International Review of Entrepreneurship, Article #1674, 20(2): pp. 197-226.
© 2022, Senate Hall Academic Publishing.

Does Born Global Survival Differ from Other Start-Ups? Employee- versus Firm-level Resources

Pontus Braunerhjelm[1]
The Royal Institute of Technology (KTH), Stockholm, Sweden; Blekinge Institute of Technology, Sweden; and The Swedish Entrepreneurship Forum

Torbjörn Halldin
The Royal Institute of Technology (KTH), Stockholm, Sweden; and The Confederation of Swedish Enterprise

Abstract. In this paper we embark from a resource-based view to explain hazard rates among new firms. Whereas previous research primarily has approximated firms' resource bases with size and performance variables (e.g., productivity), we differentiate between employee- and firm-level components, analyzing firm survival. We focus on born global firms within both the manufacturing and knowledge-intensive services (KIBS) industries while implementing three broader control groups. Using longitudinal data we implement a Cox proportional hazard model to estimate the hazard ratios of the included employee- and firm-level variables. Both industry- and firm-level differences are identified, even though the results vary with the specification of the estimations and the particular group being examined. The results should be relevant for both managers and policymakers.

Keywords: born global firms, survival, resource base, hazard rates.

JEL classification: L25, L26, M13, D21, D22

1. Introduction

Industrial dynamics, the allocation of resources and increasing economic efficiency are largely driven by the entry and exit of firms. These events provide the pediment for Schumpeterian creative destruction processes that supposedly enhance innovative processes and make industries and firms more competitive. On a more aggregate level, dynamic creative destruction processes are critical to promote growth and increase prosperity.

Most economies have since long promoted policy measures to improve the business climate and facilitate the entry and growth of new firms (World Bank, 2019). The opposite side of firms' lifecycle, i.e., business failure is, however,

1. Corresponding author: Pontus Braunerhjelm, The Royal Institute of Technology (KTH), Division of Economics, Indek, 100 44 Stockholm. Email: pontus.braunerhjelm@indek.kth.se.

© 2022, Senate Hall Academic Publishing. All Rights Reserved

often neglected (Parastuty, 2018). This seems particularly prevalent regarding born globals, a phenomenon that has been widely researched in the last two decades. Rather, the born global literature has addressed issues related to scaling-up through rapid internationalization processes where strategic implications, as well as organizational and managerial aspects, have been focal points. Yet, the two (entry and exits) are inherently interdependent.

This deficiency in the research literature has been addressed by, for instance, Cavusgil and Knight (2015), who stress that one important task for future research on born globals is to identify the factors at the firm and industry levels that co-vary with failures. Oyna and Alon (2018) reach the same conclusion. Our objective is to narrow the present gap in the literature by examining factors influencing survival of firms that strive "to derive significant competitive advantage from the use of resources and the sales of outputs in multiple countries'' (Oviatt and McDougall, 1994: p. 49). We will refer to such startups as born globals.[2]

By examining the resource base of such firms, we expect to gain deeper insights into their chance for survival. A firm's resource base can be defined as a bundle of differentiated knowledge and competencies of its employees, together with other firm-specific attributes. This composite of different variables determines competitive advantage as well as firms' capabilities to augment and deploy new knowledge (Brambilla et al., 2012; Love and Roper, 2015; Huselid et al., 2017). Hence, to comprehend survival of born globals, and how they fare in comparison with other start-ups, the analysis considers differences in the composition of the resource base of new ventures (Faroque et al., 2020). More precisely, we separate between resources embodied in their employees, and those at the firm level.

Our key variables refer to the human capital structure of new ventures, measured as the share of employees having different levels of education, average individual wage (an income measure of human capital) and age (experience). Concurrently, we implement gender and nationality at the employee level to capture diversity. We then examine how the effects of such individual characteristics, as compared to firm-level variables, influence firms' survival rate. The latter refer to size and capital (equity in relation to assets) together with performance variables (productivity and profits). Some of these variables have previously been used as proxies for resource endowments, but previous analyses have not separated between employee- and firm-level variables. Neither have these been invoked to analyze firm failure.

Implementing a Cox proportional hazard model both the service and manufacturing sectors will be considered. Since there is a lack of consensus on how to define born globals, we will use three different definitions (Gabrielsson

2. McKinsey seems to have coined the concept 'born globals' in a study of manufacturing exporters in Australia (McKinsey & Co., 1993). Related concepts are international new ventures (McDougall et al., 1994) and instant exporters (McAuley, 1999).

and Kirpalani, 2012; Oyna and Alon, 2018). We will compare the results for born globals to those of three other groups of startups in the respective sector: all new firms (exporters and non-exporters), those choosing a different strategy having small shares of exports (denoted future exporters) and spin-offs. This approach allows us to trace firm-specific differences.

We structure our analysis in a way that distinguishes it from most previous contributions. First, we are able to define genuinely new firms, where entry through mergers and spinoffs can be removed or treated as a separate category of entries. Second, our data comprise both the manufacturing and service sectors (knowledge-intensive business services, KIBS), from which conclusions can be drawn, considering conceivable structural differences across these sectors (Box et al., 2017). Third, we implement detailed data for three different levels of education to capture how human capital impacts survival while controlling for some other employee characteristics. Fourth, we compare the traditional resource-based explanations of firm performance (size, capital and productivity/ profitability) to our human capital findings. Finally, we implement a longitudinal analysis to examine survival.

Our analysis contributes several new insights. In particular, born global firms seem to be different as compared to other groups of start-ups and relatively few of our explanatory variables are shown to impact survival. Regarding the two sectors, we conclude that human capital is more important for the survival of born globals in the KIBS sector, while size dominates in the manufacturing sector. This finding captures the structural differences between the sectors, as manufacturing is more capital-intensive and sensitive to scale than KIBS. The significance of these differences varies somewhat with the definition of born globals. In addition, there is some evidence of a positive impact of human capital, measured as employee wages in the manufacturing sector. Among the firm-level performance measures, significant effects are found for productivity and equity levels in the KIBS estimations.

Broadening the analysis to embrace all startup firms including non-exporters, we find that firms with high shares of employees holding degrees from postsecondary education have a higher propensity to survive longer. Hence, when analyzing more specific groups, such as born globals, the explanatory power of our resource-based variables tends to diminish.

