winter, 2002; Leonard-Barton, 1992). An important role in the theoretical approaches to organizational aging has also been placed on organizational learning theory as all the theoretical approaches build more or less on the ideas arising from the learning theory.

Empirical studies on the field have provided mixed results and given support to different types of age dependency patterns of organizations. Traditionally widely studied empirical topics on the research field have been the effects of organizational aging on failure, growth, and change. Yet, the understanding on these topics is still not complete due to the differing results between empirical studies.

Despite the fact that the topic of organizational aging has gained wide attention among scholars, there seems to be no previous attempt to review the broad topic of the effects of organizational aging on organizations. By taking the approach of a selective review, this paper responds to this shortcoming by providing an overview of the important theories and most widely studied empirical topics on the field. The discussion section also provides some suggestions for the future direction of the research on the field.

2. Organizational aging research

This chapter introduces the theoretical background of the organizational aging research. The focus of this introduction is on the literature streams that have contributed on the aging research the most: organizational ecology, industrial economics, and management literature. In addition to these literature streams, also organizational learning theory has made a major contribution to the organizational aging literature by providing a foundation on which all the theoretical approaches are built. The contribution of the learning literature is discussed together with the other three literature streams. Also other lines of literature have recognized the possibility of age related effects on organizational functioning (see for example Mueller and Yun, 1998, and DeAngelo, DeAngelo & Stulz, 2006, for examples of life-cycle theories of a firm applied in empirical finance). However, in order to keep this review focused, the discussion here is limited to the most influential lines of research.

2.1 Theoretical background

Organizational ecology literature has provided three differing views on the effects of organizational aging on organizations: liability of newness, liability of adolescence and liability of obsolescence. While the liability of newness theory suggests that the highest risk of failure is at the very beginning of an organization's life, and it then decreases with age, the liability of obsolescence logic, conversely, suggests that the risk increases with age, being the highest for old organizations. The liability of adolescence logic, on the other hand, shows an inverted U-shaped relationship where the risk of failure first increase, being highest at the adolescence of the organization's life, and then starts to decrease. (Hannan, 1998.)

The liability of newness theory is based on Stinchcombe's (1965) thoughts about young organizations dealing with issues specific to new organizations. These issues include the need of the members of the organization to learn and even invent new roles, which causes both costs and inefficiency. The other challenges specific to new organizations are the lack of trust between members of the organization as there has not been time for the relationships of trust to develop, and the lack of stable ties to customers. This makes young organizations less efficient than their older competitors. (Stinchcombe, 1965.) Hannan and Freeman (1984) explain the same phenomenon through a selection process. Older organizations are favored due to the higher level of reliability and accountability. The higher levels of reliability and accountability are achieved through increasing reproducibility. (Hannan & Freeman, 1984.)

The liability of adolescence theory is in line with the liability of newness theory in the sense that as organizations age, their risk of failure decreases. According to this logic, however, the highest risk is not at the very beginning of an organization's life, but somewhat after that. According to this logic, the resource endowment that the organization has at the very beginning, protects it against failing. It takes some time before these endowments run out, and time is also needed in order to collect sufficient data to evaluate the performance of the organization. This moves the highest risk of failure to the adolescence of the organization's life. (Brüderl & Schüssler, 1990; Levinthal & Fichman, 1988.)

The organizational learning literature supports the liability of newness and adolescence theories with the idea that learning and experience improve organizational competence as the existing capabilities are refined (March, 1991). Learning improves also the innovative capabilities of an organization since, as Cohen and Levinthal (1990) have shown with technological innovations, as prior knowledge accumulates, the ability of a firm to recognize and utilize new related knowledge enhances.

The liability of obsolescence, on the other hand, is based on the idea that organizations face structural inertia that makes adapting to changing environments difficult. These inertial forces are driven internally by the rigidity of both resources and routines, and also externally through the pressure caused by external barriers, constraints, and attitudes (such as legal barriers or availability of information) (Hannan & Freeman, 1977). As an organization's structure typically depends on the state of the environment at founding (Stinchcombe, 1965), and the speed at which it is able to change is slowed down by inertial forces, changes in the environment cause the environmental fit of the organization to decrease with age (Hannan & Freeman, 1977; Barron, West & Hannan, 1994). Though, it is noteworthy here that this does not happen if the environment is stable. (Barron *et al.*, 1994.) In addition to the liability of obsolescence, the idea of the risk of failure increasing with age is supported by the liability of senescence theory. According to the liability of senescence theory, the growing inefficiency of an organization is caused internally by an increasing amount of rules and routines. This means that unlike the liability of obsolescence, the liability of senescence is independent of the environment and directly caused by aging. (Barron *et al.*, 1994.)

Just like the ideas from organizational learning literature support the ideas about liabilities of newness and adolescence, support can be found also for the liability of obsolescence theory. As organizations gain experience and knowledge, their willingness to change might be reduced especially when the feedback from the existing activity is positive (Levitt & March, 1988). Especially in rapidly changing technological fields, focusing only on the existing capabilities and falling behind in technological development might cause the organization to end up with obsolete technology, since, due to the cumulative and path-dependent nature of absorptive capacity, falling behind can lead to a situation where the organization is no longer able to absorb new knowledge on that area (Cohen & Levinthal, 1990: 137).

