Who's Winning the "Survivor" Race? Gazelle or Non-Gazelle Startups

Dina Pereira, João Leitão, and Rui Baptista

Abstract High-growth firms are of particular interest for academics and policymakers due to their serious contributions to the economy, job market, and knowledge creation. Previous studies have majorly focused on firm growth rates, their persistence over time, and their determinants. Nevertheless, open research windows still remain in predicting what sort of companies will grow or even survive and in understanding the inconsistency of high-growth levels. The complexity of the relationship macroeconomic environment, high-growth regimes and firm capabilities deserves further research efforts. Here we will focus on the microeconomic determinants of startups' survival, namely, the founder's attributes and the firm' characteristics and capabilities, and their relation with business survival, contrasting gazelle and non-gazelle startups. To address this, we use a Cox proportional hazard model, for a sample of 4919 firms, collected from the Kauffman Foundation Survey. Results reveal that the main entrepreneur and entrepreneurial-level determinants of firm survival are the founders' college education, IP activity, firms' small- and medium-size, and the gazelle condition impact on the firms' chances of survival. Taken these all together and including the moderating effect of startup capitalization, results point to the fact that owners' work experience and the small- and medium-sized companies as well as the companies' R&D activities moderated by capitalization access increases the chances of firm survival. Crisis spurs firms' exit, nonetheless startups pursuing a competitive advantage strategy and the moderating effect of startup capital on their internal R&D activities increase the chances of survival.

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1 Introduction

Gazelle firms are understood as key agents in the role model of entrepreneurial economy based on knowledge. They are characterized by high-growth rates, turbulence, and fast change, also being important "new job-creators". Moreover they are of particular interest for academics and policymakers as they present a crucial contribution to the economy, the job market, and knowledge creation (Coad et al. 2014).

These firms are responsible for most net new job generation. They are fast-growing and have an important role in the current economy, creating a lever for economic growth and real convergence. Understanding what drives the sustainable growth of such firms and predicting the determinants that can most affect their performance and survival in order to prevent exit over many years and design sustainable policies is therefore essential.

Much work has been done on the analysis of firm growth determinants, regimens, rates, and persistence (Bottazzi and Secchi 2006; Coad 2007; Acs and Mueller 2008; Lee 2010; Parker et al. 2010; Coad and Hölzl 2011). Research on high-growth firms covers a wide array of items, namely, size (Delmar 1997; Delmar and Davidsson 1998; Weinzimmer et al. 1998; Delmar et al. 2003; Shepherd and Wiklund 2009) and age (Delmar et al. 2003; Haltiwanger et al. 2013); belongs to an enterprise group (Delmar et al. 2003); is family-owned (Bjuggren et al. 2013); and belongs to an industry sector (Delmar et al. 2003; Davidsson and Delmar 2003, Davidsson et al. 2006; Halabisky et al. 2006; Acs et al. 2008), region location (Stam 2005; Acs and Mueller 2008), or country location (Schreyer 2000; Bravo-Biosca 2010), among others.

Several scholars conclude that the majority of entrepreneurs fail or exit during the first 5 years of activity (Parsa et al. 2005; Verhoeven et al. 2005; Hayward et al. 2006; Meijaard et al. 2007; Bangma and Snel 2009). For instance, in the US, 34% of new ventures exit after 2 years, 50% after 4 years, and 60% after 6 years (Hayward et al. 2006). Another example is the case of the Netherlands where almost 50% of new ventures do not survive during the first 5 years (Meijaard et al. 2007; Bangma and Snel 2009). In addition, van Gelderen et al. (2006) analyzed the explanatory factors of creating and making a business to survive. They based their study on Gartner's (1985) framework of new venture creation which concludes that startup efforts are influenced by a set of characteristics of the founders, the firm, the environment surrounding the new venture, and the process of creating a new venture. They point to the perceived risk of the market acting as a predictor of starting the firm versus exiting and simply abandoning the startup creation effort.

Stam and Wennberg (2009) studied the effects of initial R&D on firm growth, defending that this can stimulate new product development at a later stage in the lifecycle of high-tech firms. Conversely, R&D is not supposed to affect the growth

rate of new low-tech firms, only being a stimulus to a limited group of new high-tech and high-growth firms, which are extremely important when considering innovation and entrepreneurship policies.

Recent studies on firm performance, focusing on high-growth firms, state that a set of determinants play a central role in their survival, such as the capacity to adapt quickly in the turbulent environment of fast technological change where "gazelles" operate and develop exit strategies adjusted to this capacity, opting for routes like mergers and acquisitions (M&A), joint-ventures, etc., instead of closing (Klepper and Simons 2005; Wieser 2005; Coad and Rao 2008). In addition, Baptista and Karaöz (2011) show that the process of replacing exiting firms with entrants is a factor of turbulence in high-growth markets. In turn, the incumbents' displacement by new entrants is understood as the main selection force when focusing on declining markets.

In accordance with Coad and Timmermans (2014), there is much room for researching on gazelles under a management perspective as it is still needed to understand in more detail the microeconomic determinants of sustainable high growth. It is important to unveil determinants related with the role played by the entrepreneur, industry characteristics, organizational change during high-growth periods, management styles, firm strategies, and others of major interest for a longer and sustainable high growth.

This chapter makes an attempt to assess if gazelle startups live longer than non-gazelle startups, by analyzing the microeconomic determinants responsible for such scenario and by using an estimation of predicted survival rates of US startup firms under Cox proportional hazard models.

The importance of studying the predictors of survival and growth, as well as understanding what determines firm survival rates, has been a topic of analysis for researchers such as Stuart et al. (1999), Baum et al. (2000), Cohen et al. (2002), Gans and Stern (2003), Gulati and Higgins (2003), Ziedonis (2004), Audretsch and Lehmann (2005), Colombo and Grilli (2005), Cefis and Marsili (2007), Mann and Sager (2007), Srinivasan et al. (2008), Wennberg et al. (2010), Grilli (2011), and Medrano (2012), among others.

In this context, and in line with the objectives of the present work, authors like Stuart et al. (1999), Baum et al. (2000), Cohen et al. (2002), Gans and Stern (2003), Gulati and Higgins (2003), Ziedonis (2004), Audretsch and Lehmann (2005), Cefis and Marsili (2007), Srinivasan et al. (2008), and Medrano (2012) analyzed the determinant factors for survival associated with firms' characteristics, namely, the firms' IPR portfolio and R&D intensity.

Colombo and Grilli (2005) and Grilli (2011) point out that the entrepreneur's previous professional experience is related to the survival and exit rates and with the option of exiting through merger and acquisition.

This chapter attempts to fill the caveat found in the literature, by estimating the predictors of survival and growth of "gazelle" and "non-gazelle" firms, in order to assess the role played by different microeconomic determinants of growth, namely, at the entrepreneur (e.g., founder' attributes) level, the entrepreneurial unit (e.g., firm's characteristics, innovation strategies) level, and the industry sector level.

Using a Cox proportional hazard model, we estimate the hazard ratios of the included firm and founder/owner/firm control variables, based on a sample of 4919 US startups created in 2004 and tracked by the Kauffman Foundation in the subsequent 7 years.

The empirical evidences now obtained reveal that the main microeconomic determinants of firm survival are owners' prior work experience; the small and medium size of the firms; firms with R&D activities; the moderating effect of startup capitalization on the small- and medium-sized companies; as well as on the firms having R&D activities and pursuing a competitive advantage orientation.

Startups with R&D dedicated activities and higher startup capitalization have higher survival ratios than others. Concerning the 2007–2008 financial crisis period, our results suggest that firms are more likely to exit, than in other periods. Notwithstanding, startups that pursue a competitive advantage strategy and denote a higher access to startup capital moderated by their internal R&D activities are not so exposed at the hazard of exiting.

The reminder of chapter is organized as follows: Sect 2 develops the theoretical underpinnings, drawing on the literature about entrepreneur(ial) determinants of exit; Sect. 3 presents the empirical approach and discusses the results; and lastly, Sect. 4 concludes and provides policy implications as well as guidelines for entrepreneurs and practitioners in the framework of technological entrepreneurship, namely, founders/owners or managers of gazelle-firms, which are considered as innovative and high-growth entrepreneurial units.

2 Microeconomic Determinants of Firm Growth

2.1 Entrepreneur Level

Different studies concluded for a positive relationship between entrepreneurs' attributes related with their education and experience and the firms' performance (e.g., Rae and Carswell 2001; Mosey and Wright 2007; Shrader and Siegel 2007; Serneels 2008). Marvel and Lumpkin (2007) analyzed the effect of education on firms' innovation radicalness, concluding for a positive connection. Other studies ratified the positive relationship between founders' higher levels of education and firm innovativeness (De Winne and Sels 2010; Sullivan and Marvel 2011; Ganotakis 2012; Tang and Murphy 2012; Robson et al. 2012; Rauch and Rijsdijk 2013; Gries and Van Dung 2014).

Marvel et al. (2014) argue that it's important to achieve equilibrium among knowledge, skills, and abilities (KSAs), in order to create and spur startups growth.

Highly educated founders, as stated hereafter, are more prepared to absorb and exploit opportunities, and these can happen along work experiences, both as prior experiences as employees and as business owners. Several scholars defend a positive and significant relationship between the founders' previous entrepreneurial

experiences and the firms' survival rates, which decreases the probability of exiting and increases the chances of success (Taylor 1999; Ucbasaran et al. 2003; Politis 2005).

Accordingly, repeat entrepreneurs are more likely to have more personal financial resources to invest or reinvest, greater access to external financial support, and are more able to create new businesses with higher growth potential (Colombo and Grilli 2005). In the view of Tyebjee and Bruno (1984), experienced entrepreneurs are more able to develop high-performance ventures and to plan and also to delineate and implement more efficient exit strategies.

The exit process can also be approached as a learning process that will support the creation of a new firm and subsequent growth, reflecting the concept of entrepreneurial engagement. This concept relates to a process including diverse levels of engagement, such as intentions to establish a firm or startup activity (Grilo and Thurik 2005, 2008).

Westhead et al. (2005) argue that serial entrepreneurs have the capacity to enter and exit repeatedly, acting as key drivers for the economy and industry, due to their previous experience and external learning spillovers. The authors also suggest that serial entrepreneurs are more prone to enter a new business after exiting another due to additional skills and knowledge achieved in previous experiences.

This could be connected with the dynamic capabilities perspective presented in Teece et al. (1990, 1997), Teece and Pisano (1994), and Teece (2007, 2009, 2010a, 2014) that goes beyond a financial-statement view of assets to emphasize the "soft assets" that management needs to make a rational use of both internal and external resources to the firm. This type of assets, in our view, is dependent on the entrepreneur's background, characteristics, and experiences.

In this same vein, other authors (Wagner 2003; Schutjens and Stam 2006; Stam et al. 2008; Amaral et al. 2011) state that more educated founders, and in the majority of times males, are more prone to reengage in the entrepreneurial process after closing a business, being also more capable of using these prior experiences in favor of the new venture's success. Braguinsky et al. (2012) analyzed high-tech startups and concluded for the positive effect of pre-entry work experience on recognition and exploitation of a new business opportunity. Nevertheless, they mention other factors that impact on the new firm performance, such as the innate ability of the entrepreneurs, as well as the age effect, since younger entrepreneurs are positively related with the entrepreneurial earnings.

Accordingly, employees who leave their jobs and transform into founders denote an increased performance comparing to other startups (Phillips 2002; Agarwal et al. 2004; Klepper and Sleeper 2005; Franco and Filson 2006). This happens because these new entrepreneurs acquire managerial experience at their previous employers, additional technical and regulatory knowledge and personal networks (Agarwal et al. 2004; Ensley et al. 2002; Chatterji 2009; Dencker et al. 2009), also denoting higher human capital (Klepper 2007).

Moreover, these new founders acquire extra qualifications and social networks and experience valuable an easier access to finance needed to starting up, including banks and venture capitalists, in early stage phases and during growth and maturity

(Zott and Huy 2007; Painter 2010; Jayawarna et al. 2011). Consequently, these quality employees who create their own ventures preserve social ties with their prior employers and coworkers, being possible to extract value from these ties and contribute to the new firm growth (Nyberg and Wright 2015).Entrepreneurs, with experience gained in incumbent firms, have higher capabilities to extract the most of new challenges (Klepper 2002), as they have accumulated work experience and industry background being more capable of detecting business opportunities and achieving the needed resources to grow their companies (Colombo et al. 2004).

Prior experience in the same industry of the new firm is considered to act favorably when starting up (Helfat and Lieberman 2002), as the founders' set of industry knowledge and industry networks provide important management and technical resources to these new firms (Van Gelderen et al. 2006). The same results were found by Baptista et al. (2014) who state that prior experience just before starting up spurs the new venture performance by benefiting from the industry-specific human capital.