A first conclusion is thus that there seems to be distinct industry-specific differences, albeit becoming smaller as the analysis is extended to comprise all new firms. Second, there are also obvious differences regarding the origin of firms. Spinoffs, shown to have the highest survival rate in several studies, reveal a different pattern compared to the other groups of firms. Thus, there are also firm-specific differences related to the resource base when we look at survival rates. Third, there seems to be firm-specific assets not captured by the variables implemented in the present studies. The latter could be related to interaction effects within the firm and less tangible assets such as company culture.

The remainder of this article is organized as follows. Section 2 reviews the literature on firm internationalization, with a special focus on born global firms from which the hypotheses are inferred. Section 3 describes the data, the empirical methodology and presents some descriptive statistics. In section 4, the results are presented, while section 5 elaborates on the implications and interpretations of the findings. Finally, the conclusions follow in the last section.

2. Previous Research

2.1. Internationalization of Start-ups

Even though research on born globals has witnessed a rapid expansion in recent decades (Coviello, 2015), attempts to analyze and understand the survival of born global firms have been extremely scarce.[3] Focus has, instead, primarily been on the factors influencing the pace of the globalization of startups, or young and small firms, since at least the beginning of the 1970s. The gradual international process, as envisaged in the stage theories of Vernon (1966; 1971) and later by Johanson and Vahlne (1977; 1990; 2006), is based on the maturation of products (product lifecycle) and hurdles regarding knowledge about foreign markets (psychic distance), which was argued to prompt a sequential entrance to foreign markets.

These traditional models have, however, been criticized for an inadequate description of how young firms internationalize in today's global markets (Oviatt and McDougall, 1994; Chetty and Campbell-Hunt, 2004; Fan and Phan, 2007). Consequently, the international entrepreneurship literature has emerged as an alternative theoretical framework as to why global strategies could be a superior way for startup firms to rapidly exploit entrepreneurial opportunities and strengthen their potential for future growth and competitiveness.[4] Firms are assumed to profit from a born global strategy by exploring and capitalizing on international opportunities. This is claimed to be especially important for firms with niche products of high technological content.[5] Still, when analyzing born globals the effects seem more ambiguous. For example, Choquette et al. (2017)

3. See surveys by, e.g., Rialp et al. (2005; 2014) and Cavusgil and Knight (2015).
4. Previous contributions are ample (see e.g. Etemad and Wright, 2003; Chetty and Campbell-Hunt, 2004; Knight and Cavusgil, 2004; Oviatt and McDougall, 2005; Rugman et al., 2011; Johanson and Vahlne, 2009; Wan et al., 2011).
5. In the 1990s, Knight and Cavusgil (1996) presented several trends that supposedly led to the emergence of born global firms, e.g., increased competitive pressure, advances in technology, the flexibility of smaller firms, globalization, and more global networks. See also Freeman et al. (2006) who listed a number of key variables that can be positively associated with rapid internationalization: 1) a too small domestic market; 2) commitment and belief by senior management to the idea of internationalization; 3) personal networks; 4) unique technology as a source of competitive advantage; and 5) growth through partnership and alliances.

and Braunerhjelm and Halldin (2019) find no or very weak effects on performance for firms adopting born global strategies. The exception is size measured as employees, a result which appears also in several other analyses of young firms' internationalization (see e.g., Grazzi and Moschella, 2018).

A large bulk of the literature on born globals stresses the links between a sufficient resource base and firm performance (Penrose, 1959; Westhead et al., 2001; Oviatt and McDougall, 2005; Laantia et al., 2007). Yet, the details and composition of the resource base have not been pinned down in empirical analyses. The most commonly used proxies for a solid resource base have been firm size and productivity (Sharfman et al., 1988; Mishina et al., 2004; Hashai, 2011; Sui and Baum, 2014).

A resource-based view has for instance been adopted by Sapienza et al. (2006), Zhou et al. (2010) and Chang and Rhee (2011), focusing on the ability to reallocate existing resources within the firm due to new and changing circumstances. Other authors stress that without an appropriate resource base, rapid internationalization may incur non-recoupable costs due to increased expenditure related to coordination processes, more transactions, legal issues, etc. (Zaheer and Mosakowski, 1997; Braunerhjelm, 1999; Salomon and Wu, 2012). Similarly, Carr et al. (2010) argue that firms embarking on a born global strategy must also be equipped with absorption and learning capacities.[6] Without such capacities, it is obviously unlikely that the potential advantages of having access to foreign factors and customer markets, as well as a broader knowledge base, can be exploited (Hitt et al., 1997; Zahra et al., 2000).

Some empirical evidence has been provided by Efrat and Shoham (2012) who conclude that internal competencies, such as technological capabilities, enhance the probability of survival in foreign markets for Israeli firms. Also, De Clercq et al. (2012) emphasize knowledge as a key factor for born globals to succeed. Overall, the twin liabilities of newness (Stinchcombe, 1965) and foreignness (Hymer, 1976) suggest that learning capabilities and the skill composition of new firms are critically important factors for survival.[7] However, very few studies have implemented data on employees, e.g., education levels, to examine their effect on the survival of born globals.

2.2. Firm Survival

Regarding firm survival, several studies have addressed this phenomenon more generally in the industrial organization literature, even though born globals per se

6. Some contributions distinguish between geographical, customer or product scope as strategies for survival (Almor, 2013; Almor et al., 2014). The geographic, or regional, view has been suggested as an alternative path to reduce risk exposure (Rugman et al., 2011; Sui and Baum, 2014). See also Gabrielsson and Gabrielsson (2013) and Patel et al. (2018).
7. One strand in the literature claims that there is a "learning-by-exporting" effect which should favor long-term survival (see, e.g., Bernard et al., 2007).

have not been the prime objective of the analyses. Small and medium-sized exporters have been shown to experience a significantly lower failure rate than non-exporters (Esteve-Pérez and Máñez-Castillejo, 2008). Other authors stress that human capital is crucial for firms' performance and survival (Audretsch, 1989; Rauch et al., 2005; Unger et al., 2011; Koch et al., 2013).[8] Similarly, there are also a number of studies that address the importance of attracting, training and retaining human capital in SMEs, given the competition for skills from particularly large firms (Hornsby and Kuratko, 2003; Rutherford et al., 2003; Kotey and Folker, 2007; Atkinson et al., 2014; Kitching, 2016). Lee et al. (2012) examine how SMEs' internationalization strategies, technological resources (R&D) and alliances, influence the rate of failure. They conclude that internationalization does not increase hazard rates, whereas R&D-outlays have a more ambiguous effect, depending on how it is organized (standalone or in alliances). Mudambi and Zarah (2007) find no, or small, differences between born globals and multinational enterprises embarking on more gradual FDI strategies. These studies take an overall perspective, while failures, particularly how they are associated with employee characteristics, basically remain unexplored.