All the three different views have gained empirical proof, as the various empirical studies on the relationship of age and mortality have provided conflicting results, and the research field has struggled to find the reasons and mechanisms that would explain all these contradictory views to gain empirical support (Hannan, 1998). However, attempts have been made to find explanations for the arise of different age patterns in empirical studies. It as been argued that the different age dependency patterns found between firms can be explained, for example, through different technology strategies (Henderson, 1999) or stocks and flows of resources (Le Mens, Hannan & Pólos, 2011).

Organizational ecology literature, however, is not the only literature stream that has contributed in the organizational aging research. In the industrial economics literature, the logic behind the views on organizational aging is rooted in Schumpeter's (1942) ideas of creative destruction. According to the logic, the times of radical and incremental innovation alternate in an industry,

and it is most often the firms new to the industry that are responsible of the innovations of radical type as it is the incumbent firms that more often produce incremental innovations. (Abernathy & Utterback, 1978; Tushman & Anderson, 1986.) Although not concerning the age dependency directly, this logic makes a distinction between entrants and incumbents in the industry and suggests that aging changes the nature of an organization's innovative output (Sørensen and Stuart, 2000).

Regarding the mortality hazard, the industrial economics research has also presented somewhat differing results. Several studies have recognized that the risk of failure decreases with age (e.g. Evans, 1987; Dunne, Roberts & Samuelson, 1989; Caves, 1998). However, Agarwal and Gort (1996, 2002) suggest that the failure hazard of a firm first decreases with age but eventually starts to increase again (U-shaped relationship). In this line of literature, the survival patterns have been explained through two different viewpoints: learning-by-doing and the above mentioned technological change (Agarwal & Gort, 1996). As firms age and gain experience in an industry, they learn about their own efficiency and the more they know, the better are their chances for survival (Jovanovic, 1982). In addition to learning about themselves, the firms also learn about the technologies they are involved with. The rate of this learning, however, slows down with age due to the finiteness of information about a specific technology, and the tendency of firms to adopt the most important knowledge first. (Agarwal & Gort, 2002: 185.) The other explanation follows Gort and Klepper's (1982) ideas on industries evolving with product life cycles, which causes variation to the survival rates of the firms operating in the industries mainly due to technological change (Gort & Klepper, 1982; Agarwal & Gort, 1996). For example, Agarwal and Gort (2002) explain the U-shaped age dependency pattern through the rate of technological change that is defined by the life cycle of the industry. The obsolescence of the endowments of an individual firm, in turn, is defined by this rate of change. The initial endowments of a firm are usually low (compared to the industry average), but increase with time (age) as the least efficient firms fail causing the distribution of endowments to change. The firms also make new investments that might increase their endowments, but eventually obsolescence of the initial endowments rises to a level at which the new investments do not compensate for the increasing obsolescence anymore. (Agarwal & Gort, 2002.)

In management literature, the discussion on the effects of organizational aging is mainly incorporated in capability studies and the reasoning behind the relationship of organizational aging and capabilities relies heavily on organizational learning. As explained in the following, in line with the other streams of literature, also the management literature recognizes the possibility of both positive and negative consequences arising from aging.

Learning enables organizations to become more efficient in their routines as they learn by doing and experimenting (Levitt & March, 1988). The learning process is also one of the key processes underlying dynamic capabilities (Teece *et al.* 1997). Zollo and Winter (2002: 340) have stated that it is actually the learning mechanisms that shape the routines of an organization through dynamic capabilities. According to them, dynamic capabilities are developed as an organization learns from its past experience, and as the knowledge is shared within the organization. (Zollo & Winter, 2002.) However, in certain circumstances (such as dynamic environments) the core capabilities of a firm may eventually turn into core rigidities that inhibit innovation as the firm loses its ability to adapt (Leonard-Barton, 1992). Also the dynamic capabilities and learning

mechanisms behind them need to be updated in order to keep up with the changing environment (Zollo & Winter, 2002:341). Following this logic, it can be understood that aging, on one hand, gives organizations the time advantage of developing their capabilities, but on the other hand, this advantage can become a rigidity if the organizations are not able to adapt to the environment. The development of dynamic capabilities with age affects also firm performance, since although having effective dynamic capabilities does not guarantee a competitive advantage, it is necessary for achieving superior performance (Eisenhardt & Martin 2000; Zahra *et al.* 2006). Building on the resource based view of the firm, Thornhill and Amit (2003), have shown that the failure of young firms is likely to be caused by the lack of managerial knowledge and abilities (initial endowments) as the failure of old firms is more likely to be caused by the inability to keep up with the changing environment (lack of dynamic capabilities).