Preexisting capabilities acquired in related industries give new firms abilities and skills to deal with the entering in the new industry (Qian et al. 2012) as well as argue that professional background in the field is important for. Moreover, these founders become more able to explore and benefit from the organizational innovation of the company (Huang et al. 2012), impacting on the firms' innovation outcomes (Robson et al. 2012) and more capable of reconfiguring and adapting to the changing environment by reducing adaptability constraints (Carroll and Hannan 2000; Chen et al. 2012).

Previous experience in different activity sectors from the new founded company can also impact positively on the new ventures' success as it can spur innovativeness and explore new routines and processes (Levitt and March 1988; Phillips 2002; Beckman 2006). This is the case of Tesla, a new venture that creates synergies from an electrical engineer, a computer scientist, and an energy engineer. In this line of reasoning, we propose:

Proposition 1 The longer the previous entrepreneurs' working experiences the higher the chances of survival.

The founders' entrepreneurial experience is also important for explaining the new venture's performance, since habitual or repeated entrepreneurs, i.e., founders who have created at least one company in the past, or own more than one firm (portfolio entrepreneur), have a higher entrepreneurial human capital that will have a positive effect on the new firm's success (Ucbasaran et al. 2003; Stam et al. 2008). The same is defended by McGrath and MacMillan (2000) who argue that these founders accumulate management and technical skills, market, and industry/sector knowledge, business networking of major importance for the firm growth (Sullivan and Marvel 2011).

Furthermore, new ventures founded by talented, self-employed, entrepreneurs impact positively on their performance, and specifically on high-tech startups (Tyebjee and Bruno 1984; Evans et al. 1989; Taylor 1999; Hamilton 2000; Politis 2005; Åstebro et al. 2011). The fact that repeat entrepreneurs tend to own additional

financial resources to invest or reinvest and more access to external financial support can impact on the new businesses' growth potential (Colombo and Grilli 2005).

An entrepreneur who has acquired experience by owning another company in the past may present a specific tacit knowledge related with conducting the business (Cooper et al. 1989) or having more managerial experience to organize the new company and drive it to grow and succeed (Shane 2000; Ganotakis 2012). In the same line of reasoning, Landier and Thesmar (2009) state that repeat entrepreneurs, either sequential or portfolio, with prior business experience, are more optimistic than rookie entrepreneurs, although the first ones by making a break between each venture creation can cause a depreciation in their specific human capital which may have a negative effect on the new venture's success (Amaral et al. 2011).

Conversely, in a study applied to a sample of Portuguese firms, Baptista et al. (2012), conclude that founders' prior industry and managerial experience impact favorably on sales performance of the new ventures.

Proposition 2 The previous entrepreneurs' experience as business owners moderated by the effect of this having been in the target industry of the new venture increases the likelihood of firm survival.

The processes of creating and closing firms have important effects both on industry and economy, being those determined by several factors founded on the individual characteristics of the entrepreneur (Hessels et al. 2011).

According to DeTienne and Cardon (2008), the set of decisions made by high-tech firms depend upon several personal traits of the founders, namely, their intentions, motivations, and educational backgrounds. In this sense, creation, exit decisions, and strategies adopted by entrepreneurs are influenced by their cognition and knowledge.

The educational background of the entrepreneur has to do not only with his qualifications but also with the entrepreneurial education he achieved, and if he has a deeper understanding of firm processes, as this will affect the decisions and strategies developed. Halldin (2012) also advocates that employees' characteristics determine firms' survival rates, especially regarding their educational backgrounds.

Based upon Becker's "Human Capital Theory" (Becker 1964), scholars focus on the entrepreneurs' decisions to create a business and to make it grow which depend on their resources, skills, and capacities.

The Penrose an *Theory of the Growth of the Firm* (1959), which settled the basis for the resource-based theory of the firm (Barney 1991), claimed that the human capital of the firm is responsible for firm creation, success, and diversification, either from the firms' founders or the new joiners. Later, the knowledge-based view expands the resource-based view of the firm, which defends knowledge as the most important firm's resource that adds sustainable competitive advantage (Wiklund and Shepherd 2003).

Markman and Baron (2003) suggest that founders' knowledge sets on the new ventures' field is of extreme importance to be more successful. Dimov and Shepherd (2005) points out that having wide knowledge on markets and technology, by means of larger education stocks, has a positive effect on the opportunities' development.

Baptista et al. (2012) analyzed 25,480 Portuguese knowledge-based firms that started their activity after 1991 and outlined an important correlation between highly educated business owners and startups' performance. Later on, Baptista et al. (2014) analyzed the effects of a set of different types of entrepreneurial human capital related with the founders' backgrounds, on startups' early years. Their results show that founders with more stocks of innovative capabilities, marketing, finance, and organizational routines will have an improved learning capability, thus being more prone to achieve success.

The founders' educational background entails the entrepreneurs with increased capacities to assimilate and exploit to its utmost work experiences and industry-specific experiences, achieving higher success (Brüderl et al. 1992). Moreover, Van der Sluis et al. (2005) conclude that formal educational has a positive and significant effect on the entrepreneurial pathway.

In the same vein, Kato et al. (2015) defend that the education of founders is crucial to increase firm innovation, namely, by providing the entrepreneur with skills to be able to exploit it, as their education provides them tools to detect, absorb, and exploit external flows of knowledge (Shane 2000), as well as augmented learning aptitudes and organizational skills (Grant 1996). The authors point to the importance of R&D investment to overcome the lack of resources and business experience which is related with the educational background of the founder. Additionally, more educated founders were found to be more prone to raise external capital and specifically capital targeted at R&D.

De Clercq and Arenius (2006), Coleman (2007), Shrader and Siegel (2007), Kessler and Frank (2009), Serneels (2008), and Ucbasaran et al. (2008) recognize that human capital, in the form of education and organizational experience, impacts on opportunity recognition, firms' financial performance, growth, and innovation.

Ucbasaran et al. (2008) address another important outcome that founders' education can bring, specifically the set of important informal contacts that more educated entrepreneurs acquire while having their academic routes that are able to impact positively on the firm's growth. Furthermore, the authors also conclude that the more educated entrepreneurs are, the higher incomes they will obtain, being these important to support the new venture's initial funding.

Gimmon and Levie (2010) in an analysis of 193 startups created in the scope of the Israeli Technology Incubator Program (1991–2001) suggest a positive relationship between the firm survival and business and managerial and general technology expertise. They also argue that founders' academic status affects positively on external investment inflow and thus survival and performance. Thus, being our theoretical focus the development of some propositions that will guide our empirical investigations, we propose the following:

Proposition 3 The entrepreneurs' college education influences the likelihood of firm survival.

Proposition 4 New ventures' founders' college education has a moderator effect on obtaining higher startup capitalization, thus being more prone to survive.

2.2 *Entrepreneurial Unit Level*

Following the pioneering work of Birch et al. (1995), a gazelle firm is an entrepreneurial unit that achieves a minimum of 20% sales growth each year over an interval, starting from a base-year revenue of at least USD 100,000. For the authors, this kind of firm is neither small nor large. They tend to be evenly balanced, allowing them to produce great innovation and rapid job growth. Delmar et al. (2003) proposed an alternative "gazelle" concept by developing 19 measures associated with growth and sources of variability, covering sales, employment and profitability, or subjective assessments by the owners.

Another important issue in defining gazelles concerns fast growth. Regarding sales, the norm is to consider 20–30% per annum as a threshold. As for time, some studies use a 3-year period as a reference; others consider the importance of a 10-year life span. Furthermore, it is important to consider whether fast growth will be achieved every year or if it can fluctuate and so consider the mean for the period under consideration (Delmar et al. 2003; Garnsey et al. 2006). On average, these firms grow very fast in their first years, followed by decline or by a considerable deceleration of growth rates (Hull and Arnold 2008).

According to Ahmad (2006), the OECD defines gazelles as young (less than 5 years old), high-growth firms, characterized by an average employment growth rate above 20% per year over a 3-year period and with ten or more employees at the start of the period.

Henreckson and Johansson (2010) argue that gazelles are responsible for generating the majority of new jobs, being on average younger and smaller than other firms. The authors also stress that the fact that these firms are young is more determinant than their size for new job creation and rapid growth.

An alternative taxonomy on growth patterns is proposed by Nightingale and Coad (2013), considering muppets (marginal undersized poor performers) and gazelles (high-impact firms). The authors characterize the muppet firms, opposed to gazelles, as firms with marginal ambition or capability to grow and innovate, denoting high exit, being undersized as they don't have the needed scale to perform and compete with incumbents in their sectors and industries.

Littunen and Virtanen (2006) performed an analysis to new Finnish firms between 1990 and 1997, both growers and non-growers, to understand how these firms grow and which are the factors involved in their performance. To do so they focused on survivor firms (86), being half growing ventures and the other half non-growing. Moreover, their intention was to compare the ventures in the growth category with the other surviving ones, in order to detect differences and similarities in the relative growth of small new firms, including but not limiting to gazelles. Their results suggest that factors like experience (age), firm location, training, and motivation are correlated with the growing firms.

Of particular interest is the analysis of the relationship between firm growth, and more specifically, gazelle firms' growth, and their profitability. By using a sample of 964 Danish gazelle firms, Senderovitz et al. (2012) conclude for a positive

relationship, which is stronger for those which operate under a broad market strategy rather than those who undertake a niche strategy.

Parker et al. (2010) stress the importance of understanding the consistency of growth, if sales growth should be organic or achieved by acquiring other businesses. The authors estimate a model of firm growth in which they evaluate a mix of firm growth strategies in medium-sized firms, by using survival and growth to explain firms' performance. One of the firm growth strategies tested is related with innovation and technology, more specifically with the development and introduction of new products and with having a R&D manager responsible for these developments. Results show that for gazelles that have developed new products to introduce into the market after 1996 survived less and denoted lower likelihood of being acquired. This result maybe related with the high risk and volatility associated with new product development. Furthermore, the authors conclude that the high grower firms were mostly non-manufacturers. Several scholars (Dunne et al. 1989; Audretsch and Mahmood 1994; Mata and Portugal 1994; Mitchell 1994; Haverman 1995; Sharma and Kesner 1996) defended that firm size is also fundamental for companies to pursue a growth strategy. They argued that larger firms tend to have higher survival rates than their smaller counterparts, due to the efficient scale needed to operate, increased access to funds, and also a larger capacity to diversify and differentiate the managerial ability.

Colombelli et al. (2014) investigate the effects of gazelle firms that follow exploration or exploitation strategies targeted at knowledge creation, by focusing on 335 active companies listed on the main European financial market, in order to accelerate the pace of innovation and growth. The authors defend that growth in gazelle firms is related with exploration based on familiar technology, being high-growth firms fundamental for technological knowledge generation.

Acs et al. (2008) argue that gazelles tend to increase their productivity very fast after entry due to their reduced and flexible size and specific characteristics. These firms are able to challenge existing one and to foster competition with other established firms. Furthermore, they have lower exit rates. Nevertheless, being a gazelle firm is a temporary condition in the firm's lifecycle, as explained by Hölzl (2009), due to the patterns these firms follow, since some settle down to remain SMEs, while others become large firms, and others fail and exit.

According to Klepper and Simons (2005), gazelles denote a fast growth rate and, in the presence of shakeouts typical of growing industries, instead of closing down tend to activate the mergers and acquisitions option. Gazelles are considered to be innovative in a Schumpeterian way since they create new markets and jobs while destroying others. These firms tend to replace incumbent firms using competitive advantage in the form of organizational and technological innovation.

Hereby we propose:

Proposition 5 The new venture's positioning in a strategy targeted at competitive advantage impacts positively on firm survival, especially for gazelles.

Notwithstanding, authors such as Wieser (2005) or Coad and Rao (2008) argue that innovation plays a key role in these high-flyer firms. Gazelles tend to be more productive in generating innovation and also grow faster than non-innovators.

The relationship between firm lifecycle and innovation intensity is relevant for explaining exit rates (Klepper 1996, 1997; Medrano 2012). At the first stage, the exploration phase, the intensiveness of product innovation is extremely important. At the second, growth stage, the risk of failure is higher, since it is associated with higher market growth rates and lower product innovation. At the third stage, maturity phase, market entry is rarer, market position is stable, and process innovation is of vital importance.

Cefis and Marsili (2011) suggest that in low-tech firms, innovation can be considered an advantage in order to maintain market positioning, regarding the capacity to change and improve production processes. Young firms that are unable to innovate or have low production costs are extremely exposed to newness and more likely to fail. On the contrary, in high-tech firms, innovation only gives access to a fast race with incumbent firms and not the possibility of securing their position or achieving success. For these firms, concentrating on radical innovations, rather than only on incremental innovations, brings a competitive advantage regarding differentiation from competitors.