Sui and Baum (2014), implementing a longitudinal dataset for Canadian born globals, examine whether highly internationalized startups resort to more modest export levels or abandon foreign markets completely, if exposed to financial stress. Their main interest is thus the longevity of a born global strategy, rather than firm survival. According to their results, rapid internationalization strategies are more frequently abandoned compared to more "traditional" and gradual penetration of foreign markets. They explain this by a lack of both organizational and innovation resources. More precisely, Sui and Baum (2014, p. 824) claim that "… although small, new ventures are able to internationalize early with limited resources, it is particularly critical for born-global firms to acquire adequate resources during the internationalization process to survive abroad."

A notable exception as regards survival is work by Sleuwagen and Onkelinx (2014) who conclude that the failure rate is higher among born globals than among small firms in general. This is however more an observation than an explanation of the underlying factors. In a subsequent analysis Onkelinx et al. (2016) use data from the National Bank of Belgium for the period 1998 to 2005 to examine how firms' human capital is associated with successful internationalization. They implement a human capital index composed of a weighted average of the education level of newly hired employees and the average wage level of all employees. They also construct a "change index" of the human capital variable used in the empirical analysis.

According to their results, a curvilinear relationship prevails between the level of human capital and rapidly internationalizing firms. For firms choosing an aggressive internationalization strategy, the effect of their employees' human

8. According to Eurofound (2016), born globals also seem to have a higher endowment of human capital than other startup firms.

capital seems to diminish once a certain level is reached. The authors emphasize that young and small firms heading for rapid internationalization must carefully decide on their skill composition to avoid exhausting resources and to succeed in foreign markets.

Hence, even though exits of firms have been examined in the previous literature, the relationship between born global strategies and survival has received scant attention, particularly with regard to how the skill composition of firms' employees influences exit. Notwithstanding that access to resources, e.g., size, solidity, capital and knowledge, has been stressed as decisive for success, knowledge about which types of resources influence survival basically remains in the dark (Sapienza et al., 2006; Mudambi and Zahra, 2007; Keupp and Gassmann, 2009; Prashantham and Young, 2011; Wan et al., 2011).

To conclude, a firm's resource base is, to a large extent, a bundle of tangible and nontangible resources originating in capital, solidity and organization of firms, as well as the skills and abilities of employees. In order to comprehend the survival of born globals we argue that it is necessary to differentiate between different types of firm resources. Consequently, we separate between hypotheses related to employee characteristics on the one hand, and firm level on the other, while controlling for industry effects.

2.3. Employee-level Hypotheses

Regarding employee characteristics, we emphasize the importance of human capital, which is estimated using variables to capture different aspects of employee competencies, primarily education, experience, and wage. Autio et al. (2000) argue that young firms have a "learning advantage of newness" compared to older incumbents, while Peña (2002) stresses that human capital is a critical intangible asset for new firm survival. Additionally, Knight and Cavusgil (2004) provide evidence that knowledge is key for the successful outcome of early internationalization. These rather sweeping conclusions are however vague on the particular type of employee skills that are required.[9] Moreover, existing studies have predominantly focused on the traits of the entrepreneur and not on those of the firm's employees (Jones and Coviello, 2005; Matthew and Zander, 2007; Saridakis et al., 2008).[10]

Even though experience can be expected to enhance on-the-job learning and the diffusion of knowledge to other employees, several studies have found a

9. See also Weerawardena et al. (2007) and Krieger et al. (2018). Jovanovic (1982) suggests that heterogeneous firms learn about their efficiency levels only after they enter the market, which can be expected to be positively associated with employee competencies. Depending on the degree of inefficiency and adaptation, firms are either forced out of the market or survive and grow larger.
10. For instance, Andersson et al. (2015) implement educational data and previous experience for entrepreneurs in a comparative study on China and Sweden.

negative effect of age on performance (Skirbekk, 2008). More elderly employees are found to be especially low-productive regarding tasks that require a reorientation toward solving new kinds of problems, which may increase with the complexity of such tasks (Myerson et al., 1990).[11] As noted above, born global firms seem most prevalent in niche production and are often technologically advanced. Simultaneously, newly founded small firms often require that employees are engaged in a variety of work tasks, some of which inevitably are new and unfamiliar to the individual worker, particularly if related to new technologies. This may hamper performance among elderly employees. Lazear (2005) has shown how "jack-of-all-trade" abilities are important for entrepreneurial performance.[12]

Hence, we propose the following hypotheses related to human capital at the employee level:

H1a. Educated employees positively affect survival of born globals.

H1b. Higher employee wages reflect higher human capital, which positively affect survival of born globals.

H1c. The impact on firm survival of employee experience, measured as higher age, is a priori ambiguous.

While human capital is our key employee-level variable, we also control for a few additional employee characteristics based on Becker's (1957) model of employer discrimination. In this model, employers are believed to discriminate against, for instance, women and immigrants. These groups are only hired if it is possible to pay them lower wages to compensate for the risks attributed to potentially lower abilities. Nondiscriminatory employers would thus hire employees from these discriminated groups at lower wages that may result in more profitable firms that are more likely to grow and survive in a competitive market. In addition, immigrants may have knowledge about foreign markets.[13] This leads us to our final hypothesis regarding employees:

H2. Firms with higher shares of immigrants and women have a higher survival rate.

We now turn to our second subset of hypotheses focusing on firm-level factors. These primarily include firm size and performance variables, taking different types of firms into account as well as their industry affiliation.

---

11. The typical example is the introduction of computers and IT-related ingredients in many work tasks, which, if used appropriately, often can enhance productivity. See Czaja and Sharit (1993) for an early investigation of the link between age and low productivity in computer-based work performance. However, in fields they know well and where long experience is especially beneficial, employees of a higher age can remain very productive.
12. Senior employees are also often paid higher salaries and employee obligations in terms of pension benefits, which tend to increase as a firm's employees are ageing. Hereby, a more elderly employee has to produce more than his or her younger counterpart to be just as productive.
13. It is particularly likely that immigrants add knowledge on destination countries from which they originate which should increase sales and survival probabilities (Hatzigeorgiou and Lodefalk, 2016).