Also the ability of young organizations to change more efficiently than older organizations, has been explained with capability development. Zahra, Sapienza and Davidsson (2006) suggest that the different learning mechanisms dominating the dynamic capability development of organizations at different ages is the underlying reason. This suggestion is based on the idea that even though planning could be beneficial for them, young firms do not have the resources and experience required for it and are unable to utilize learning mechanisms that require it. (Delmar & Shane, 2003; Zahra *et al.*, 2006). For this reason, they are more likely to use the learning mechanisms that require less planning, and so are also faster, in their dynamic capability development process. This faster process makes them also able to change more rapidly than the older organizations. (Zahra *et al.*, 2006.)

The three approaches discussed above are not strictly distinct as they build on similar ideas in terms of learning and the importance of resources and/or initial endowments. The main difference between these views, however, is the emphasis on either selection or adaptation. As the organizational ecology scholars see the external selection forces as the main factor defining the fate of organizations, the management literature emphasize the internal competences of organizations in defining who is able to adapt to the environment and survive. Also the industrial economics literature emphasizes the external selection forces arising from the industry dynamics, although it leaves also some room for the adaptation approach as individual firms have the chance to affect in which industry they operate and how they position themselves within that industry. (Lewin & Volberda, 2005.)

3. Empirical research on organizational aging

This chapter introduces the age-relationships that have gained most attention over the years in the empirical research on the field. The effect of age on failure, growth, and change have traditionally been popular topics of research. These themes are shortly discussed and some recent findings of empirical studies on each topic is presented in the form of a selective review. As mentioned in the introduction, organizational aging has been studied widely in several different research fields, and aiming to cover it all would be impossible within the scope of a single review. For this reason, the focus was set on some of the recent findings in each topic in order to give the reader an idea of the current state of the research on these topics.

3.1 Aging and failure

The relationship between organizational aging and the risk of failure has been the most widely studied topic related to the effects of organizational aging. As discussed, the liability of newness theory gained support in the organizational ecology literature early on. However, later studies (that control also the organizational size) have provided contradictory results. Baum and Shiplov's (2006) book chapter on organizational ecology lists 57 studies on organizational aging published in 1983-2003. The studies cover 63 different populations of organizations, ranging from New York City credit unions 1914–1990 (Barron *et al.* 1994) to Bavarian Brewers 1900–1981 (Swaminathan and Wiedenmayer 1991). Out of all the studies, the results on 46 different populations were obtained while controlling both the age and size of the organization¹. Out of these 46 studies, the results on 12 populations showed a decreasing failure hazard with age (liability of newness), 11 showed an increasing failure hazard (liability of obsolescence / senescence), and 6 showed initially increasing and then decreasing hazard (liability of adolescence). The results on 15 populations showed no dependence between age and mortality hazard. (Baum & Shipilov, 2006.) As explained in the previous chapter, the later organizational ecology literature has pursued to explain the varying empirical results on the topic, and as, for example, Henderson (1999) has explained the different patterns with different technology strategies, Le Mens *et al.* (2011) have suggested that the difference lies in the stocks and flows of resources.

The results discussed above represent the findings of the organizational ecology literature. A set of studies from other literature streams and from some more recent literature is discussed next. Table 1 presents the findings of these papers. As mentioned, the effect on aging on the hazard of failure has been the most heavily studied of all the effects of aging. In some of the studies, the focus is not directly on the relationship of firm age and failure, but nevertheless, all the studies in table 1 provide valuable evidence on this relationship.

Majority of the papers summarized in table 1 find a decreasing risk of failure with age (Fariñas & Moreno, 2000; Agarwal & Gort, 2002; Mata & Portugal, 2002; Fackler, Schnabel & Wagner, 2003; Addison, Bellmann & Kölling, 2004; Persson, 2004; Esteve-Pérez, Sanchis-Llopis & Sanchis-Llopis, 2004; Yasuda, 2005; Bernard & Jensen, 2007; Bellone, Musso, Nesta & Quéré, 2008; Park, Shin & Kim, 2010; Mueller & Stegmeier, 2015). Yet, Agarwal and Gort (2002) find that the rate of this declining failure risk is diminishing and eventually the risk starts to rise again. Also Esteve-Pérez *et al.* (2004) and Fackler *et al.* (2013) find this eventual increase in the risk of failure hazard. Jensen, Webster, & Buddelmeyer (2008) state that, although new firms are more likely to fail than incumbents, the industry environment is in central role when assessing the failure hazard as new firms prosper in innovative industry environments. Bellone *et al.* (2008) have presented that the determinants of firm survival depend on firm age as the selection process forces bad performers to exit, and this process is less harsh on older firms. Some of the studies, on the other hand, have found a different type of age dependency pattern. An inverted U-shaped pattern, where the risk of failure first increases and then decreases, was reported by Honjo (2000), Strottman (2007), Esteve-Pérez and Mañez-Castillejo (2008), and by He and Yang (2016). Esteve-Pérez and Mañez-Castillejo (2008) also found that after this initial inverted U-shaped pattern, the risk starts to increase again.