According with Hsu (2004), Hochberg et al. (2007), and Hallen (2008), each patent application filed by new firms increases the attraction of initial funding from prominent venture capitalists. Moreover, the ownership of a large patent portfolio increases the value of liquidity when exiting via an initial public offering (IPO), especially in the case of the biotechnology industry (Stuart et al. 1999; Baum et al. 2000; Gulati and Higgins 2003). Firms with previous successful IPO experiences are more likely to undergo more successful IPO exits in new ventures than first time entrepreneurs or founders with previous experience of failure.

Ownership of patents and other intellectual property rights (IPRs) give the inventor additional bargaining power when transferring or selling them to third parties, improving the chances of the firm's successful survival (Cohen et al. 2002; Ziedonis 2004). As so, patents are important tools to convey crucial information to external investors regarding the research stream of the startup (Long 2002). This is consistent with the perspective of Hallen (2008), who confirms the importance for growth of the firm having such internal IPRs in contrast with others needing to acquire external knowledge assets.

In the view of Hsu (2007), the entrepreneurial process can also be influenced by the intangible assets owned by the entrepreneur. In this sense, patents enable the entrepreneur to acquire financial resources over the different stages of the firm's lifecycle, including the exit stage.

Srinivasan et al. (2008) argue that the greater the diversification of the firm's portfolio combined with more patents and trademarks, the longer it survives. In this vein, increasing the diversification of new firms' product-market portfolios (either in patents or trademarks) denotes that a firm is undertaking a leveraged innovation strategy, in order to pursue a sustainable survival and development.

Buddelmeyer et al. (2010) state that although firms compete by developing new technologies, innovation can bring serious risks and thus increase the likelihood of non-survival. Recent studies focused on the determinant and positive effect of firms' innovative behavior on survival rates (for instance, the study by Cantner et al. 2011, which analyzed the evolution of the innovative performance of German automobile industry) and the favorable impact of high-quality patents (measured through forward citations and international patents filed) on the survival rate of US Internet-based and software firms between 1998 and 2003 (Wagner and Cockburn 2010).

Medrano (2012) analyzes the importance of innovation and age in firm survival, using information on high-quality patents in laser source technology and patents owned in co-authorship with university inventors. The same author concludes that high-quality patents (measured by the number of forward citations) show a positive and significant relationship with firm survival. Moreover, new firms that start without inherited innovative capabilities are supposed to compensate for this lack of appropriate pre-entry experience with investment in high-quality innovation. The study also finds that co-authorship with university inventors is not crucial for firm survival, since only a small percentage of them are active source producers for firms.

Coleman et al. (2013) focused on data from new firms created in 2004, from KFS, to analyze the predictors of firm survival. Based upon the resource-based view, the authors focus on the impact of tangible and intangible resources on startups' survival, contrasting service, and non-service firms. They outline the importance of education, work and life experience on firm survival, as well as an adequate startup financial capital. Results also stress the importance of IP rights, which reduces the likelihood of non-service firms' exit, specifically via merger and acquisition.

As so, we propose the following:

Proposition 6 The new ventures' IPRs portfolio impacts positively on firm survival.

The existence and amount of initial financial capital is of extreme importance for firms' survival (Cooper et al. 1994; Holtz-Eakin et al. 1994; Headd 2001; Lee and Zhang 2011). The importance of having such capital resides on the possibilities of firms to finance their activities for longer periods as well as to search for adequate additional sources, as it supports the existence of liquidity constraints. Interestingly, Lee and Zhang (2011) analyzed the impact of different types of capital on survival and concluded that having loans is associated with higher survival likelihood. On the other side, equity investments decrease the likelihood of startup longevity.

Additionally, firms' survival has been explained by several scholars by means of accessing additional sources of capital (Brüderl et al. 1992; Liao et al. 2004; Parker and Belghitar 2006). Caves (1998) also stressed the importance of having higher financial capital and expectations and thus survival. Firm's with higher amounts of startup capital have higher expectations and tend to survive longer.

Proposition 7 New ventures' capacities for obtaining higher startup capitalization enable them to survive.

Proposition 8 New ventures' access to higher startup capitalization moderates the effects of firms and owners attributes improving the chances of survival.

The financial crisis of 2007–2009 brought serious problems to the firms' access to finance, in terms of difficulties to obtain loans, the so-called credit crunch (Cowling et al. 2012), considering that 57% of debt funding for US small businesses comes from banks, in accordance with the 2003 Survey of Small Business Finance (SSBF). Here, we will use the crisis effect to control for the impact of new ventures' ease of access to capitalization during crisis times and normal times, on firm survival and growth.

In the line posed by Filippetti and Archibugi (2011), obtaining bank lending is still difficult, especially for smaller firms, fact that restrained the economic recuperation at international level. Having access to financial capital is of major importance for innovative firms, especially small new ventures, as frequently they need external resources to exploit such innovations (Beck and Demirguc-Kunt 2006; Schneider and Veugelers 2010). However, for these type of new ventures, the access to finance is more difficult to achieve, as defended by Schneider and Veugelers (2010), Hutton and Lee (2012), Mason (2013), and Mina et al. (2013).

Ventures with an innovation strategy, by facing higher risks and volatility, see the granting of credit by banks more difficult. Moreover, the IPR portfolio is hard to value and thus to use as an asset for obtaining credit. Albeit the difficulties in granting access to external finance in the context of the economic crisis, there is plenty of room for studies on how the "credit crunch" has a negative effect on innovative ventures' access to finance. For instance, Paunov (2012) argues that during crisis innovation investments were reduced, with the exception of firms with access to important public financial support which continued to invest in their innovation projects during the crisis.

Proposition 9 Financial crisis improves the likelihood of startups' non-survival, being gazelles more prone to avoid exit.

3 Model and Estimation Method

3.1 The Conceptual Model

In order to focus on the microeconomic determinants of gazelles' sustained high growth and survival, this chapter intends to analyze, on one hand, the entrepreneur level through founder/owner attributes, such as work experience, entrepreneurial experience, entrepreneurial experience in target industry, college education, gender, and age, and on the other, the entrepreneurial unit level, namely, limited partnership, SME, competitive advantage, R&D activities, IP, gazelles, and the startup capital, as a moderator. We use controls by adding the variables related to the activity sector, such as service and manufacturing. Illustrating our model is given by the following (Fig. 1):

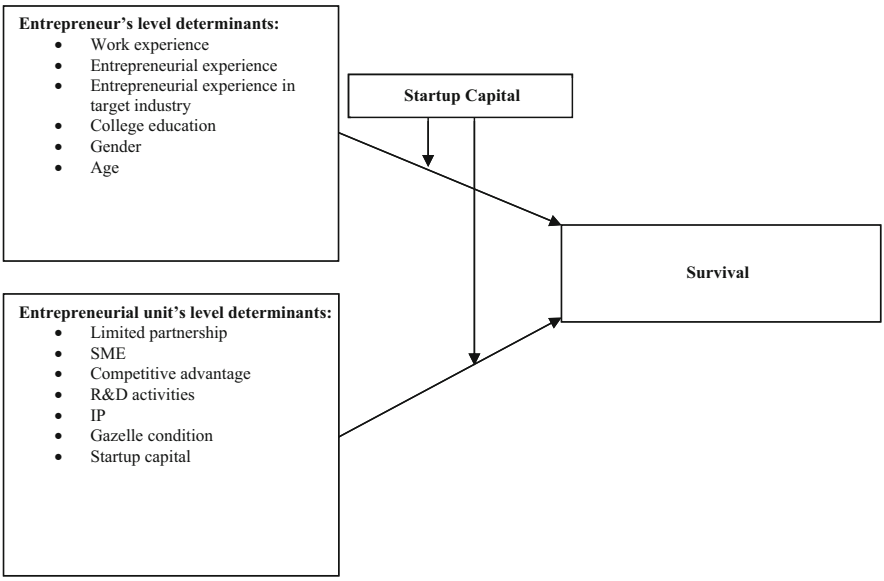

Fig. 1 Conceptual model

3.2 Dataset and Variables

This chapter uses the Kauffman Firm Survey (KFS), which is a panel study of firms founded in 2004 and tracked over their early years of operation. This panel was created from a random sample of the Dun & Bradstreet (D&B) database. The dataset has 34,433 observations of 4919 companies corresponding to 6 years of survey, starting from 2004, year of foundation.

The variables included in the Cox proportional hazard model are described in Table 1 below. We intend to assess the major determinants for US startups' non-survival, based upon entrepreneurs' attributes, namely, their work experience, their entrepreneurial experience, the entrepreneurial experience in the target industry, entrepreneurs' college education, gender, and age. Moreover, we will also evaluate the effects of a set of determinants related with the startup, such as the fact that the company is a limited partnership, a SME, its competitive advantage, the R&D activities, the IPR it possesses, the gazelle condition, and its startup capital. Some of the variables were computed, being the cases for the gazelle status and the startup capital, using other variables such as employment, equity, and debt.

Table 1 Variables description

Variables	Description	Mean	St. dev.
Work experience	If the entrepreneurs have prior work experience (year 0) equals to 1, otherwise is 0	0.9186827	0.2733496
Entrepreneurial experience	If the entrepreneurs have prior entrepreneurial experience (year 0) equals to 1, otherwise is 0	0.4238666	0.49422
Entrepreneurial experience in the target industry	If the entrepreneurs have prior entrepreneurial experience in the target industry (year 0) equals to 1, otherwise is 0	0.1784916	0.3829649
College education	Average college education of entrepreneurs (year 0), having college education equalling to 1 if the highest share is composed of founders with higher education or 0 if otherwise	0.2689571	0.4434627
Gender	Average gender of entrepreneurs (year 0), male equalling to 1 if the highest share is composed of men or female, 0, if otherwise	0.7391746	0.4391295
Age	Age of entrepreneur (year 0) in different intervals: 18–24, 25–34, 35–44, 45–54, 55–64, 65–74, 75, or older	3.525.513	1.133.123
Limited partnership	If the startup is a limited partnership (year 0) equals to 1, otherwise is 0	0.3468185	0.4760058
SME	If the startup is a SME (year 0) equals to 1, otherwise is 0	0.0359829	0.1862665
Competitive advantage	If the startup owns unique assets (year 0), i.e., competitive advantage over competitors in the startup year equals to 1, otherwise is 0	0.6369181	0.4809371
R&D activities	If startup has at least one R&D employee (year 0) equals to 1, otherwise is 0	0.4212238	0.4938055
IP	If startups own IPRs, namely, patents, trademarks and/or copyrights (year 0) equals to 1, otherwise, is 0	0.2024802	0.401889
Gazelle	Computed variable, using firm growth measured through employees' growth of at least 20% per year, being equal to 1 if the startup is a gazelle assuming high growth, or 0 otherwise (year 0)	0.0451311	0.2076128
Startup capital	Amount of equity and debt invested by all owners in the startup year, in 5 intervals, namely, (1) <5000; (2) 5000–10,000; (3) 10,000–25,000; (4) 25,000–100,000; (5) >100,000 (USD)	2.892051	1.627069
Manufacturing	1 if the company is from the manufacturing sector, 0 otherwise (year 0)	0.235617	0.424427
Service	1 if the company is from the service sector, 0 otherwise (year 0)	0.3978451	0.4895029
Survival	1 if the startup survives at the end of the period and 0 if it exited	0.6480992	0.4776118

4 Results and Discussion

4.1 Descriptive Statistics and Correlations

Summarizing the main characteristics of our sample, firstly approximately 92% of the entrepreneurs have prior work experience. Moreover, 42% of the startup owners have been business owners in the past, and 17% also have entrepreneurial experience in the target industry. About 27% of the entrepreneurs have college education, and 74% are male with an average age of 44 years.

About 35% of the startups are limited partnerships, being 36% SMEs. Approximately 64% of the companies state they own unique assets, i.e., competitive advantages over competitors, and 42% have at least one R&D employee dedicated to R&D activities. About 20% of the startups own IPRs.

Only about 5% of the companies are considered high growers, for which we called gazelles, being the others the marginal growers.

Considering the startups' capital, using the amount of equity and debt invested by all owners in the startup year, the majority of firms is located in the second interval under analysis, namely, between 5000 and 10,000 USD. Approximately 40% corresponds to service firms, and 65% of the companies survived at the end of the period considered. Table 2 presented below reports the correlations for the variables understudy.

The founder's work experience is significantly correlated with the male condition, with the firms' IP activity and negatively correlated with the small and medium dimension of the companies. The SME condition of firms is also negatively and significantly correlated with the ownership of IP rights.