2.4. Firm-level Hypotheses

Previous findings by Mudambi and Zahra (2007), Prashantham and Young (2011), De Clercq et al. (2012) and Box et al. (2017) have emphasized the importance of size, market experience and capital to cope with the liability of newness.[14] Similarly, there are strong reasons to expect performance to exert a positive impact on survival, even though—as reported above—the empirical evidence is scant. Hence, we hypothesize the following:

H3a. The size of firms (sales and employees) positively affects survival.

H3b. Higher firm-level performance (productivity/profitability) positively affects survival.

H3c. A higher equity share positively affects survival.

Regarding firm origin, research by Agarwal et al. (2004), Klepper and Sleeper (2005), Eriksson and Kuhn (2006) and Klepper (2009) has shown that spinoff firms survive longer than other new firms. This finding is corroborated in a study by Andersson and Klepper (2013), implementing detailed Swedish data. Hence, the learning and skills attributed to their previous experience as employees seem to have increased firms' probability of survival.

H4. Spinoffs have a higher survival rate as compared to new firms of other origin.

H3a-c and H4 constitute our four core hypotheses with regard to firm-level variables. In addition, a number of previous contributions have stressed the importance of industry differences, particularly that born globals are expected to be more prevalent in high-technology niche markets (Freeman et al., 2006; Fernhaber et al., 2007; Zander et al., 2015) and that the likelihood of surviving is lower in high-technology industries (Audretsch, 1995).[15] Thus, throughout the analysis, we control for industry-specific effects and for time and regional effects.

3. Data, Descriptive Statistics, and Methodology

The dataset is provided by Statistics Sweden and covers the period 1997-2008.[16] It includes register data from business statistics and information on exports, entry

14. See surveys by Rialp et al. (2014) and Zander et al. (2015).
15. In particular, the situation of surviving more than a decade subsequent to birth is lower in high-technology industries. However, conditional on surviving the first five years, the likelihood of surviving an additional two years is actually greater, and not lower, in highly innovative industries (Audretsch, 1995).
16. Available data is tied to a specific period which implies limitations due to possible period or cohort effects. Even though we do not see exceptional occurrences (e.g., pandemics or widespread international conflicts) during the particular period examined, factors can still be present that affect the determinants of survival (e.g., see Fukuda, 2013; Zhang and Acs, 2019). An extension to capture such effects may be possible but would render additional costs and take considerable time. Standard controls are implemented to capture time-, region-, and industry-specific effects.

and exit of firms. In addition, employees are matched with employers. All firms are included in the manufacturing and KIBS industries, i.e., we have population data.[17] The reason to include KIBS industries in the analysis is threefold. First, they have a non-negligible and increasing export share. Second, we expect employee characteristics, particularly human capital, to be more important in the less capital-intensive service sector. Third, compared to the manufacturing sector, born globals in other sectors have not been extensively studied and quantified, even though service sectors account for the major brunt of startups.

A firm is characterized as new in a certain year if it was not registered in the business statistics in the previous year. Since data are available from 1997-2008, we can identify new firms from 1998 onward. A new firm could, however, also be a result of a spinoff or merger, which we expect to have different characteristics compared to genuinely new firms (Gabrielsson et al., 2008; Andersson and Klepper, 2013). Our data, however, allow us to identify spinoffs (and mergers) as a specific group of start-ups.

We also exclude new firms that subsequently merge or spinoff part of their business since such activities result in restructured firms with somewhat new characteristics. Hence, only organic growth is allowed. Firms leaving the dataset due to a merger or acquisition are also excluded since they exit the market for reasons other than being low performers. To ensure that some economic activity is taking place in each firm, we only include new firms with at least one employee.

Furthermore, we impose a restriction on persistence in global activities. Born global firms that exit the export markets during the time period of study, despite fulfilling the requirements of the definitions below of being a born global, are removed from the sample. Such born global firms cannot be perceived as born global in the original sense of Oviatt and McDougall (1994) or McKinsey & Co. (1993).

Limiting our dataset to the firms fulfilling the abovementioned selection criteria implies that we can extract a subset of genuine born global firms. More precisely, we will implement three different definitions of born globals in our analysis. The first *stringent* definition refers to previous strands of the literature and requires a new firm to have reached a 25 percent export share (export in relation to total sales) two years after its inception. Moreover, we impose two additional definitions of born globals where the criteria with regard to exports are varied. The *modest* definition encompasses those firms reaching an export share of at least 10 percent within five years of firm birth. The third definition, the *alternative* one, introduces an element of persistence in export behavior. Firms classified according to this definition have an export share greater than 25

17. We do not separate between different types of firms, i.e., incorporated firms, trading companies, etc. Due to threshold values for the registration of exports to EU countries (Eliasson et al., 2012), some export data to the EU are not reported. Hence, there might be a moderate underestimation of the number of born global firms.

percent, on average, during three consecutive years, starting no later than years two, three and four since being founded.

To compare the activities of born global firms to those of other new firms, it is imperative to construct adequate control groups. As described above, spinoff firms could be expected to be endowed with different characteristics than those of other types of new firms. Supposedly, such characteristics influence firm dynamics. New firms engaged in export activities but not fulfilling the born global definitions are expected to be inherently different from firms only focusing on the Swedish home market. To capture these differences, the following three control groups were constructed: i) spinoff firms, ii) future exporters, i.e., those with exports during the studied time period but not reaching the requirements of the born global definitions, and iii) the total bulk of new firms.[18]

Due to the abovementioned identification procedure of born global firms, they can only be identified from 1998 onward. Since the export performance of new firms must be monitored to characterize firms as born globals, the time window of born globals is narrowed down even further. This results in born globals of the stringent definition founded during the nine-year period 1998-2006, born globals of the modest definition during the six-year period 1998-2003 and those firms satisfying the alternative definition during the seven-year period 1998-2004.