Table 1 Studies providing empirical evidence on the firm age-failure relationship.*

Author(s)	Year	Sample	Effect of firm age on the risk of failure
Addison <i>et al.</i>	2004	German plants	-
Agarwal & Gort	2002	US manufacturing firms	U
Agarwal <i>et al.</i>	2002	US manufacturing firms	Depends on the life cycle state of the industry
Bellone <i>et al.</i>	2008	French manufacturing firms	-, determinants of firm survival depend on age
Bernard & Jensen	2007	US manufacturing plants	-
Esteve-Pérez & Mañez-Castillejo	2008	Spanish manufacturing firms	First \cap , then +
Esteve-Pérez <i>et al.</i>	2004	Spanish manufacturing firms	U
Fackler <i>et al.</i>	2003	West German establishments	U
Fariñas and Moreno	2000	Spanish manufacturing firms	-
Fortune & Mitchell	2012	Struggling exiting firms in the US Internet sector	The likelihood of an exit by acquisition rather than dissolution increases with age
He & Yang	2016	Chinese industrial enterprises	\cap
Honjo	2000	Manufacturing firms in Tokyo	\cap
Jensen <i>et al.</i>	2008	Australian companies	- (but also depends on context)
Mata & Portugal	2002	Portuguese firms	-
Mueller & Stegmeier	2015	Bankrupt German plants	-
Park <i>et al.</i>	2010	Korean manufacturing firms	-
Persson	2004	Swedish establishments	-
Strottman	2007	Baden-Wuerttemberg manufacturing establishments	\cap
Thompson	2005	US iron and steel shipbuilding industry	Age dependency of survival can be explained with a selection bias
Thornhill & Amit	2003	Bankrupt Canadian companies	Reasons of failure are different for young and old firms
Yasuda	2005	Japanese manufacturing firms	-

*pattern shape: - = decreasing, + = increasing, U = U-shaped, \cap = inverted U-shaped, non-linear = other non-linear

Thornhill and Amit (2003) have discussed the reasons that cause firms to fail and they claim that the reasons behind failure are different for young and old firms. According to them, young firms fail because of managerial deficiencies as the reasons of failure for older firms could lie in difficulties in adapting to changes in the environment. Agarwal, Sarkar & Echambadi (2002) have investigated the age dependencies in the context of industry life cycle, and found that young

firms face higher failure rates if they enter an industry when it is mature compared to those young firms that enter the industry when it is still in the growth phase. Later, the failure hazard will decrease with time for those firms that entered the industry during the mature phase of the industry life cycle, and increase for those firms that entered during the growth phase. (Agarwal *et al.* 2002.) Thompson (2005) showed that the age dependency found in his data can be explained with a selection bias. In his study the observed age dependency became statistically insignificant when proxies for firm quality were added to the analysis. (Thompson 2005.) Finally, Fortune and Mitchell (2012) discussed the different types of exits and showed that when predicting the type of exit (acquisition or dissolution) for an exiting firm, the likelihood of an exit by acquisition increases and by dissolution decreases with age.

The reasoning provided by the authors for the different age-failure relationship found in the studies, in most of the papers, lay on the different liability patterns (liabilities of newness, adolescence, obsolescence, and senescence) (Agarwal *et al.*, 2002; Mata & Portugal, 2002; Fackler *et al.*, 2003; Thornhill & Amit, 2003; Esteve-Pérez *et al.*, 2004; Strottman, 2007; Esteve-Pérez & Mañez-Castillejo, 2008) and/or on learning and capability development (Fariñas & Moreno, 2000; Agarwal & Gort, 2002; Esteve-Pérez *et al.*, 2004; Park, 2010; Fortune & Mitchell, 2012; Mueller & Stegmeier, 2015; He & Yang, 2016). The higher risk of failure of young firms was also explained with resource restrictions (Honjo, 2000; Thornhill & Amit, 2003), vulnerability to competition (Jensen *et al.*, 2008; He & Yang, 2016), and changes in economic conditions (Jensen *et al.*, 2008). In addition, Agarwal and Gort (2002) have applied the industry life cycle theory as they state that the effects of age depend on the state of the industry. Some of the papers did not provide a theoretical explanation for the age dependency, either since age effects were not the main focus of the study or due to the purely empirical nature of the study.

As is evident from the empirical work, the observed age dependency patterns of the risk of failure are not uniform. What should be kept in mind when interpreting the results, however, is that some of the studies have very different time spans (e.g. as Honjo (2000) has focused on young firms and observed them 9 years at most, Thompson (2005) has a 90-year observation period in his study). Despite the somewhat differing empirical evidence, the industrial economics literature mostly agrees with the findings of the early work (e.g. Evans 1987; Dunne *et al.* 1989) on the failure risk of new firms decreasing with age due to the learning effects presented by Jovanovic (1982) as explained in the previous chapter. Yet, the possibility of the risk to increase later is recognized also in this stream of literature (Mata & Portugal, 2002).