4.2 Cox Proportional Hazard Estimations

The results of the Cox proportional hazard estimations are presented below in Table 3, showing the hazard ratios, using an Efron approximation to compute ties. When the hazard ratio is higher than one, there is a less likelihood of survival, while a hazard ratio under one corresponds to a greater likelihood of survival. We have tested seven models, corresponding the first one to the survival analysis of the entrepreneurs' attributes effects on survival, the second adding to the previous the moderating effect of the startup capital, the third one deals with the firms' characteristics and such effects on survival, the fourth adds the moderating effect of startup capitalization, the fifth predicts survival by using all the prior models, the sixth one adds to these the effects of crisis and activity sector to the prediction of survival, and the last one which contrasts results in crisis and out of the crisis.

Next tables summarize the survival results for all models. Model 1 presents significant hazard ratios for the effects of the founders' attributes on firm survival.

Table 2 Variables correlations

	Work exp	Entr exp	Entr exp ind	Coll edu	Gender	Age	Ltd part	Manuf	Serv	SME	Compet advant	R&D	IP	Gazelle	Startup cap	Survival	Crisis
Work experience	1.000																
Entrepreneurial experience	0.4446	1.000															
Entrepreneurial experience in the target industry	0.3006	0.5885	1.000														
College education	0.3505	0.2209	0.1489	1.000													
Gender	0.7116	0.3980	0.2648	0.2726	1.000												
Age	0.3032	0.1973	0.1131	0.1464	0.2575	1.000											
Limited partnership	0.0078	−0.0588	−0.0721	−0.0936	−0.0411	−0.0562	1.000										
Manufacturing	0.0048	0.0095	0.0195	−0.0592	0.0519	0.0197	−0.0664	1.000									
Service	−0.0387	−0.0086	−0.0256	−0.0600	−0.0730	−0.0137	0.0805	−0.4513	1.000								
SME	−0.8385	−0.4235	−0.2376	−0.3366	−0.6636	−0.3148	−0.0240	0.0161	0.0152	1.000							
Competitive advantage	0.5305	0.3083	0.1955	0.2699	0.4181	0.2613	−0.0334	0.0081	−0.0387	−0.5459	1.000						
R&D activities	0.3873	0.2657	0.1776	0.1686	0.3308	0.2284	−0.1552	0.0768	−0.0512	−0.3939	0.3891	1.000					
IP	0.6788	0.3635	0.2177	0.3026	0.5447	−0.1112	−0.0150	0.0103	−0.0292	−0.7112	0.4531	0.3477	1.000				
Gazelle	0.1207	0.1021	0.0856	0.0606	0.1213	−0.0181	−0.0787	0.0700	−0.0468	−0.0747	0.1342	0.1800	0.1918	1.000			
Startup capital	0.3367	0.2727	0.1639	0.1936	0.3052	0.5468	−0.1085	0.0277	−0.0160	−0.3513	0.2783	0.2731	0.0690	−0.0052	1.000		
Survival	0.0959	0.0587	0.0316	0.0279	0.0856	0.1648	−0.0135	0.0115	−0.0012	−0.1062	0.0902	0.0698	−0.0031	−0.0006	0.1211	1.000	
Crisis	−0.1214	−0.0683	−0.0396	−0.0438	−0.0986	−0.2182	0.0000	−0.0000	−0.0000	0.1195	−0.1051	−0.0692	0.0165	0.0171	−0.1578	−0.0645	1.000

Table 3 Survival results for model 1

Variables	Hazard ratio	Coefficient	Z	$P > \|z\|$	[95% confidence interval]	
Work_exp	1.334.401	0.0561741***	6.85	0.000	1.228.721	1.449.169
Ent_exp	0.9395972	0.0407249	−1.44	0.151	0.8630742	1.022.905
Ent_exp_ind	1.055.914	0.0598156	0.96	0.337	0.9449518	1.179.907
College_ed	1.035.141	0.0402974	0.89	0.375	0.9590979	1.117.214
Gender	0.9451158	0.0386243	−1.38	0.167	0.8723661	1.023.932
Age_ent	1.017.745	0.0179737	1.00	0.319	0.9831203	105.359
Observations	34,433					
Failures	6390					
Likelihood ratio	99.62					

***Significant at the 1% level. **Significant at the 5% level. *Significant at the 10% level

Firms with founders' prior work experience denote higher survival hazard ratios compared to others (Table 3).

Model 2 introduces the moderating effect of startup capitalization. Results denote that startups' owners, with prior work experience, have higher survival hazard ratios than other companies. Furthermore, college education of the owners moderated by owning startup capitalization lowers the likelihood of non-survival (Table 4).

Model 3 deals with the effects of the entrepreneurial unit characteristics on the firms' survival and points to the fact that limited partnerships have higher survival hazard ratios than other companies; firms with competitive advantages over competitors also have higher survival hazard ratios than firms with no competitive advantages. In addition, Cox results show that startups with IPR's and gazelles have lower survival hazard ratios, thus tend to live longer (Table 5).

Model 4 adds the moderating effects of startup capitalization to the firms' level attributes understudy. Results denote that small- and medium-sized startups have lower survival hazard ratios than other companies. Adding to this, firms with R&D activities denote higher survival hazard ratios than firms with no declared R&D. Small- and medium-sized startups moderated by the effect of startup capitalization denote a higher survival hazard ratio, being the same effect found for firms with R&D moderated by startup capitalization. On the opposite, gazelle companies moderated by the effect of startup capital denote lower survival hazard ratios (Table 6).

Model 5 aggregates the effects of the previous four models. In accordance with previous models, work experience of the founders lowers survival hazard ratios. Small- and medium-sized startups have higher survival hazard ratios when compared with non-SME. Firms that possess R&D activities have higher survival hazard ratios than others.

SMEs with startup capital and pursuing a competitive advantage strategy have higher survival hazard ratios than other firms. R&D-oriented firms with startup capitalization have lower survival hazard ratios than the opposite firms, so the former survive more (Table 7).

Table 4 Survival results for model 2

Variables	Hazard ratio	Coefficient	Z	$P > \|z\|$	[95% confidence interval]	
Work_exp	1.258.273	0.1194048***	2.42	0.015	1.044.719	1.515.481
Ent_exp	1.047.074	0.1048955	0.46	0.646	0.8604079	1.274.238
Ent_exp_ind	0.8749444	0.1123626	−1.04	0.298	0.6802476	1.125.366
College_ed	0.9010035	0.0819539	−1.15	0.252	0.7538805	1.076.838
Gender	1.015.989	0.096695	0.17	0.868	0.8430963	1.224.336
Age_ent	103.474	0.0415242	0.85	0.395	0.9564718	1.119.412
Work_expXStart_cap	104.588	0.0631978	0.74	0.458	0.9290687	1.177.379
Ent_expXStart_cap	0.9320926	0.056027	−1.17	0.242	0.8285035	1.048.634
Ent_exp_indXStart_cap	1.125.118	0.0819346	1.62	0.105	0.9754633	1.297.733
College_edXStart_cap	109.277	0.0586412**	1.65	0.098	0.9836731	1.213.967
GenderXStart_cap	0.9474196	0.0569459	−0.90	0.369	0.8421312	1.065.872
Age_entXStart_cap	0.9915766	0.0197389	−0.42	0.671	0.953634	1.031.029
Observations	34,433					
Failures	6390					
Likelihood ratio	106.96					

***Significant at the 1% level. **Significant at the 5% level. *Significant at the 10% level

Table 5 Survival results for model 3

Variables	Hazard ratio	Coefficient	Z	$P > \|z\|$	[95% confidence interval]	
Ltd_partnership	1.063.179	0.028133**	2.32	0.021	1.009.444	1.119.773
SME	102.818	0.0659679	0.43	0.665	0.9066848	1.165.957
Comp_adv	1.263.404	0.0455969***	6.48	0.000	1.177.123	1.356.009
R&D	1.028.466	0.0396504	0.73	0.467	0.9536157	1.109.191
IP	114.234	0.0767635**	1.98	0.048	1.001.374	1.303.151
Gazelle	0.7232642	0.0505801***	−4.63	0.000	0.630623	0.8295147
Startup_cap	1.039.193	0.025958	1.54	0.124	0.9895419	1.091.336
Observations	34,433					
Failures	6390					
Likelihood ratio	148.87					

***Significant at the 1% level. **Significant at the 5% level. *Significant at the 10% level

Assessing the results for the sixth model (Table 8), the working experience of founders and firms with R&D activities prove to have higher survival hazard ratios. On the contrary, SMEs denote lower survival hazard ratios. More to this, SMEs and firms with a competitive advantage strategy moderated by the effect of startup capitalization have higher survival hazard ratios. On the other side, firms with R&D activities moderated by the effect of startup capitalization have a lower likelihood of non-survival. Plus we can conclude that startups during the financial crisis period of 2007–2008 have a higher likelihood of non-survival rather than firms in other periods.

Next model contrasts results during crisis and out of crisis period (Table 9).

Our results for non-crisis period denote that founders' work experience affect firms' survival, being likely to be endangered. On the contrary, founders' college education and the small and medium size of the companies under analysis lower firms' survival hazard ratios. Moreover, the moderating effect of startup capitalization over the SME size of the companies as well as the strategy targeted at competitive advantage moderated by startup capital signal a lower likelihood of firm survival.

During a crisis period, the owners' age and the R&D activities in startups point to a higher likelihood of firm exit. Startups with a competitive advantage orientation tend to survive longer. Nevertheless, when analyzing the moderating effect of startup capital over the firms' competitive advantage strategy, the results obtained suggest that these kinds of firms have a higher survival hazard ratio. On the contrary, firms having R&D activities moderated by startup capitalization are more likely to live longer.

Summing up, we conclude that when the main entrepreneur and entrepreneurial level determinants of firm survival where analyzed per se the most important are the founders' college education, IP activity, firms' small and medium size, and the gazelle condition impact on the firms' chances of survival. Taken these all together including the moderating effect of startup capitalization, results point to the fact that owners' work experience and the small- and medium-sized companies as well as the companies' R&D activities moderated by capitalization access higher the chances of

Table 6 Survival results for model 4

Variables	Hazard ratio	Coefficient	Z	$P > \|z\|$	[95% confidence interval]	
Ltd_part	0.9772763	0.0666027	−0.34	0.736	0.8550801	1.116.935
SME	0.6186847	0.0938257***	−3.17	0.002	0.4596017	0.8328315
Comp_adv	0.9957764	0.0827298	−0.05	0.959	0.8461424	1.171.872
R&D	1.200.363	0.1046903**	2.09	0.036	1.011.754	1.424.134
IP	0.9793899	0.1745848	−0.12	0.907	0.690592	138.896
Gazelle	0.9149683	0.1479814	−0.55	0.583	0.6664045	1.256.245
Startup_cap	0.9212122	0.1228763	−0.62	0.538	0.7092866	1.196.458
Ltd_partXStart_cap	1.073.834	0.0566964	1.35	0.177	0.9682672	119.091
SMEXStart_cap	1.450.163	0.1410263***	3.82	0.000	1.198.501	1.754.668
Comp_advXStart_cap	1.175.573	0.0612871***	3.10	0.002	1.061.386	1.302.045
R&DXStart_cap	0.8969082	0.0481516**	−2.03	0.043	0.8073284	0.9964277
IPXStart_cap	1.047.022	0.1388605	0.35	0.729	0.8073575	1.357.831
GazelleXStart_cap	0.8374308	0.0864819**	−1.72	0.086	0.6839823	1.025.305
Observations	34,433					
Failures	6390					
Likelihood ratio	175.78					

***Significant at the 1% level. **Significant at the 5% level. *Significant at the 10% level

Table 7 Survival results for model 5

Variables	Hazard ratio	Coefficient	Z	$P > \|z\|$	[95% confidence interval]	
Work_exp	142.054	0.2060981**	2.42	0.016	106.895	1.887.772
Ent_exp	1.057.841	0.1068545	0.56	0.578	0.8678385	1.289.442
Ent_exp_ind	0.9048195	0.117389	−0.77	0.441	0.7016639	1.166.795
College_ed	0.9007778	0.0830482	−1.13	0.257	0.7518656	1.079.183
Gender	1.010.079	0.096678	0.10	0.917	0.8373056	1.218.503
Age_ent	1.031.458	0.0426858	0.75	0.454	0.9510988	1.118.608
Work_expXStart_cap	0.9153939	0.0834839	−0.97	0.332	0.7655586	1.094.555
Ent_expXStart_cap	0.9142322	0.0556256	−1.47	0.141	0.8114578	1.030.023
Ent_exp_indXStart_cap	1.107.177	0.0817026	1.38	0.168	0.9580845	1.279.471
College_edXStart_cap	1.085.069	0.0592314	1.50	0.135	0.9749719	1.207.598
GenderXStart_cap	0.9545271	0.0575232	−0.77	0.440	0.8481874	1.074.199
Age_entXStart_cap	0.9949115	0.0203618	−0.25	0.803	0.955793	1.035.631
Ltd_part	0.9584215	0.0662372	−0.61	0.539	0.8370077	1.097.447
SME	0.7171639	0.1124575**	−2.12	0.034	0.5274031	0.9752011
Comp_adv	0.9927592	0.0830618	−0.09	0.931	0.8426086	1.169.666
R&D	1.181.301	0.1044912**	1.88	0.060	0.9932713	1.404.924
IP	0.8100521	0.1532041	−1.11	0.265	0.5591474	1.173.545
Gazelle	0.9004274	0.146239	−0.65	0.518	0.6549444	1.237.921
Startup_cap	0.9529709	0.1455752	−0.32	0.753	0.7064	1.285.608
Ltd_partXStart_cap	10.922	0.0586358	1.64	0.100	0.9831152	1.213.388
SMEXStart_cap	1.354.952	0.1350341***	3.05	0.002	1.114.534	164.723
Comp_advXStart_cap	1.175.444	0.0618368***	3.07	0.002	1.060.284	130.311
R&DXStart_cap	0.9080931	0.0496459**	−1.76	0.078	0.8158207	1.010.802
IPXStart_cap	1.125.093	0.1540048	0.86	0.389	0.8603489	1.471.305
GazelleXStart_cap	0.848008	0.0879645	−1.59	0.112	0.6919969	1.039.192