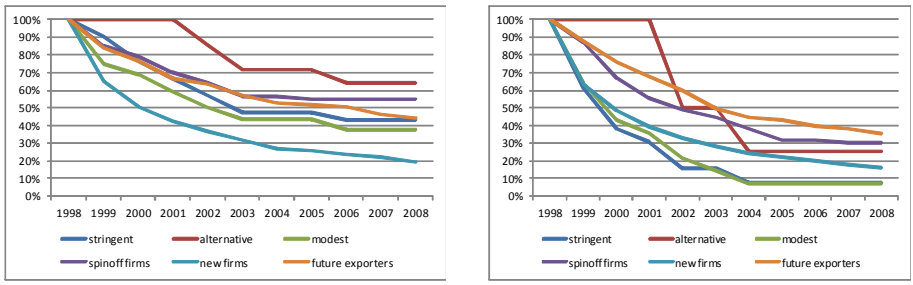
3.1. Hazard Rates – Some Illustrations

To obtain some preliminary idea of the survival of new firms, i.e., both born global firms and the described reference firms, Figure 1 presents how the cohort of firms born in 1998 evolves over the 1998-2008 period. For both manufacturing firms and KIBS firms in this cohort, survival rates are lowest during the early period of a firm's life. After an initial rapid decline, the slope of the curves flattens out. However, despite this overall pattern, the different groups of firms in the 1998 cohort seem to have somewhat different characteristics in terms of survival rates. Born globals, with the exception of the alternative definition[19], do not seem to perform better in terms of survival rates looking at all groups (Figure 1).[20] A decade after birth, about 20 percent of all new manufacturing firms in the sample still exist, while approximately 40 percent of the born global firms of the stringent

18. The inclusion of spinoff firms as a comparison group is based on the many studies, e.g., Klepper and Sleeper (2005) and Agarwal et al. (2004), that report superior survival rates for spinoff firms.
19. The considerably less smooth line of the group of born global firms associated with the alternative definition is explained by the fact that this group only contains a few firms when narrowed down to a single year's cohort. Therefore, one should not put too much emphasis on the high survival rates among these firms.
20. Remember the narrowness of a single cohort. However, similar results are found for other cohorts as well.

and modest definitions remain which is on par with the group of future exporters but somewhat below spin-offs. For the KIBS firms in the right-hand chart of Figure 1, there is a downward shift for most curves.[21] Born globals (stringent and modest definitions) are however revealed to have the least successful outcome after ten years, only eight percent have survived. That is about half the share of all start-ups in the KIBS-sector.

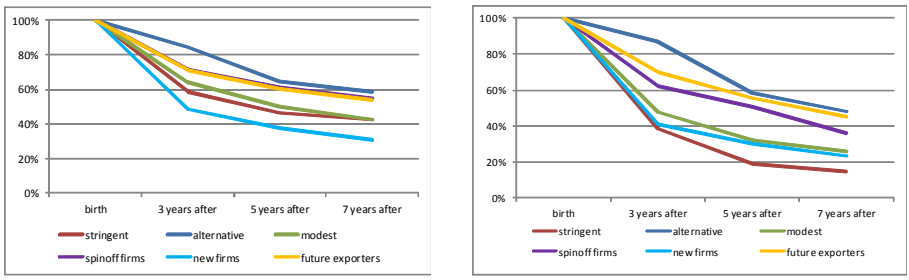
Figure 1. Percentage of firms surviving, 1998 cohort.
The left-hand chart represents manufacturing firms, and the right-hand chart represents KIBS firms. Stringent, alternative, and modest represent the three born global firm definitions. The remaining three lines are the three reference groups.



Instead of describing a single cohort, Figure 2 is based on pooled data. The two charts represent the average share of firms surviving three, five and seven years after being founded for the manufacturing and KIBS sectors. It is clear that almost all subgroups of firms have higher average survival rates than the comparison group of all new firms in manufacturing. Only born global KIBS firms, defined according to the stringent definition, perform worse than the total bulk of new firms. Comparing manufacturing firms to KIBS firms, we see that manufacturing firms, on average, survive longer than KIBS firms. Finally, it is obvious that new firms are shown to have most difficulties in surviving the first couple of years after foundation, indicating the presence of a "liability of newness" (Dunne et al., 1988; Audretsch, 1995).

21. For the born global firms, the smallness of the sample should be noted when interpreting KIBS firms. Beginning in 1998, the firms defined by the stringent, alternative and modest born global definitions numbered 13, 4 and 14 firms, respectively.

Figure 2. Average share of firms surviving three, five and seven years based on pooled data. The left-hand chart represents manufacturing firms, and the right-hand chart represents KIBS firms. Stringent, alternative, and modest represent the three born global firm definitions. The remaining three lines are the three reference groups.



3.2. Descriptive Statistics

Divided by industry class, Table 1 presents data on the number of firms surviving three, five and seven years following firm foundation.[22] One could suspect that the more advanced and the higher the technology content of the industry is, the higher the entry costs for new firms. Hence, firms entering such industries despite these entry costs could be expected to be stronger than the average entering firm. However, looking at manufacturing firms, no such effect is revealed. Rather, among manufacturing firms, the medium segment in terms of technology content has most survivors.[23]

22. Due to the pooled data, the within-parentheses share of survivors could sometimes be higher, for instance, seven years after birth than five years after birth. The reason for this is the limited time frame of the dataset. Firms with the possibility to survive five years have to be born during 1998-2003, whereas firms with the possibility to survive seven years have to be born during 1998-2001. As an example, we could, in the first case, have five out of ten firms surviving, while three out of five firms could be surviving in the latter case.
23. Note again that some of the groups of born global firms contain very few firms. Therefore, some of the percentages might not be representative.

Table 1. Number of surviving firms, divided by industry, three, five and seven years following firm foundation
Within parentheses is the share of firms surviving three, five and seven years. The manufacturing industry classes are based on the OECD classification of technology content. The KIBS industries are SNI 72-74.