3.2 Aging and growth

The relationship of firm age and growth is another topic that has gained wide interest in the studies focusing on the effects of aging and firm dynamics. Based on early work on industry entry, Geroski (1995) presented that the age (and size) of an industry entrant correlate with not only the survival but also the growth of a firm. Some of the early work on the topic suggests that firm growth decreases with age (and size) (Evans 1987; Dunne *et al.* 1989). These early results are in line with Jovanovic's (1982) learning model that suggests a similar relationship for aging and growth of a firm. Also later models (e.g. Klepper & Thompson, 2006) have predicted (size-

conditional) decrease in growth rates with age. Table 2 lists the results of some later studies providing empirical evidence on the age-growth relationship.

Table 2 Studies providing empirical evidence on the firm age-growth relationship.*

Author(s)	Year	Sample	Effect of firm age on growth
Autio <i>et al.</i>	2000	Entrepreneurial firms in the Finnish electronics industry	- (international growth rate after internationalization)
Capasso <i>et al.</i>	2015	Italian wineries	+
Carr <i>et al.</i>	2010	US firms	- (short term growth rate after internationalization)
Chen <i>et al.</i>	2012	US wireless telecommunications industry	-
Coad & Tamvada	2012	Small Indian firms	-
Coad <i>et al.</i>	2013	Spanish manufacturing firms	-
Fariñas and Moreno	2000	Spanish manufacturing firms	-
Haltiwanger <i>et al.</i>	2013	US private non-farm firms	-
Hamilton	2010	Christchurch (New Zealand) growth firms	No effect
Huergo & Jaumandreu	2004	Spanish manufacturing firms	-
Huynh & Petrunia	2010	Canadian firms	U
Lu & Beamish	2006	Japanese SMEs	- (age at the first foreign direct investment negatively moderates the relationship of foreign direct investments and firm growth)
Moreno & Castillo	2011	Spanish firms	-
Park <i>et al.</i>	2010	Korean manufacturing firms	-
Rodríguez <i>et al.</i>	2003	Santa Cruz de Tenerife (Spain) firms	- (in some of the analyses insignificant effect)
Shanmugam & Bhaduri	2002	Indian manufacturing firms	+
Sleuwaegen & Goedhuys	2002	Ivorian (Côte d'Ivoire) manufacturing firms	-
Steffens <i>et al.</i>	2009	Australian SMEs	-
Suárez & De Jorge	2012	Spanish retail firms	+
Yasuda	2005	Japanese manufacturing firms	-

*pattern shape: - = decreasing, + = increasing, U = U-shaped, \cap = inverted U-shaped, non-linear = other non-linear

Again, majority of the studies listed here support the findings of the early work on the field and find a negative relationship between firm age (or its industry tenure) and growth (Fariñas & Moreno, 2000; Sleuwaegen & Goedhuys, 2002; Rodríguez, Molina, Pérez & Hernández, 2003; Huergo & Jaumandreu, 2004; Yasuda, 2005; Steffens, Davidsson & Fitzsimmons, 2009; Park *et al.*, 2010; Moreno & Castillo, 2011; Chen, Williams & Agarwal, 2012; Coad & Tamvada, 2012; Coad, Segarra & Teruel, 2013; Haltiwanger, Jarmin & Miranda, 2013). Yet, in some of the analyses by Rodríguez *et al.* (2003) the age effect was insignificant and in the study of Fariñas and Moreno (2002) the negative age effect was observed for successful firms, but with failing

firms in the sample the effect was insignificant. Also, Sleuwaegen and Goedhuys (2002) did not find this negative age effect for firms that had a large startup size. Chen *et al.* (2012) noted that even though firms with shorter industry tenure grow faster, at older age, the growth slows down more for the de novo firms than for the firms that have pre-entry experience, and Steffens *et al.* (2009) concluded that, even though young firms are more likely to present high growth rates, high growth young firms are less likely to maintain the high growth position than old high growth firms. In addition to these studies, a negative age-growth relationship was also found by two studies focusing on international growth. Both Autio, Sapienza and Almeida (2000) and Carr, Haggard, Hmieleski and Zahra (2010) found that growth rates after internationalization are higher for young firms than for the older ones. A similar finding was made by Lu and Beamish (2006) who investigated the role of firm age as a moderator between foreign direct investments and firm growth.

Three of the studies found a positive link between firm age and growth. In their study on Indian firms, Shanmugam and Bhaduri (2002) found that older firms grow faster than young firms, and Suárez and De Jorge (2012) found this type of relationship in their study on Spanish firms. Also Capasso, Gallucci and Rossi (2015) found that older firms have a higher trend of sales growth than young firms. Huynh and Petrunia's (2010) analysis shows a U-shaped age-growth pattern, in which, however, the growth is fastest for young firms. Finally, Hamilton (2010) found no age dependency for growth in his study.