Observations	34,433
Failures	6390
Likelihood ratio	200.25

***Significant at the 1% level. **Significant at the 5% level. *Significant at the 10% level

Table 8 Survival results for model 6

Variables	Hazard ratio	Coefficient	Z	$P > \|z\|$	[95% confidence interval]	
Work_exp	1.410.233	0.2039607**	2.38	0.017	1.062.142	1.872.403
Ent_exp	1.047.668	0.105702	0.46	0.644	0.8596933	1.276.743
Ent_exp_ind	0.9136154	0.118072	−0.70	0.485	0.7091817	1.176.981
College_ed	0.9179825	0.0844183	−0.93	0.352	0.7665797	1.099.288
Gender	1.012.184	0.0962384	0.13	0.899	0.8400931	1.219.528
Age_ent	1.040.107	0.0431708	0.95	0.343	0.9588436	1.128.257
Work_expXStart_cap	0.9142914	0.0832631	−0.98	0.325	0.7648338	1.092.955
Ent_expXStart_cap	0.9258164	0.0562141	−1.27	0.204	0.8219422	1.042.818
Ent_exp_indXStart_cap	1.096.944	0.0805224	1.26	0.207	0.9499502	1.266.682
College_edXStart_cap	1.071.418	0.0582011	1.27	0.204	0.9632081	1.191.784
GenderXStart_cap	0.9548257	0.0570335	−0.77	0.439	0.8493375	1.073.416
Age_entXStart_cap	0.9902188	0.0203583	−0.48	0.633	0.9511105	1.030.935
Ltd_part	0.9650534	0.0666053	−0.52	0.606	0.8429539	1.104.839
SME	0.7348273	0.1142549**	−1.98	0.048	0.5417962	0.9966316
Comp_adv	0.958442	0.0800876	−0.51	0.611	0.813653	1.128.996
R&D	1.173.181	0.1034447**	1.81	0.070	0.9869856	1.394.503
IP	0.8177339	0.1546034	−1.06	0.287	0.5645223	1.184.521
Gazelle	0.929756	0.149856	−0.45	0.651	0.6779134	1.275.157
Startup_cap	0.9451856	0.1438698	−0.37	0.711	0.7013793	1.273.741
Ltd_partXStart_cap	108.347	0.0580478	1.50	0.135	0.9754679	120.343
SMEXStart_cap	1.361.394	0.1348961***	3.11	0.002	1.121.092	1.653.205
Comp_advXStart_cap	1.183.117	0.0621624***	3.20	0.001	1.067.344	1.311.447
R&DXStart_cap	0.9025934	0.0491263**	−1.88	0.060	0.8112655	1.004.202
IPXStart_cap	1.131.266	0.155218	0.90	0.369	0.8645174	1.480.321
GazelleXStart_cap	0.8471458	0.087086	−1.61	0.107	0.6925565	1.036.242
Manufact	0.9513591	0.0321146	−1.48	0.140	0.8904527	1.016.432

Service	0.9903779	0.02842	−0.34	0.736	0.9362132	1.047.676
Crisis	3.686.337	0.1456497***	33.02	0.000	3.411.642	398.315
Observations	34,433					
Failures	6390					
Likelihood ratio	1421.26					

***Significant at the 1% level. **Significant at the 5% level. *Significant at the 10% level

Table 9 Survival results for model 7[a]

Variables	Hazard ratio	Coefficient	z	$P > \|z\|$		[95% confidence interval]
	Crisis = 0 Observations—24,595 Failures—4174 Likelihood ratio—109.84					
Work_exp	1.609.575	0.2966682**	2.58	0.010	112.156	2.309.937
Ent_exp	10.306	0.1308606	0.24	0.812	0.803542	1.321.817
Ent_exp_ind	0.9999929	0.1626369	−0.00	1.000	0.7270415	1.375.418
College_ed	0.8212587	0.0966305**	−1.67	0.094	0.6521184	1.034.269
Gender	0.9900191	0.1200919	−0.08	0.934	0.7805318	1.255.731
Age_ent	1.002.653	0.0564826	0.05	0.962	0.8978416	11.197
Work_expXStart_cap	0.8918497	0.1026468	−0.99	0.320	0.7117431	1.117.532
Ent_expXStart_cap	0.9441978	0.0723489	−0.75	0.454	0.8125309	1.097.201
Ent_exp_indXStart_cap	1.043.445	0.0974492	0.46	0.649	0.8689093	125.304
College_edXStart_cap	1.113.784	0.0777604	1.54	0.123	0.9713441	1.277.112
GenderXStart_cap	0.9423083	0.0724279	−0.77	0.439	0.8105276	1.095.515
Age_entXStart_cap	0.9874589	0.0277686	−0.45	0.654	0.9345061	1.043.412
Comp_adv	0.967531	0.0845502	−0.38	0.706	0.8152306	1.148.284
R&D	0.7157789	0.1399967**	−1.71	0.087	0.4878602	1.050.177
IP	1.034.007	0.1091755	0.32	0.751	0.8407161	1.271.737
Gazelle	1.081.508	0.1217931	0.70	0.487	0.8673063	1.348.612
Startup_cap	0.675866	0.1650222	−1.60	0.109	0.4188203	109.067
Comp_adv	0.8644587	0.1725809	−0.73	0.466	0.5845344	1.278.434
R&D	0.8822546	0.1772722	−0.62	0.533	0.5950606	1.308.057
Ltd_partXStart_cap	1.061.693	0.0729709	0.87	0.384	0.9278871	1.214.794
SMEXStart_cap	1.363.637	0.1687911**	2.51	0.012	1.069.884	1.738.043
Comp_advXStart_cap	1.141.758	0.0761527**	1.99	0.047	1.001.846	130.121

R&DXStart_cap	0.9505724	0.0662921	−0.73	0.467	0.829131	1.089.801
IPXStart_cap	1.247.789	0.2263241	1.22	0.222	0.8744801	178.046
GazelleXStart_cap	0.9203254	0.1159633	−0.66	0.510	0.7189321	1.178.135
Manufact	0.970131	0.0403532	−0.73	0.466	0.8941784	1.052.535
Service	0.9884853	0.0351718	−0.33	0.745	0.9218986	1.059.881
	Crisis = 1 Observations—9838 Failures—2216 Likelihood ratio—59.98					
Work_exp	1.067.587	0.2476134	0.28	0.778	0.6776072	1.682.011
Ent_exp	1.074.611	0.1791231	0.43	0.666	0.7751171	1.489.824
Ent_exp_ind	0.79491	0.1699287	−1.07	0.283	0.5228243	1.208.593
College_ed	1.119.116	0.1649633	0.76	0.445	0.838308	1.493.986
Gender	1.070.209	0.1646948	0.44	0.659	0.7915475	1.446.973
Age_ent	1.115.343	0.0690082**	1.76	0.078	0.987969	125.914
Work_expXStart_cap	0.971582	0.1446003	−0.19	0.846	0.7257639	130.066
Ent_expXStart_cap	0.8955075	0.0896769	−1.10	0.270	0.7359175	1.089.706
Ent_exp_indXStart_cap	11.893	0.142003	1.45	0.147	0.9411468	1.502.883
College_edXStart_cap	1.003.521	0.0867754	0.04	0.968	0.8470758	118.886
GenderXStart_cap	0.9617458	0.0920217	−0.41	0.684	0.7972888	1.160.125
Age_entXStart_cap	0.9839147	0.0300691	−0.53	0.596	0.9267106	104.465
Comp_adv	0.9742799	0.1103704	−0.23	0.818	0.7802903	1.216.498
R&D	0.8739908	0.2227218	−0.53	0.597	0.5303866	1.440.195
IP	0.7945574	0.1088739**	−1.68	0.093	0.6074209	1.039.348
Gazelle	1.285.901	0.1835008**	1.76	0.078	0.972163	1.700.888
Startup_cap	1.115.599	0.3307331	0.37	0.712	0.6239634	1.994.607
Comp_adv	1.037.505	0.2874077	0.13	0.894	0.6028259	1.785.618
R&D	1.011.939	0.2339915	0.05	0.959	0.6431763	1.592.129

(continued)

Table 9 (continued)

Variables	Hazard ratio	Coefficient	z	$P > \|z\|$		[95% confidence interval]
Ltd_partXStart_cap	1.108.783	0.0953642	1.20	0.230	0.9367771	1.312.371
SMEXStart_cap	1.246.916	0.2059097	1.34	0.181	0.9021399	1.723.457
Comp_advXStart_cap	1.257.638	0.1078126***	2.67	0.007	1.063.128	1.487.736
R&DXStart_cap	0.8334613	0.0733577**	−2.07	0.038	0.7014009	0.9903862
IPXStart_cap	0.9980636	0.207087	−0.01	0.993	0.6645742	1.498.901
GazelleXStart_cap	0.7604083	0.1381364	−1.51	0.132	0.5326192	1.085.617
Manufact	0.918284	0.053065	−1.48	0.140	0.8199523	1.028.408
Service	0.994379	0.048316	−0.12	0.908	0.9040506	1.093.732
Observations Failures Likelihood ratio		34,433 6390 109.84				

***Significant at the 1% level. **Significant at the 5% level. *Significant at the 10% level

[a]Only significant values are presented

firm survival. Crisis increases firms' exit, nonetheless startups pursuing a competitive advantage strategy and the moderating effect of startup capital on their internal R&D activities increase the chances of survival.

5 Discussion

Our results reveal that the founders' college education, IP activity, firms' small and medium size, and the gazelle condition affect the likelihood of survival. Taken these all together including the moderating effect of startup capitalization, results show that owners' work experience and the small- and medium-sized companies, as well as the companies' R&D activities moderated by capitalization access, increase the chances of firm longevity. Crisis also increase firms' exit; however startups pursuing a competitive advantage strategy and the moderating effect of startup capital on their internal R&D activities increase the chances of survival.

In this section we will contrast our findings with our propositions. Proposition 1 declared that the longer the previous entrepreneurs' work experience, the higher the chances of survival. We find partial support for this proposition, as our results for model 5 suggest that founders with prior work experience are more prone to lower survival hazard ratios. Our results are in line with findings of previous authors who defended that the founders' prior experiences play in favor of the new venture's success (Wagner 2003; Schutjens and Stam 2006; Stam et al. 2008; Amaral et al. 2011; Braguinsky et al. 2012), due to a prior acquisition of technical and regulatory knowledge or personal networks (Klepper 2002; Agarwal et al. 2004; Colombo et al. 2004; Ensley et al. 2002; Chatterji 2009; Dencker et al. 2009).

The second proposition stated that the previous entrepreneurs' experience as business owners moderated by the effect of this having been in the target industry of the new venture increases the likelihood of firm survival. Here, our results do not confirm such statement, as we found no evidence of such relationship.

The third proposition argues that the entrepreneurs' college education influences the likelihood of firm survival. The results obtained from the first model estimation suggest that firms with college educated owners have lower survival hazard ratios, thus exit less. This is in line with Baptista et al. (2012, 2014) who pointed to an important correlation between highly educated business owners and startups' performance. Our findings are also in accordance with De Clercq and Arenius (2006), Coleman (2007), Shrader and Siegel (2007), Kessler and Frank (2009), Serneels (2008), and Ucbasaran et al. (2008), who argue that education and organizational experience affect firms' financial performance, growth, and innovation.

The fourth proposition states that new ventures' founders' college education has a moderator effect on obtaining higher startup capitalization, thus being more prone to survive. Our results do not allow ratifying or rejecting such proposition.