Manufacturing firms

Born global firms (Stringent)	*After 3 years*	*After 5 years*	*After 7 years*
High tech	7 (41%)	3 (33%)	2 (50%)
Mid high tech	20 (65%)	14 (52%)	10 (48%)
Mid low tech	21 (72%)	14 (52%)	8 (40%)
Low tech	23 (48%)	12 (34%)	10 (40%)
Born global firms (Alternative)	*After 3 years*	*After 5 years*	*After 7 years*
High tech	4 (80%)	2 (67%)	1 (100%)
Mid high tech	13 (93%)	10 (83%)	7 (88%)
Mid low tech	21 (95%)	15 (71%)	9 (60%)
Low tech	21 (75%)	13 (52%)	10 (50%)
Born global firms (Modest)	*After 3 years*	*After 5 years*	*After 7 years*
High tech	7 (47%)	5 (33%)	2 (29%)
Mid high tech	30 (64%)	25 (53%)	16 (44%)
Mid low tech	32 (71%)	23 (51%)	16 (50%)
Low tech	36 (60%)	29 (48%)	17 (40%)
New firms	*After 3 years*	*After 5 years*	*After 7 years*
High tech	192 (49%)	95 (35%)	43 (25%)
Mid high tech	494 (53%)	278 (42%)	168 (36%)
Mid low tech	1117 (54%)	644 (43%)	378 (36%)
Low tech	1903 (44%)	1021 (34%)	558 (26%)
New firms exporting	*After 3 years*	*After 5 years*	*After 7 years*
High tech	48 (59%)	28 (51%)	14 (42%)
Mid high tech	144 (75%)	93 (64%)	63 (58%)
Mid low tech	164 (76%)	109 (64%)	74 (59%)
Low tech	246 (68%)	164 (58%)	106 (51%)
Spinoff firms	*After 3 years*	*After 5 years*	*After 7 years*
High tech	35 (67%)	25 (66%)	17 (63%)
Mid high tech	122 (76%)	87 (69%)	51 (58%)
Mid low tech	145 (68%)	96 (56%)	59 (47%)
Low tech	167 (67%)	106 (55%)	66 (47%)

KIBS firms

Born global firms (Stringent)	*After 3 years*	*After 5 years*	*After 7 years*
Computer and related services	3 (21%)	2 (14%)	0 (0%)
R&D	5 (56%)	3 (50%)	2 (50%)
Other business activities	14 (36%)	5 (15%)	4 (16%)
Born global firms (Alternative)	*After 3 years*	*After 5 years*	*After 7 years*
Computer and related services	4 (100%)	3 (75%)	1 (33%)
R&D	4 (100%)	4 (100%)	2 (100%)
Other business activities	12 (80%)	5 (38%)	4 (44%)
Born global firms (Modest)	*After 3 years*	*After 5 years*	*After 7 years*
Computer and related services	8 (40%)	6 (30%)	4 (24%)
R&D	6 (67%)	6 (67%)	4 (67%)
Other business activities	21 (46%)	13 (28%)	7 (21%)
New firms	*After 3 years*	*After 5 years*	*After 7 years*
Computer and related services	2416 (38%)	1235 (28%)	633 (22%)
R&D	130 (40%)	62 (30%)	31 (22%)
Other business activities	8871 (42%)	4658 (31%)	2336 (24%)
New firms exporting	*After 3 years*	*After 5 years*	*After 7 years*
Computer and related services	115 (64%)	85 (57%)	54 (48%)
R&D	29 (74%)	13 (52%)	8 (44%)
Other business activities	337 (71%)	199 (54%)	124 (44%)
Spinoff firms	*After 3 years*	*After 5 years*	*After 7 years*
Computer and related services	215 (59%)	143 (48%)	68 (34%)
R&D	11 (44%)	6 (30%)	3 (23%)
Other business activities	376 (65%)	234 (53%)	125 (42%)

The variables included in the Cox proportional hazard model are described in Table 2. Since we focus on the firms' resource bases, distributed on employee-level and firm-level characteristics, the variables of interest available in the dataset are human capital, gender, age, wages (income) and immigration status. On the firm level, we focus on size, sales, profitability, productivity and equity share. The first four firm-level performance measures are expected to positively influence chances of survival, whereas indebted firms (those with low equity shares) are believed to absorb funds, which is expected to reduce survival chances. We also control for effects related to time, industry classes, regions, and

market concentration by implementing dummies.[24] The firm-level variables are winsorized to remove extreme outliers.[25]

Table 2. Description of variables included in the Cox proportional hazard model

Variable	Definition
Survival	A dummy indicating whether the firm exists the following year
Female	Share of female employees
Age	Average age of employees
Income	Average income of employees, both wage income and business income
Immigrant	Share of immigrants among employees
Schooling1	Share of employees with an upper secondary diploma as highest education
Schooling2	Share of employees with a post secondary education of maximum two years as highest education
Schooling3	Share of employees with a post secondary education of at least three years as highest education
Size	Number of employees
Lp	Labor productivity
Sales	Sales per employee
Profits	Profits over sales
Equity share	Equity over total assets
Entry share	A dummy indicating whether the firm belongs to an industry with an entry share below the median in a particular year

Table 3 presents the descriptive statistics three years after birth for both manufacturing firms and KIBS firms. Based on this table, a few things are worth mentioning about the characteristics of born global firms. Beginning with the manufacturing sample, we see that employees in born global firms (and spin-off firms) seem to have higher average wages than the total bulk of new firms (column 4). This finding is likely explained by there being more educated employees in born global firms (but not in spin-offs). We also see that born global manufacturing firms are larger and more productive, generating higher sales per employee than the reference groups of firms.[26] Performance varies depending on which variable we consider.

24. According to the population ecology theories developed by Hannan and Freeman (1989), the likelihood of a new firm surviving is lower in populations where there are a greater number of other competing new entrants. Competition at the industry level is captured by calculating the median entry share for each industry each year. Firms belonging to industries below this median are assigned the dummy value 1, and those above, 0.
25. Implying that the one percent largest and smallest observations are hereby given the 99th and 1st percentile values, respectively.
26. When comparing size to spinoff firms, one should keep in mind that spinoff firms are naturally large from the beginning.