The explanations provided by the authors for the found age related results included the liability of obsolescence/senescence (growing inertia) (Lu & Beamish, 2006; Steffens *et al.*, 2009; Carr *et al.*, 2010; Coad & Tamvada, 2012; Chen *et al.*, 2012; Coad *et al.*, 2013) for explaining the negative age-growth relationship. The faster growth of young firms was explained also by basing on the learning theory. Huergo and Jaumandreu (2004) suggested that young firms enjoy learning and spillover effects that facilitate the growth, Sleuwaegen and Goedhuys (2002) stated that these learning effects dominate until a maximum efficiency level is achieved and the growth starts to decline, and also Fariñas and Moreno (2000) suggested that the returns to learning are smaller for older firms since there is less room for additional efficiency gains. Autio *et al.* (2000) presented that the international growth of young firms is faster since they are less bound to the home market (they have had less time to gain knowledge and competencies specific to their home market) which makes it easier for them to adapt to the requirements of the foreign markets. Rodriguez *et al.* (2003) noted that the negative age-growth relationship found on their study could be due to the limited market size of their sample population. The positive age-growth relationship was explained only by Capasso *et al.* (2015) who stated that it is due to the strengthening of the relationships, reputation, and brand of the firms over time. However, they also stated that the nature of the industry in their study (the wine industry) could affect the relationship since in this industry age can be also an important part of the value of the product for the customers. (Capasso *et al.*, 2015.)

As is implied by the results of the studies presented here, the newer empirical studies are mostly in line with the early work suggesting a decreasing growth rate with firm age. However, as was the case with age-failure relationship, also other types of age dependency patterns have been found for the age-growth relationship. The growth of a firm in empirical studies is often measured as the growth of sales, employment and/or assets (Shanmugam and Bhaduri, 2002:

607), and this is the case also in most of the studies presented in table 2. Other measures for growth used in the studies are number of subscribers (Chen *et al.* 2012), gross output (Coad & Tamvada 2012), profits and productivity (Coad *et al.* 2013) as well as operating income, added value, and equity (Rodríguez *et al.* 2003).

3.3 Aging and change

As is the case with age-growth and age-failure relationships, the relationship of aging and change has gained wide attention. The roots of this line of research lie in the ideas about creative destruction (Schumpeter, 1942), and that mature (and large) organizations become increasingly bound to incremental technological change (minor process improvements), and are increasingly unlikely to engage in radical technological change (major product innovations requiring new technology) (Abernathy & Utterback, 1978). Amburgey, Kelly and Barnett (1993) have suggested that while old organizations are less likely to change (regarding goal changes and technical/strategic changes), they also suffer from a greater increase in failure hazard than younger organizations after a change (although their initial failure hazard before the change is lower). Table 3 introduces the results from some more recent empirical studies on the age-change relationship.

Many of the studies in table 3 found a negative relationship between firm age and the likelihood or rate of change (Kraatz & Zajac, 2001; Nagaoka, 2005; Shimizu & Hitt, 2005; Haller & Siedschlag, 2011; Coad & Guenther, 2013; De Figueiredo. P., Rawley & Rider, 2015; Le Mens, Hannan & Pólos, 2015). The type of change in these studies is various, ranging from product portfolio expansions (Coad & Guenther 2013; De Figueiredo *et al.*, 2015) to adoption of new practices (Nagaoka, 2005) and unit divestments (Shimizu & Hitt, 2005). This negative age-change relationship was found also by Atwater, Gopalan, Lancioni and Hunt, (2010) who studied the likelihood of a strategic change after a strategic surprise, and by Ruzzier and Konecnik Ruzzier (2015) who studied the extent of change. Partial support for the negative age-change relationship was found in the studies of Mole, Ghobadian, O'Regan and Liu (2004) and Desai (2008) who, in addition to the negative relationship, found also an insignificant relationship between firm age and change with some of their statistical models. As presented in an earlier chapter, Autio *et al.* (2000) and Carr *et al.* (2010) studied the performance outcomes of change, and found that young organizations enjoy greater performance effects after a change (short term growth after internationalization). Also Lu and Beamish (2006) investigated performance outcomes, and found that firm age at its first foreign direct investment (expansion of geographical reach) negatively moderates the relationship of foreign direct investments and firm growth.

Table 3 Studies providing empirical evidence on the firm age-change relationship.*