Proposition 5 stated that the new venture's positioning in a strategy targeted at competitive advantage impacts positively on firm survival, especially for gazelles. We observed that for models 3 and 4, startups with competitive advantages over

competitors have higher survival hazard ratios than firms with no competitive advantages, thus being more likely non-survival. Our findings contrast with previous studies of Senderovitz et al. (2012) who argue there is a positive relationship between firm survival and growth, and the strategy they follow targeted a broad market strategy. In a related vein, Parker et al. (2010) stress the importance of undertaking growth strategies focused on innovation in medium-sized firms, explaining survival. Conversely, Colombelli et al. (2014) found that gazelles survive and grow more when they have a competitive advantage based on familiar technology and technological knowledge generation. An additional concern here is related to the lack of data for testing the role played by business models that help to intermediate the home-based development of a technology and its successful commercial exploitation (Teece 2010b).

Our sixth proposition defends that the new ventures' IPRs portfolio impacts positively on firm survival. Results for model 3 suggest that startups with an IP portfolio have lower survival hazard ratios than startups with no IP. We partially support previous studies (Cohen et al. 2002; Ziedonis 2004; Hallen 2008; Srinivasan et al. 2008; Wagner and Cockburn 2010: Cantner et al. 2011; Medrano 2012; Coleman et al. 2013) stating that owning patents and other intellectual property rights (IPR) increase the chances of successful survival. Adding to this, Hsu (2007) defended that patents enable the founder to accomplish fundraising along the different stages of the firm's lifecycle.

Proposition 7 states that the new ventures' capacities for obtaining higher startup capitalization enable them to survive. The results we obtained do not confirm such direct relation, however related with this last proposition, Proposition 8 argues that the new ventures' access to higher startup capitalization moderates the effects of firms and owners attributes improving the chances of survival. Our results support the proposition, as the founders' college education moderated by the effect of startup capitalization lower the survival hazard ratios when compared to others. The same trend is detected with the moderating effect of startup capital on firms having R&D activities, and such effects on gazelles increase the chances of survival. Our findings see support in the literature which correlates the existence and amount of initial financial capital and firms' survival (Cooper et al. 1989; Holtz-Eakin et al. 1994; Caves 1998; Headd 2001; Lee and Zhang 2011). Nevertheless, Lee and Zhang (2011) also point that the existence of startup capital in the form of equity investments decreases the likelihood of startup longevity.

The last proposition argues that the financial crisis improves the likelihood of startups' non-survival, being gazelles more prone to avoid exit. Our results do not confirm such proposition, as during crisis, gazelle startups are not more likely to survive. Our findings also point to a relation between startups pursuing a competitive advantage orientation, firms' R&D activities moderated by the effect of startup capitalization, and the higher likelihood of survival.

Of particular interest, we detected that during crisis the moderating effect of startup capital over the startups' R&D activities affects the likelihood of a higher survival hazard ratio, probably due to the scarcity of financial support available in such periods. These results are aligned with the studies of Schneider and Veugelers

(2010), Filippetti and Archibugi (2011), Hutton and Lee (2012), Mason (2013), and Mina et al. (2013), who argue that during crisis ensuring access to external finance sources is more difficult, especially for smaller firms, fact that has consequences on the firm survival. Paunov (2012) also defended that during crisis, obtaining financial support for pursuing the innovative projects is harder, with the exception of firms with access to public sources of external finance.

5.1 Implications for Policymakers and Entrepreneurs

Fast growth firms are a key player in modern knowledge economies, marked by high turbulence and technological change, and are also important "new job promoters". Understanding what drives the sustainable growth of such firms and predicting the determinants that can most affect their performance and survival, in order to prevent exit over many years, is therefore critical for ensuring a sustainable economic growth. As so, both policymakers and entrepreneurs must be aware of such influencers on survival and be able to react and catalyze them.

To prevent the decision to exit, stakeholders such as the policymakers and entrepreneurs should focus on the hazard determinants and design, in a truly cooperative basis, private and public incentives, and funding programs for strengthening prior entrepreneurial experience, work experience, and higher startup capitalization. Moreover, being more supportive of shared IP portfolios (e.g., using international patent box schemes) and R&D reinvestment programs (by launching tax incentives for promoting a new type of R&D bootstrapping, through the strategic allocation of a percentage of the profits to additional investments in both internal and external R&D) can influence the performance of startups, and specifically gazelles, in order to reinforce their dynamic capabilities and to survive longer. During crisis, these stakeholders must be aware that fast growers are more resilient. On the other hand, the development of formal programs for improving managerial, IP, and financial literacy competences could enhance the strategic factors that revealed low survival hazard rates, such as the firm's innovation portfolio, the experience of the owners regarding the industry/sector characteristics, the managerial, entrepreneurial, and financial capacities.

Moreover, innovation at the industrial policy level is required, in order to relaunch intangible investment programs dedicated to the screening of high-growth entrepreneurship, using early warning indicators that could help in preventing financial stress and in restructuring the business, by providing organizational endurance oriented to firm survival and performance. The support for global entrepreneurs to lead ventures funded on co-branded joint-ventures, mergers, and acquisitions or consortia of high-growth firms is also welcome, since this could be a new pathway for creating scale and establishing new global trademarks. In this scope the exploration of coopetition strategies applied to gazelle startups is considered as a high potential framework for leveraging endogenous economic growth based on innovative and entrepreneurial units, which need to foster the scale and the intensity of

intangible assets, in order to be able to survive, facing highly turbulent and competitive platforms.

5.2 Limitations and Future Research

The present study's results should be analyzed bearing its limitations in mind. From one side, the aim is to tackle firms' business exit (or to assure the firms' survival), especially that of gazelle startups, so far, an under explored topic, using a dataset with restrictions at the data availability level. The results drawn are based on a dataset with a low percentage of gazelles in the whole sample. This can be a limitation, so future research should focus on wider samples with a longitudinal basis, which can be used for forecasting and contrasting purposes.

Future research would benefit from analyzing other determinant factors concerning technological structure or entrepreneurial innovation capacity of high-growth firms engaged both in manufacturing and service activities. This probably will play an important role when interpreting the importance of the diversity of technological capabilities for the survival, success, and exit patterns of high-technology versus low-technology fast-growing new firms.

Another important issue when focusing on the dynamic capabilities, which are able to impact other capabilities, namely, the entrepreneurial innovation capacity, it would be useful to examine the implications of having outsourced capabilities (e.g., coopetition schemes, alliance capabilities, IP transactions, scope of IP, diversity of IP portfolios, etc.) for building these firms' knowledge base (and hence absorptive capacity).

Our results are also derived from the KFS survey composed of startups in different activity sectors. It would be of interest to compare patterns among different sectors, regarding collaborative and coopetitive industry intensiveness, e.g., alliance capabilities, and entrepreneurial innovation capacity.

Future research could focus on analyzing other datasets to promote further understanding of the determinants of survival. Other characteristics and determinant factors should be analyzed, gathering data from alternative primary sources, regarding corporate R&D strategy and the entrepreneur's innovation behavior. On one hand, this includes cooperation with the external environment, patenting patterns, and coopetition strategies, such as coinventorship and co-branding with diversified stakeholders and international patenting patterns. On the other hand, the genetic, psychological, and behavioral characteristics of the entrepreneur which may influence the leadership process of technological and corporate change within the context of a resilient firm type, such as gazelle startups, deserve further research. Of particular interest is to unveil the role of founders' teammates, their shared experiences, and skills on the future startup performance and survival.

6 Conclusions

This chapter tackles firms' business survival, especially that of gazelle startups. Using a Cox regression model, we assess the determinant factors of firm survival among a sample of 4919 firms created in 2004–2010, according to data collected from the Kaufman Foundation Survey.

The results obtained allow us to conclude that the founders' college education, IP activity, firms' small and medium size, and the gazelle condition affect the likelihood of survival. When assessing such conditions including the moderating effect of startup capitalization, findings point out that owners' work experience and the small- and medium-sized companies, as well as the companies' R&D activities moderated by capitalization access, increase the chances of firm longevity. Crisis also impacts on the firms' non-survival, nevertheless startups having a competitive advantage strategy and the moderating effect of startup capital on their internal R&D activities increase their chances of living longer.

Our empirical findings reveal that, consistent with prior research, gazelles tend to survive longer than non-gazelles, possibly due to their dynamic capabilities and resilience capacity for anticipating and addressing the changes in technology and market.

The findings help to clarify the role of a set of entrepreneur-level determinants, from one side, and, from the other, a mix of the entrepreneurial unit-level factors of firm survival when dealing with startups and high-growth firms. Lastly, the results can allow for diverse interpretations and guide policymakers and why not, global entrepreneurs when focusing on the corporate R&D strategy and on the entrepreneurial innovation capacity and strategy of the firm in determining the potential benefits and survival hazard risks associated with behaviors oriented to global ventures and coopetition.

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References

Acs, Z., & Mueller, P. (2008). Employment effects of business dynamics: Mice, gazelles and elephants. *Small Business Economics, 30*, 85–100.

Acs, Z., Parsons, W., & Tracy, S. (2008). *High impact firms: Gazelles revisited*. Office of Advocacy. US. Small Business Administration.

Agarwal, R., Echambadi, R., Franco, A., & Sarkar, M. (2004). Knowledge transfer through inheritance: Spinout generation, development, and survival. *Academy of Management Journal, 47*, 501–522.

Ahmad, N. (2006). *A proposed framework for business demographic statistics*. OECD Statistics Working Paper Series, STD/DOC 3. Paris.

Amaral, A., Baptista, R., & Lima, F. (2011). Serial entrepreneurship: Impact of human capital on time to re-entry. *Small Business Economics, 37*(1), 1–21.
Åstebro, T., Chen, J., & Thompson, P. (2011). Stars and misfits: Self-employment and labor market frictions. *Management Science, 57*(11), 1999–2017.
Audretsch, D., & Lehmann, E. (2005). The effects of experience, ownership, and knowledge on IPO survival: Empirical evidence from Germany. *Review of Accounting and Finance, 4*, 13–33.
Audretsch, D., & Mahmood, T. (1994). The rate of hazard confronting new firms and plants in US manufacturing. *Review of Industrial Organization, 9*, 41–56.
Bangma, K., & Snel, D. (2009). *Bedrijvendynamiek en werkgelegeneheid, periode 1987–2008*. Zoetermeer: EI.
Baptista, R., & Karaöz, M. (2011). Turbulence in growing and declining industries. *Small Business Economics, 36*, 249–270.
Baptista, R., Lima, F., & Mendonça, J. (2012, February 23). *Human capital and the performance of firms over time*. https://doi.org/10.2139/ssrn.2009673. Retrieved from http://ssrn.com/abstract=2009673
Baptista, R., Karaöz, M., & Mendonça, J. (2014). The impact of human capital on the early success of necessity vs. opportunity-based entrepreneurs. *Small Business Economics, 42*(4), 831–847.
Barney, J. (1991). Firm resources and sustained competitive advantage. *Journal of Management, 17*, 99–120.
Baum, J., Calabrese, T., & Silverman, B. (2000). Don't go it alone: Alliance network composition and startups' performance in Canadian biotechnology. *Strategic Management Journal, 21*, 267–294.
Beck, T., & Demirguc-Kunt, A. (2006). Small and medium-size enterprises: Access to finance as a growth constraint. *Journal of Banking and Finance, 30*, 2931–2943.
Becker, G. (1964). *Human capital: A theoretical and empirical analysis, with special reference to education*. Chicago: Chicago University Press.
Beckman, C. (2006). The influence of founding team company affiliations on firm behavior. *Academy of Management Journal, 49*(4), 741–758.
Birch, D., Haggerty, A., & Parsons, W. (1995). *Who's creating jobs?* Boston: Cognetics.
Bjuggren, C., Daunfeldt, S.-O., & Johansson, D. (2013). High-growth firms and family ownership. *Journal of Small Business and Entrepreneurship, 26*(4), 365–385.
Bottazzi, G., & Secchi, A. (2006). Explaining the distribution of firms growth rates. *RAND Journal of Economics, 37*, 234–263.
Braguinsky, S., Klepper, S., & Ohyama, A. (2012). High-tech entrepreneurship. *Journal of Law and Economics, 55*(4), 869–900.
Bravo-Biosca, A. (2010). *Growth dynamics: Exploring business growth and contraction in Europe and the US*. Research Report. London: NESTA.
Brüderl, J., Preisendörfer, P., & Ziegler, R. (1992). Survival chances of newly founded business organizations. *American Sociological Review, 57*(2), 227–242.
Buddelmeyer, H., Jensen, P., & Webster, E. (2010). Innovation and the determinants of company survival. *Oxford Economic Papers, 62*(2), 261–285.
Cantner, U., Krueger, J., & von Rhein, K. (2011). Knowledge compensation in the German automobile industry. *Applied Economics, 43*, 2941–2951.
Carroll, G., & Hannan, M. (2000). *Demography of corporations and industries*. Princeton, NJ: Princeton University Press.
Caves, R. (1998). Industrial organization and new findings on the turnover and mobility of firms. *Journal of Economic Literature, 36*(4), 1947–1982.
Cefis, E., & Marsili, O. (2007). *Going, going, gone. Innovation and exit in manufacturing firms*. ERIM Report Series. Reference No. ERS-2007-015-ORG.
Cefis, E., & Marsili, O. (2011). Born to flip. Exit decisions of entrepreneurial firms in high-tech and low-tech industries. *Journal of Evolutionary Economics, 21*, 473–498.
Chatterji, A. (2009). Spawned with a silver spoon? Entrepreneurial performance and innovation in the medical device industry. *Strategic Management Journal, 30*(2), 185–206.