Table 3. Descriptive statistics for surviving firms three years after birth

Manufacturing firms

	Stringent 183 obs		Alternative 175 obs		Modest 323 obs		New firms 4162-4208 obs		Futrure exporters 687-695 obs		Spinoff firms 523 obs	
	Mean	Sd	Mean	Sd	Mean	Sd	Mean	Sd	Mean	Sd	Mean	Sd
Survival	0,90	0,31	0,90	0,30	0,92	0,28	0,89	0,31	0,92	0,28	0,92	0,27
Female	0,23	0,24	0,25	0,25	0,23	0,26	0,25	0,40	0,21	0,32	0,21	0,21
Age	43,8	7,3	43,9	7,4	43,7	7,6	44,3	10,2	43,64	9,37	43,3	6,1
Income	255921	124898	252002	131279	246560	115118	170414	193077	220621	274861	270175	134992
Immigrant	0,11	0,18	0,12	0,19	0,11	0,20	0,11	0,29	0,11	0,26	0,10	0,16
Schooling1	0,56	0,27	0,55	0,27	0,56	0,29	0,61	0,45	0,57	0,40	0,59	0,25
Schooling2	0,12	0,17	0,13	0,19	0,13	0,20	0,11	0,28	0,14	0,28	0,11	0,15
Schooling3	0,13	0,22	0,13	0,23	0,11	0,22	0,08	0,25	0,10	0,26	0,07	0,14
Size	26,2	29,3	27,2	29,7	20,9	26,5	1,9	3,4	3,66	7,37	22,7	24,2
Lp	536376	331253	524557	337854	518679	392326	309359	390633	434600	515648	497173	311594
Sales	2206676	2198254	2366469	3250671	2116963	2643675	786788	1211993	1514037	2174122	1596476	1922957
Profits	0,02	0,21	0,02	0,22	0,04	0,19	0,23	0,84	0,08	1,06	0,04	0,12
Equity share	0,25	0,24	0,23	0,23	0,24	0,23	0,07	1,11	0,20	0,25	0,24	0,23

KIBS firms

	Stringent 39 obs		Alternative 39 obs		Modest 93 obs		New firms 12018-12284 obs		Futrure exporters 565-572 obs		Spinoff firms 645-542 obs	
	Mean	Sd	Mean	Sd	Mean	Sd	Mean	Sd	Mean	Sd	Mean	Sd
Survival	0,85	0,37	0,87	0,34	0,92	0,27	0,87	0,34	0,85	0,37	0,92	0,27
Female	0,26	0,32	0,21	0,27	0,23	0,30	0,31	0,43	0,26	0,32	0,27	0,28
Age	42,3	8,39	42,7	8,2	43,3	8,9	47,0	11,1	42,26	8,39	40,6	6,6
Income	323811	132808	320245	119872	324461	129281	269424	197164	323811	132808	367619	181577
Immigrant	0,18	0,28	0,14	0,24	0,16	0,29	0,07	0,25	0,18	0,28	0,07	0,14
Schooling1	0,42	0,40	0,47	0,40	0,34	0,36	0,34	0,45	0,42	0,40	0,35	0,29
Schooling2	0,17	0,28	0,17	0,28	0,24	0,32	0,23	0,40	0,17	0,28	0,25	0,23
Schooling3	0,33	0,36	0,28	0,33	0,35	0,36	0,37	0,46	0,33	0,36	0,34	0,32
Size	8,1	12,00	8,00	11,91	6,41	8,98	1,5	1,6	8,05	12,00	11,4	14,0
Lp	524524	489568	520475	507731	513113	434363	451014	460033	524524	489568	656001	442366
Sales	2762756	3964144	3034466	4103204	2230842	2945028	785487	1049570	2762756	3964144	1476486	2565444
Profits	-0,06	0,40	-0,07	0,43	-11,10	86,15	-196,46	16447,17	-0,06	0,40	-1,28	31,80
Equity share	0,28	0,42	0,28	0,43	0,39	0,49	0,19	1,74	0,27	0,36	0,24	0,43

When looking at the KIBS sample, many of these differences between born global firms and other types of firms disappear. The higher share of immigrants among born global firms and future exporters is noteworthy here, which is not surprising since, for exporting firms, it could be advantageous to have employees with experience from foreign countries. Turning to the differences between manufacturing firms and KIBS firms, the most striking is the negative profitability among KIBS firms.[27] Compared to manufacturing firms, KIBS firms are also smaller on average, and their employees have higher wages and are better educated than manufacturing employees.

3.3. Methodology

The Cox proportional hazard model is probably the most widely used method when estimating survival rates and has been dominating empirical analyses since

27. It is, especially, the very large negative average profitability among born global firms of the modest definition and for the total amount of new firms that is striking. These figures are, however, very skewed since the medians show 0.03 and 0.38 for these two samples.

at least the 1990s (Mata and Portugal, 1994; Audretsch and Mahmood, 1995).[28] Different specifications of the Cox proportional hazard model exist (Cox, 1972; Cox and Oakes, 1984). Since our prime interest concerns how a number of covariates influence the probability of firm failure, we will implement a multivariate log linear hazard model of the life duration of firms,

$$\log h_i(t) = \alpha + \beta_1 x_{i1} + \beta_2 x_{i2} + \ldots + \beta_k x_{ik} \quad (1)$$

or, equivalently, with the baseline hazard function $h_0(t)$ unspecified:[29]

$$h_i(t) = h_0(t) * \exp(\beta_1 x_{i1} + \beta_2 x_{i2} + \ldots + \beta_k x_{ik}) \quad (2)$$

The covariates are represented by x, i is a subscript for each observation and β represents the coefficients to be estimated. The baseline hazard $h_0(t)$ refers to the hazard rate that corresponds to x being equal to zero. The Cox proportional hazard model is semiparametric by nature since, even though the baseline hazard can take any form, the covariates enter the model linearly. The results for our covariates, i.e. our employee and firm level variables, are presented below.

4. Results

The results from the Cox proportional hazard estimations are found in Table 4 for the manufacturing sample and in Table 5 for the KIBS sample.[30] Hazard ratios with a ratio larger than one means that there is a lower likelihood of survival, while a hazard ratio smaller than one implies a higher likelihood of survival.

4.1. Born Globals

As regards born global firms, relatively few variables seem to influence survival rates. In the manufacturing sector (Table 4), none of the human capital variables related to education (schooling) exert a positive impact on survival rates. Only weak support is attained for our alternative measure of human capital (employee average wage), and the effect is restricted to the modest definition of born globals.

28. See the Appendix for a more detailed description of the model.
29. The unspecified baseline hazard function is one of the characterizing features of the Cox model. The natural log of the baseline hazard rate can be considered a constant in the model. This component expresses the hazard rate changes as a function of survival time, whereas the covariate vector expresses the natural log of the hazard rate as a function of the covariates (Hosmer and Lemeshow, 1999).
30. Note that the alternative definition generates too small sample variance to conduct a robust estimation. Hence, no regression results are presented for this alternative of born globals in the KIBS sector.