Author(s)	Year	Sample	Effect of firm age on change (likelihood, extent or rate)
Angst <i>et al.</i>	2010	US care delivery organizations	+
Atwater <i>et al.</i>	2010	US less-than-truckload motor carrier firms	-
Autio <i>et al.</i>	2000	Entrepreneurial firms in the Finnish electronics industry	Young firms have higher international growth rates after a change (internationalization) than older firms
BarNir <i>et al.</i>	2003	Northeast US SMEs in magazine publishing businesses	+
Carr <i>et al.</i>	2010	US firms	Young firms have higher short term growth rates after a change (internationalization) than older firms
Chizema & Shinozawa	2012	Japanese firms	+
Coad & Guenther	2013	German machine tool manufacturers	-
de Figueiredo <i>et al.</i>	2015	Hedge funds	-
Desai	2008	US railroad firms	- (partial support, also insignificant relationship was found)
Guillén	2002	South Korean firms in China	No effect
Haller & Siedschlag	2011	Irish manufacturing firms	-
Kraatz & Zajac	2001	US liberal arts colleges	-
Le Mens <i>et al.</i>	2015	Biotechnology firms	-
Lu & Beamish	2006	Japanese SMEs	Firm age at first foreign direct investment (expansion of geographical reach) negatively moderates the foreign direct investments - firm growth relationship
Mole <i>et al.</i>	2004	British engineering and electronics SMEs	- (partial support, also insignificant relationship was found)
Nagaoka	2005	Japanese firms	-
Ruzzier & Konecnik Ruzzier	2015	Slovenian SMEs	-
Shimizu & Hitt	2005	US-based public firms acquiring and divesting another US company	-
Shropshire & Hillman	2007	US firms	+
Vicente-Lorente & Zúñiga-Vicente	2006	Spanish banks	No effect
Zúñiga-Vicente <i>et al.</i>	2005	Spanish banks	No effect

*pattern shape: - = decreasing, + = increasing, U = U-shaped, ∩ = inverted U-shaped, non-linear = other non-linear

Again, also a positive age relationship was found. The positive effect of aging on the likelihood of change was found by BarNir, Gallagher and Augerc (2003) and Angst, Agarwal, Sambamurthy and Kelley (2010) who studied the likelihood of a firm to adopt new technology, and by Shropshire and Hillman (2007) and Chizema and Shinozawa (2012) who studied the likelihood of a change in stakeholder management and government system, respectively.

Three of the studies found age as an insignificant predictor of change. The studies of Zúñiga-Vicente, de la Fuente-Sabaté & Suárez-González (2005) and Vicente-Lorente and Zúñiga-Vicente (2006) on Spanish banks found the insignificant age dependency on strategic change, and the study of Guillén (2002) on South Korean firms in China found that age does not affect the rate of foreign expansion. However, Guillén (2002) notes that this finding could be also due to the limitations of the data used in the study (such as the short observation period of nine years), and Vicente-Lorente and Zúñiga-Vicente (2006) stated that the factors affecting strategic change are time and context dependent.

As many of the studies presented here found a negative relationship between aging and change, the results seem to be mostly in line with the previously discussed ideas from technological change literature presenting that established organizations may face difficulties when radical change is required, and organizational ecology literature suggesting that the increasing structural inertia makes organizations rigid, and so less likely to change as they age. Yet, some studies found an opposite or insignificant relationship. The differences in the results between the studies could partly arise from the fact that the type of change investigated varies between the studies, and it is possible, even likely, that the effects of aging are not identical for all types of change. Yet, based on the mixed empirical results of the studies, it seems that the effects of organizational aging on change are not clear cut.

In most of the papers that found a negative association between age and change, the reasoning lay in the ideas of structural inertia, growing bureaucracy, and established routines (Autio *et al.*, 2000; Shimizu & Hitt, 2005; Lu & Beamish, 2006; Desai, 2008; Atwater *et al.*, 2010; Carr *et al.*, 2010; de Figueiredo *et al.*, 2015; Le Mens *et al.*, 2015; Ruzzier & Konecnik Ruzzier, 2015). Other explanations for the negative relationship included the resource based view and the industry life cycle theory (Coad & Guenther, 2013), the vintage capital theory (Mole *et al.*, 2004), and information asymmetry (Nagaoka, 2005). Maintaining a competitive position at a product market requires an increasing amount of resources as competition in the product market intensifies over time, and, due to the limited amount of resources, firms are eventually forced to exit some product markets in order to be able to compete in the others, which decreases their diversification rates (Coad & Guenther, 2013). The vintage capital explanation suggests that young firms have “fresher capital” (newer technology) and are so also more likely to adopt new technology (Mole *et al.*, 2004), and the information asymmetry view suggests that old firms are less likely to introduce stock options because the information asymmetry between managers and investors declines with age (Nagaoka, 2005). In the studies finding a positive association between age and change, the reasoning of the results based on increasing amount of resources, capabilities, established relationships, knowledge, and legitimacy that better facilitate change (BarNir *et al.*, 2003; Shropshire & Hillman, 2007; Angst *et al.*, 2010; Chizema & Shinozawa, 2012).

4 Discussion and conclusions

The previous chapters have discussed the important theoretical approaches to the effect of organizational aging on organizations, and presented the popular topics of empirical research on the field. This chapter addresses the shortcomings and strengths of this previous research and concludes in suggestions for the direction of the research on the field in the future.