Chen, P.-L., Williams, C., & Agarwal, R. (2012). Growing pains: Pre-entry experience and the challenge of transition to incumbency. *Strategic Management Journal, 33*, 252–276.
Coad, A. (2007). A closer look at serial growth rate correlation. *Review of Industrial Organization, 31*(1), 69–82.
Coad, A., & Hölzl, W. (2011). Firms' growth: Empirical analysis. In M. Dietrich & J. Krafft (Eds.), *Handbook on the economics and theory of the firm*. Cheltenham: Edward Elgar.
Coad, A., & Rao, R. (2008). Innovation and firm growth in high-tech sectors: A quantile regression approach. *Research Policy, 37*(4), 633–648.
Coad, A., & Timmermans, B. (2014). Two's company: Composition, structure and performance of entrepreneurial Pairs. *European Management Review, 11*(2), 117–138.
Colombelli, A., Krafft, J., & Quatraro, F. (2014). High-growth firms and technological knowledge: Do gazelles follow exploration or exploitation strategies?. *Industrial and Corporate Change, 23*(1), 261–291.
Cooper, A. C., Woo, C. Y., & Dunkelberg, W. C. (1989). Entrepreneurship and the initial size of firms. *Journal of Business Venturing, 4*(5), 317–332.
Coad, A., Frankish, J. S., Nightingale, P., & Roberts, R. G. (2014). Business experience and start-up size: Buying more lottery tickets next time around? *Small Business Economics, 43*(3), 529–547.
Cohen, W., Goto, A., Nagata, A., Nelson, R., & Walsh, J. (2002). R&D spillovers, patents and the incentives to innovate in Japan and the United States. *Research Policy, 31*(8–9), 1349–1367.
Coleman, S. (2007). The role of human and financial capital in the profitability and growth of women-owned small firms. *Journal of Small Business Management, 45*(3), 303–319.
Coleman, S., Cotei, C., & Farhat, J. (2013). A resource-based view of new firm survival: New perspectives on the role of industry and exit route. *Journal of Developmental Entrepreneurship, 18*(01), 1350002. https://doi.org/10.1142/S1084946713500027. 25 p.
Colombo, M., & Grilli, L. (2005). Founders' human capital and the growth of new technology-based firms: A competence-based view. *Research Policy, 34*(6), 795–816.
Colombo, M., Delmastro, M., & Grilli, L. (2004). Entrepreneurs' human capital and the startup size of new technology-based firms. *International Journal of Industrial Organization, 22*, 1183–1211.
Cooper, A., Gimeno-Gascon, F., & Woo, C. (1994). Initial human and financial capital as predictors of new firm venture performance. *Journal of Business Venturing, 9*, 371–395.
Cowling, M., Liu, W., & Ledger, A. (2012). Small business financing in the UK before and during the current financial crisis. *International Small Business Journal, 30*(7), 778–800.
Davidsson, P., & Delmar, F. (2003). Hunting for new employment: The role of high growth firms. In D. A. Kirby & A. Watson (Eds.), *Small firms and economic development in developed and transition economies: A reader* (pp. 7–19). Hampshire: Ashgate Publishing.
Davidsson, P., Delmar, F., & Wiklund, J. (2006). Entrepreneurship as growth; growth as entrepreneurship. In *Entrepreneurship and the growth of firms* (pp. 21–38). Cheltenhem: Edward Elgar.
De Clercq, D., & Arenius, P. (2006). The role of knowledge in business start-up activity. *International Small Business Journal, 24*(4), 339–358.
De Winne, S., & Sels, L. (2010). Interrelation-ships between human capital, HRM and innovation in Belgian start-ups aiming at an innovation strategy. *International Journal of Human Resource Management, 21*, 1863–1883.
Delmar, F. (1997). Measuring growth: Methodological considerations and empirical results. In R. Donkels & A. Miettinen (Eds.), *Entrepreneurship and SME research: On its way to the next millennium* (pp. 199–215). Aldershot: Ashgate Publishing.
Delmar, F., & Davidsson, P. (1998). A taxonomy of high-growth firms. In P. D. Reynolds & W. D. Bygrave (Eds.), *Frontiers of entrepreneurship research* (pp. 399–413). Wellesley, MA: Babson College.
Delmar, F., Davidsson, P., & Gartner, W. (2003). Arriving at the high growth firm. *Journal of Business Venturing, 18*, 189–216.

Dencker, J., Gruber, M., & Shah, S. (2009). Pre-entry knowledge, learning, and the survival of new firms. *Organization Science, 20*(3), 516–537.

DeTienne, D., & Cardon, M. (2008). *The impact of new venture design on entrepreneurial exit*. Babson College, Babson College Entrepreneurship Research Conference (BCERC).

Dimov, D. P., & Shepherd, D. A. (2005). Human capital theory and venture capital firms: Exploring "home runs" and "strike outs". *Journal of Business Venturing, 20*(1), 1–21.

Dunne, T., Roberts, M., & Samuelson, L. (1989). The growth and failure of U.S. manufacturing plants. *Quarterly Journal of Economics, 104*, 671–698.

Ensley, M., Pearson, A., & Amason, A. (2002). Understanding the dynamics of new venture top management teams: Cohesion, conflict, and new venture performance. *Journal of Business Venturing, 17*, 365–386.

Evans, D., David, S., & Leighton, L. (1989). Some empirical aspects of entrepreneurship. *American Economic Review, 79*(3), 519–535.

Filippetti, A., & Archibugi, D. (2011). Innovation in times of crisis: National systems of innovation, structure and demand. *Research Policy, 40*, 179–192.

Franco, A., & Filson, D. (2006). Spin-outs: Knowledge diffusion through employee mobility. *RAND Journal of Economics, 37*(4), 841–860.

Ganotakis, P. (2012). Founders' human capital and the performance of UK new technology based firms. *Small Business Economics, 39*, 495–515.

Gans, J., & Stern, S. (2003). The product market and the market for "ideas": Commercialization strategies for technology entrepreneurs. *Research Policy, 32*, 333–350.

Garnsey, E., Stam, E., & Heffernan, P. (2006). New firm growth: Exploring processes and paths. *Industry and Innovation, 13*, 1–20.

Gartner, W. B. (1985). A conceptual framework for describing the phenomenon of new venture creation. *Academy of Management Review, 10*(4), 696–706.

Gimmon, E., & Levie, J. (2010). Founder's human capital, external investment, and the survival of new high-technology ventures. *Research Policy, 39*, 1214–1226.

Grant, R. (1996). Toward a knowledge-based theory of the firm. *Strategic Management Journal, 17*, 109–122.

Gries, T., & Van Dung, H. (2014). *Institutional environment, human capital, and firm growth: Evidence from Vietnam*. No. 83. University of Paderborn, CIE Center for International Economics.

Grilli, L. (2011). When the going gets tough, do the tough get going? The pre-entry work experience of founders and high-tech start-up survival during an industry crisis. *International Small Business Journal, 29*(6), 626–647.

Grilo, I., & Thurik, R. (2005). Entrepreneurial engagement levels in the European Union. *International Journal of Entrepreneurship Education, 3*(2), 143–168.

Grilo, I., & Thurik, R. (2008). Determinants of entrepreneurial engagement levels in Europe and the US. *Industrial Corporate Change, 17*(6), 1113–1114.

Gulati, R., & Higgins, M. (2003). Which ties matter when? The contingent effects of interorganizational partnerships on IPO success. *Strategic Management Journal, 24*, 127–144.

Halabisky, D., Dreessen, E., & Parsley, C. (2006). Growth in firms in Canada, 1985–1999. *Journal of Small Business and Entrepreneurship, 19*(3), 255–268.

Halldin, T. (2012). *Firm internationalization and born global firms: On the causes and consequences of export market entry*. Doctoral thesis, KTH, School of Industrial Engineering and Management (ITM), Industrial Economics and Management (Dept.), Economics. ISBN: 978-91-7501-262-9.

Hallen, B. (2008). The causes and consequences of the initial network positions of new organizations: From whom do entrepreneurs receive investments? *Administrative Science Quarterly, 53* (4), 685–718.

Haltiwanger, J., Jarmin, R., & Miranda, J. (2013). Who creates jobs? Small versus large versus young. *Review of Economics and Statistics, 95*(2), 347–361.

Hamilton, B. (2000). Does entrepreneurship pay? An empirical analysis of the returns to self-employment. *Journal of Political Economy, 108*(3), 604–631.
Haverman, H. (1995). The demographic metabolism of organizations: Industry dynamics, turnover, and tenure distributions. *Administrative Science Quarterly, 40*, 586–618.
Hayward, M., Shepherd, D., & Griffin, D. (2006). A hubris theory of entrepreneurship. *Management Science, 52*(2), 160–172.
Headd, B. (2001). *Business success: Factors leading to surviving and closing successfully*. Center for Economic Studies, U.S. Department of Commerce.
Helfat, C., & Lieberman, M. (2002). The birth of capabilities: Market entry and the importance of pre-history. *Industrial and Corporate Change, 11*, 725–760.
Henreckson, M., & Johansson, D. (2010). Gazelles as job creators—A survey and interpretation of the evidence. *Small Business Economics, 35*(2), 227–244.
Hessels, J., Grilo, I., Thurik, R., & Zwan, P. (2011). Entrepreneurial exit and entrepreneurial engagement. *Journal of Evolutionary Economics, 21*, 447–471.
Hochberg, Y., Ljungqvist, A., & Lu, Y. (2007). Whom you know matters: Venture capital networks and investment performance. *Journal of Finance, 62*(1), 251–301.
Holtz-Eakin, D., Joulfaian, D., & Rosen, H. (1994). Sticking it out: Entrepreneurial survival and liquidity constraints. *Journal of Political Economy, 102*(11), 53–75.
Hölzl, W. (2009). Is the R&D behaviour of fast-growing SMEs different? Evidence from CIS III data for 16 countries. *Small Business Economics, 33*(1), 59–75.
Hsu, D. (2004). What do entrepreneurs pay for venture capital affiliation? *Journal of Finance, 59*, 1805–1844.
Hsu, D. H. (2007). Experienced entrepreneurial founders, organizational capital, and venture capital funding. *Research Policy, 36*(5), 722–741. Elsevier.
Huang, H.-C., Lai, M.-C., & Lo, K.-W. (2012). Do founders' own resources matter? The influence of business networks on start-up innovation and performance. *Technovation, 32*, 316–327.
Hull, L., & Arnold, R. (2008). *New Zealand firm growth as change in turnover*. Wellington, NZ: Ministry of Economic Development.
Hutton, W., & Lee, N. (2012). The City and the cities: Ownership, finance and the geography of recovery. *Cambridge Journal of Regions, Economy and Society, 5*(3), 325–337.
Jayawarna, D., Jones, O., & Macpherson, A. (2011). New business creation and regional development: Enhancing resource acquisition in areas of social deprivation. *Entrepreneurship and Regional Development, 23*(9/10), 735–761.
Kato, M., Okamuro, H., & Honjo, Y. (2015). Does founders' human capital matter for innovation? Evidence from Japanese start-ups. *Journal of Small Business Management, 53*, 114–128. https://doi.org/10.1111/jsbm.12094.
Kessler, A., & Frank, H. (2009). Nascent entrepreneurship in a longitudinal perspective: The impact of person, environment, resources and the founding process on the decision to start business activities. *International Small Business Journal, 27*(6), 720–742.
Klepper, S. (1996). Entry, exit, growth, and innovation over the product life cycle. *American Economic Review, 86*, 562–583.
Klepper, S. (1997). Industry life cycles. *Industrial and Corporate Change, 6*, 145–181.
Klepper, S. (2002). The capabilities of new firms and the evolution of the US automobile industry. *Industrial and Corporate Change, 11*(4), 645–666.
Klepper, S. (2007). Disagreements, spinouts, and the evolution of Detroit as the capital of the U.S. automobile industry. *Management Science, 53*(4), 616–631.
Klepper, S., & Simons, K. (2005). Industry shakeouts and technological change. *International Journal of Industrial Organization, 23*(1–2), 23–43.
Klepper, S., & Sleeper, S. (2005). Entry by spinoffs. *Management Science, 51*, 1291–1306.
Landier, A., & Thesmar, D. (2009). Financial contracting with optimistic entrepreneurs. *Review of Financial Studies, 22*, 117–150.
Lee, K. (2010). A theory of firm growth: Learning capability, knowledge threshold, and patterns of growth. *Research Policy, 39*, 278–289.