The theoretical approaches to organizational aging share similar ideas on the learning effects and importance of resources. As organizations age, they learn about both themselves and the environment they are operating in (Jovanovic, 1982; Agarwal and Gort, 2002). Young organization's also tend not to have as much resources available as the older organizations that have had time to collect more resources over time (Zahra et al., 2006). The different theoretical approaches agree that these learning by doing effects and the evolving resource base are in a key role in explaining the effects of organizational aging on organizations. Yet, the different approaches see the role of internal and external factors differently in defining the fate of an organization (Lewin & Volberda, 2005). As the management literature sees the internal competencies as a key factor in defining the fate, organizational ecology and industrial economics see that it is actually the environment of the organization that defines the fate. In this way the difference between the views is not actually in how aging affects organizations but on why and how these effects matter.

The section focusing on the empirical research on effects of organizational aging on organizations focused on the recent work on the traditionally popular topics on the field: effect of age on failure, growth, and change. Even though many of the studies found a negative relationship between organizational aging and a firm's risk of failure, growth and change, the results were nothing but straightforward since varying results and age dependency patterns were found.

A natural explanation for explaining a part of the large variation in the results of the empirical research is the difference in the definitions and measurements between the studies. Regarding failure, for example, there is no consensus of what it actually is (Mellahi & Wilkinson, 2004). For this reason, it has also been operationalized differently in different studies. For example, as Mata and Portugal (2002) measure failure as an exit from the market, Thornhill and Amit (2003) have operationalized it as bankruptcy. Also the measures and definitions for growth and change have varied between the studies. As mentioned, growth has often been measured as sales growth, employment growth or asset growth (Shanmugam and Bhaduri 2002: 607), but also other measures, such as number of subscribers (Chen et al., 2012), have been utilized. Also change has had various measures, and the whole concept of change is somewhat ambiguous (it is not clear what actually is counted as change).

Also the differing views on where the line between young and old organizations should be drawn, and the differing observation periods (or the deviation of firm ages in the sample) applied in the studies can cause false interpretation of the results. For example, a study with a short observation time (including only very young firms) might find an increasing or decreasing age dependency pattern, but represent only a part of the truth, if the trend, in fact is non-linear in long run, but the observation period was shorter than the time to the first local extreme value of the

age dependency function. In addition, as Baum and Shipilov (2006) note, the differing patterns found by empirical studies may arise from sample selection biases, problems in the selected analysis tools (e.g. testing only monotonic age dependency would not reveal liability of adolescence) or simply from variation between populations or subpopulations. Another challenge for the empirical research (and also for the comparability of the results if the coverage of the data varies between studies) is the difficulty to obtain data from start-ups and young firms, especially those that have died very young (see Hannan et al., 1998, for a discussion of the difficulties with dealing with short-lived firms in data).

As said, these variations between definitions and methodological choices between studies make comparing the results challenging. Despite the wide range of studies conducted in the field, drawing conclusions from them is difficult, when the studies are not consistent in their discussion of the phenomenon. For this reason, it seems evident that the incoherence of applied definition, measurements, and other methodological choices is slowing down the progress of the research field, and more coherent common guidelines for discussing and investigating the phenomenon are needed.

As is also evident from the previous chapters, several different theoretical approaches have been applied in explaining the effects of organizational aging on organizations. What is common to these approaches, however, is that they tend to explain only one type of age dependency pattern instead of shedding light on the reasons for several different patterns of age dependency found by different studies. The theoretical models applied also seem to oversimplify the complexity of organizational aging in many cases. As stated by Baum and Shipilov (2006), the assumptions of different age dependency models should be more thoroughly tested. As they point out, the lack of sufficient resources and relationships of trust are assumed to concern new organizations and increase their failure risk in the liability of newness hypothesis, and these assumptions are rarely directly tested even though many studies have shown that there can be significant variation between young organizations regarding these variables (Baum and Shipilov, 2006: 67-68).

Nevertheless, also attempts to explain the different types of age dependencies have been made. These include, for example, the study of Le Mens et al. (2011) where they explained the differing patterns through stocks and flows of resources and the study of Henderson (1999) where he explained the different age dependency patterns with different technology strategies as well as the work of Agarwal *et al.* (2002) stating that difference lies in the life cycle state of the industry. It is clear that the research on the field should move more towards this direction, and aim to explain the differences in the age dependency patterns found by previous empirical studies. Also, instead of the oversimplification of the complex phenomenon, the researchers should aim at building more comprehensive models for explaining the differences between industries and populations.

In brief, the research on the field of the effects of organizational aging on organizations has involved scholars from different fields of studies, and the amount of empirical research conducted on the field is vast. Yet, the understanding on how aging affects organizations is insufficient, and the results obtained from empirical studies differ from each other. Some efforts have been made to explain the different age dependency patterns found in different studies, and this is the direction that the research should continue going in order to comprehensively

understand the phenomenon. It is suggested that the future research should focus on unifying the applied definitions and aim to pursue to build a comprehensive theoretical framework that would explain the contradictory results of empirical research in the field.

Notes

1) Since firm age and size are related in the sense that young firms tend to be small, and since firm size has been shown to affect, for example, the failure risk of an organization, it is important that size is controlled when investigating the effects of firm age (for discussion on the size-age relationship, see for example Hannan, 1998; Henderson, 1999; Sørensen & Stuart, 2000).

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