Lee, J., & Zhang, W. (2011). Financial capital and startup survival. *Academy of Management Proceedings, 2011*(1), 1–6. https://doi.org/10.5465/ambpp.2011.65869494.
Levitt, B., & March, J. (1988). Organizational learning. *Annual Review of Sociology, 14*(1), 319–338.
Liao, J., Welsch, H., & Moutray, C. (2004). Start-up resources and entrepreneurial discontinuance: The case of nascent entrepreneurs. *Journal of Small Business Strategy, 19*(2), 1–15.
Littunen, H., & Virtanen, M. (2006). Differentiating growing ventures from non-growth firms. *Entrepreneurship Management, 2*, 93–109.
Long, C. (2002). Patent signals. *University of Chicago Law Review, 69*, 625–679.
Mann, R. J., & Sager, T. W. (2007). Patents, venture capital, and software start-ups. *Research Policy, 36*(2), 193–208.
Markman, G., & Baron, R. (2003). Person-entrepreneurship fit: Why some people are more successful as entrepreneurs than others. *Human Resource Management Review, 13*(2), 281–301.
Marvel, M., Davis, J., & Sproul, C. (2014). Human capital and entrepreneurship research: A critical review and future directions. *Entrepreneurship Theory and Practice*. https://doi.org/10.1111/etap.12136.
Marvel, M. R., & Lumpkin, G. T. (2007). Technology entrepreneurs' human capital and its effects on innovation radicalness. *Entrepreneurship Theory and Practice, 31*(6), 807–828.
Mason, C. (2013). *Access to finance: A 'thought piece' for the North East LEP independent economic review*. Retrieved from http://www.nelep.co.uk/media/2705/Colin-MasonAccess-to-Finance.pdf
Mata, J., & Portugal, P. (1994). Life duration of new firms. *Journal of Industrial Economics, 42*, 227–246.
McGrath, R., & Macmillan, I. (2000). *The entrepreneurial mindset*. Boston, MA: Harvard Business School Press.
Medrano, E. (2012). *Patent citations, university inventor patents, and survival in the German laser source industry (1960–2005)*. Jena Economic Research Papers 2012-009.
Meijaard, J., Van Eck, L., & Stam, E. (2007). *Stoppen binnen vijf jaar*. Zoetermeer: EIM.
Mina, A., Lahr, H., & Hughes, A. (2013). The demand and supply of external finance for innovative firms. *Industrial and Corporate Change, 22*(4), 869–901.
Mitchell, W. (1994). The dynamics of evolving markets: The effects of business sales and age on dissolutions and divestitures. *Administrative Science Quarterly, 38*, 575–602.
Mosey, S., & Wright, M. (2007). From human capital to social capital: A longitudinal study of technology based academic entrepreneurs. *Entrepreneurship: Theory and Practice, 31*, 909–935.
Nightingale, P., & Coad, A. (2013). Muppets and gazelles: Political and methodological biases in entrepreneurship research. *Industrial and Corporate Change, 23*(1), 113–143. https://doi.org/10.1093/icc/dtt057.
Nyberg, A., & Wright, P. (2015). 50 Years of human capital research: Assessing what we know, exploring where we go. *Academy of Management Perspectives, 29*(3), 287–295.
Painter, M. (2010). Get a job and keep it! High school employment and adult wealth accumulation. *Research in Social Stratification and Mobility, 28*(2), 233–249.
Parker, S., & Belghitar, Y. (2006). What happens to nascent entrepreneurs? An econometric analysis of the PSED. *Small Business Economics, 27*, 81–101.
Parker, S., Storey, D., & Van Witteloostuijn, A. (2010). What happens to gazelles? The importance of dynamic management strategy. *Small Business Economics, 35*, 203–226.
Parsa, H., Self, J., Njite, D., & King, T. (2005). Why restaurants fail. *Cornell Hotel and Restaurant Administration Quarterly, 46*, 304–322.
Paunov, C. (2012). The global crisis and firms' investments in innovation. *Research Policy, 41*(1), 24–35.
Penrose, E. (1959). *The theory of the growth of the firm*. Oxford: Oxford University Press.
Phillips, D. (2002). A genealogical approach to organizational life chances: The parent-progeny transfer among Silicon Valley law firms, 1946-1996. *Administrative Science Quarterly, 47*(3), 474–506.

Politis, D. (2005). The process of entrepreneurial learning: A conceptual framework. *Entrepreneurship Theory & Practice, 29*(4), 399–424.

Qian, L., Agarwal, R., & Hoetker, G. (2012). Configuration of value chain activities: The effect of preentry capabilities, transaction hazards, and industry evolution on decisions to internalize. *Organization Science, 23*(5), 1330–1349.

Rae, D., & Carswell, M. (2001). Towards a conceptual understanding of entrepreneurial learning. *Journal of Small Business and Enterprise Development, 8*(2), 150–158.

Rauch, A., & Rijsdijk, S. (2013). The effects of general and specific human capital on long-term growth and failure of newly founded businesses. *Entrepreneurship Theory and Practice, 37*, 923–941.

Robson, P., Akuetteh, C., Westhead, P., & Wright, M. (2012). Innovative opportunity pursuit, human capital and business ownership experience in an emerging region: Evidence from Ghana. *Small Business Economics, 39*, 603–625.

Schneider, C., & Veugelers, R. (2010). On young highly innovative companies: Why they matter and how (not) to policy support them. *Industrial and Corporate Change, 19*(4), 969–1007.

Schreyer, P. (2000). *High-growth firms and employment*. OECD Science, Technology and Industry Working Papers. No. 2000/03.

Schutjens, V., & Stam, E. (2006). *Starting a new: Entrepreneurial intentions and realizations subsequent to business closure*. Discussion Papers on Entrepreneurship, Growth and Public Policy, No. 2006–10, Max Planck Institute of Economics, Jena.

Senderovitz, M., Klyver, K., Steffens, P., & Majbritt, E. (2012). Four years on—Are the Gazelles still running? A longitudinal study of firm performance after a period of rapid growth. In *2012 Babson College Entrepreneurial Research Conference, 6–9 July, 2012*, Fort Worth, TX.

Serneels, P. (2008). Human capital revisited: The role of experience and education when controlling for performance and cognitive skills. *Labour Economics, 15*(6), 1143–1161.

Shane, S. (2000). Prior knowledge and the discovery of entrepreneurial opportunities. *Organization Science, 11*, 448–469.

Sharma, A., & Kesner, I. (1996). Diversifying entry: Some ex ante explanations for post-entry survival and growth. *Academy of Management Journal, 39*, 635–677.

Shepherd, D., & Wiklund, J. (2009). Are we comparing apples with apples or apples with oranges? Appropriateness of knowledge accumulation across growth studies. *Entrepreneurship Theory and Practice, 33*(1), 105–123.

Shrader, R., & Siegel, D. (2007). Assessing the relationship between human capital and firm performance: Evidence from technology-based new ventures. *Entrepreneurship: Theory and Practice, 31*(6), 893–908.

Srinivasan, R., Lilien, G., & Rangaswamy, A. (2008). Survival of high tech firms: The effects of diversity of product–market portfolios, patents, and trademarks. *International Journal of Research in Marketing, 25*, 119–128.

Stam, E. (2005). The geography of gazelles in the Netherlands. *Tijdschrift voor Economische en Sociale Geografie, 96*(1), 121–127.

Stam, E., & Wennberg, K. (2009). The roles of R&D in new firm growth. *Small Business Economics, 33*(1), 77–89.

Stam, E., Audretsch, D., & Meijaard, J. (2008). Renascent entrepreneurship. *Journal of Evolutionary Economics, 18*(3–4), 493–507.

Stuart, T., Hoang, H., & Hybels, R. (1999). Interorganizational endorsements and the performance of entrepreneurial ventures. *Administrative Science Quarterly, 44*, 315–349.

Sullivan, D., & Marvel, M. (2011). How entrepreneurs' knowledge and network ties relate to the number of employees in new SMEs. *Journal of Small Business Management, 49*, 185–206.

Tang, J., & Murphy, P. (2012). Prior knowledge and new product and service introductions by entrepreneurial firms: The mediating role of technological innovation. *Journal of Small Business Management, 50*, 41–62.

Taylor, M. (1999). Survival of the fittest? An analysis of self-employment duration in Britain. *Economic Journal, 109*(March), 140–155.

Teece, D. (2007). Explicating dynamic capabilities: The nature and microfoundations of (sustainable) enterprise performance. *Strategic Management Journal, 28*(13), 1319–1350.
Teece, D. (2009). *Dynamic capabilities and strategic management: Organizing for innovation and growth*. New York: Oxford University Press.
Teece, D. (2010a). Technological innovation and the theory of the firm: The role of Enterprise-level knowledge, complementarities, and (dynamic) capabilities. In N. Rosenberg & B. Hall (Eds.), *Handbook of the economics of innovation* (Vol. 1). Amsterdam: North-Holland.
Teece, D. (2010b). Business models, business strategy and innovation. *Long Range Planning, 43*, 172–194.
Teece, D. (2014). A dynamic capabilities-based entrepreneurial theory of the multinational enterprise. *Journal of International Business Studies, 45*, 8–37.
Teece, D., & Pisano, G. (1994). The dynamic capabilities of firms: An introduction. *Industrial and Corporate Change, 3*(3), 537–556.
Teece, D., Pisano, G., & Shuen, A. (1990). *Firm capabilities, resources, and the concept of strategy*. CCC Working Paper 90-8. Berkeley: Center for Research in Management, University of California.
Teece, D., Pisano, G., & Shuen, A. (1997). Dynamic capabilities and strategic management. *Strategic Management Journal, 18*(7), 537–533.
Tyebjee, T., & Bruno, A. (1984). A model of venture capitalist investment activity. *Management Science, 30*(9), 1051–1066.
Ucbasaran, D., Wright, M., & Westhead, P. (2003). Longitudinal study of habitual entrepreneurs, starters and acquirers. *Entrepreneurship and Regional Development, 15*(3), 207–228.
Ucbasaran, D., Wright, M., & Westhead, P. (2008). Opportunity identification and pursuit does an entrepreneur's human capital matter? *Small Business Economics, 30*, 153–173.
Van der Sluis, J., Van Praag, M., & Vijverberg, W. (2005). Entrepreneurship, selection and performance: A meta-analysis of the role of education. *World Bank Economic Review, 19*(2), 225–261.
Van Gelderen, M., Thurik, R., & Bosma, N. (2006). Success and risk factors in the pre-startup phase. *Small Business Economics, 26*(4), 319–335.
Verhoeven, W., Gibcus, P., & de Jong-'t Hart, P. (2005). *Bedrijvendynamiek in Nederland: goed of slecht?* Zoetermeer: EIM.
Wagner, J. (2003). Taking a second chance: Entrepreneurial re-starters in Germany. *Applied Economics Quarterly, 49*(3), 255–227.
Wagner, S., & Cockburn, I. (2010). Patents and the survival of internet-related IPOs. *Research Policy, 39*, 214–228.
Weinzimmer, L., Nystron, P., & Freeman, S. (1998). Measuring organizational growth: Issues, consequences and guidelines. *Journal of Management, 24*(2), 235–262.
Wennberg, K., Wiklund, J., DeTienne, D., & Cardon, M. (2010). Reconceptualizing entrepreneurial exit: Divergent exit routes and their drivers. *Journal of Business Venturing, 25*(4), 361–375.
Westhead, P., Ucbasaran, D., Wright, M., & Binks, M. (2005). Novice, serial, and portfolio entrepreneur behaviour and contributions. *Small Business Economics, 25*(2), 109–132.
Wieser, R. (2005). Research and Development, productivity and spillovers: Empirical evidence at the firm level. *Journal of Economic Surveys, 19*(4), 587–621.
Wiklund, J., & Shepherd, D. (2003). Knowledge-based resources, entrepreneurial orientation, and the performance of small and medium-sized businesses. *Strategic Management Journal, 24*, 1307–1314.
Ziedonis, R. (2004). Don't fence me in: Fragmented Markets for Technology and the patent acquisition strategies of firms. *Management Science, 50*, 804–820.
Zott, C., & Huy, Q. (2007). How entrepreneurs use symbolic management to acquire resources. *Administrative Science Quarterly, 52*, 70–105.