Hence, while Hypothesis 1a is rejected, we find some support for Hypothesis 1b, while the influence of employee experience (age) did not attain any significance.

Turning to Hypothesis 2, the immigrant variable is rejected for two of the three born global definitions in the manufacturing firms, whereas the gender variable is shown to be positive but insignificant. In fact, the results reveal that immigrants significantly lower the probability of survival (coefficient larger than one). This to some extent contradicts Becker's (1957) model of discrimination, indicating adverse selection or moral hazard problems. In addition, only *Size* (Hypothesis 3a) is significant among the firm-level variables, while Hypotheses 3b and 3c cannot be confirmed.

For born globals in the KIBS industry (Table 5), firms with high shares of employees holding a degree from a long post-secondary education seem to increase the chances of survival (Schooling 3). Hence, our Hypothesis 1a is partly confirmed for born globals in the KIBS industry. The remaining human capital variables (H1b—wage, and H1c—experience) are positive (coefficient is below one) but insignificant. A negative relationship between a larger share of foreign employees and survival is shown to prevail also for born global KIBS firms, while the gender variable is positive but fails to attain significance. This finding contradicts Hypothesis 2.

Among the firm-level variables, both productivity and equity share are strongly significant for our stringent definition of born globals. Consequently, Hypotheses 3b and 3c are partly confirmed. All the hazard ratios on KIBS firm-level performance are below one (but insignificant), indicating a positive influence on survival.

4.2. Control Groups

Comparing born globals to the control groups, we see considerably more significant hazard ratios, particularly when we look at all new firms (last columns of Tables 4 and 5). It is only the gender variable in the manufacturing sample that does not show a significant impact on hazard ratios when the entire sample of new firms is investigated.

Focusing on the impact of education for survival, only future exporters in the KIBS-sector seems positively influenced, whereas no significant effects could be identified for spin-offs in either sector. Using average wages to approximate human capital, considerably stronger support is reported (the exception being future exporters in the manufacturing sector), which basically confirms Hypothesis 1b. On the other hand, experience (average age of employees) is only supported for spin-offs in the KIBS-sector. However, using an alternative age variable where we separate between three different age groups (below the age of 30, between 30 and 50 and above 50 years old), the estimations reveal a higher likelihood of survival for firms with higher shares of employees in the 30 to 50

years cohort.[31] This is also in accordance with the age-productivity findings described in Skirbekk (2008). Thus, Hypothesis 1c is weakly supported.

Similar to the born global firms, the estimations for the control groups reveal a negative or insignificant effect of higher shares of foreign employees. Moreover, the only case where higher shares of female employees seem to enhance survival rates is when we consider all new firms in the KIBS sector. Hence, Hypothesis 2 is basically rejected.

Turning to the firm-level variables in the control groups, size positively influences survival of manufacturing start-ups and is also found to have a stronger positive effect on firms in the KIBS-sector. The latter result contradicts the findings for born globals where size did not influence survival in the KIBS-sector. Hypothesis 3a is thus supported.

For the remaining firm-level effects, labor productivity is shown to negatively impact survival when all startups are included which contradicts expectations and is insignificant for future exporters and spin-offs. Likewise, for the spin-offs and future exporters, sales per employee exerts a negative impact on firm survival except for spin-offs in the manufacturing sector. On the other hand, profitability is shown to have a robust positive effect on survival for all control groups in both sectors. This implies that the results provide ambiguous support for Hypothesis 3b. The additional firm-level performance variable equity has the expected positive and significant impact on survival in five out of the six estimations, basically supporting our Hypothesis 3c.

Finally, we conclude from the statistics presented in Section 3 that the survival rate of spin-offs are among the highest as compared to other start-ups, but not always the highest. Consequently Hypothesis 4 is rejected.

31. Estimation not shown but available on request. This holds for both manufacturing and KIBS firms.

Table 4. Results from the Cox proportional hazard estimations — manufacturing firms

Manufacturing firms						
	Born globals			*Control groups*		
	Stringent	*Alternative*	*Modest*	*Spinoff firms*	*Future exporters*	*New firms*
Employee variables						
Female	0.611	0.972	0.775	0.840	1.204	1.075
	[0.292]	[0.724]	[0.413]	[0.323]	[0.173]	[0.044]
Age	0.999	1.056	1.010	0.990	1.006	0.997***
	[0.019]	[0.054]	[0.018]	[0.013]	[0.005]	[0.001]
Wage	0.892	0.879	0.708*	0.745**	0.968	0.961***
	[0.092]	[0.387]	[0.146]	[0.105]	[0.068]	[0.010]
Immigrant	2.706**	1.933	2.570***	1.568	1.473**	1.152***
	[1.362]	[2.020]	[0.774]	[0.695]	[0.237]	[0.053]
Schooling1	1.138	0.897	1.340	0.592	0.949	0.844***
	[0.652]	[0.777]	[0.478]	[0.244]	[0.157]	[0.034]
Schooling2	1.085	0.701	0.986	0.520	0.930	0.759***
	[0.107]	[0.880]	[0.426]	[0.293]	[0.206]	[0.042]
Schooling3	1.058	1.805	0.833	1.234	0.715	0.744***
	[0.767]	[2.502]	[0.684]	[0.814]	[0.173]	[0.044]
Firm level variables						
Size	0.621**	0.579	0.483**	0.737***	0.631***	0.756***
	[0.119]	[0.213]	[0.145]	[0.058]	[0.067]	[0.032]
Lp	1.007	1.024	0.982	1.018	0.988	1.014***
	[0.023]	[0.046]	[0.025]	[0.025]	[0.008]	[0.003]
Sales	0.961	0.831	1.133	1.085	1.162**	0.896***
	[0.159]	[0.239]	[0.151]	[0.107]	[0.069]	[0.012]
Profits	0.978	0.968	0.947	0.938***	0.966***	0.969***
	[0.034]	[0.059]	[0.040]	[0.014]	[0.012]	[0.004]
Equity share	1.045	2.860	1.280	0.551***	0.991	0.983***
	[0.737]	[2.741)	[0.949]	[0.166]	[0.012]	[0.006]
Observations	645	501	1152	3868	4962	33550

Note: Control variables (dummies for time, industry class, regions and market concentration) are included but not reported in the estimations. Robust standard errors in brackets. * significant at 10%; ** significant at 5%; *** significant at 1%.

Table 5. Results from the Cox proportional hazard estimations — KIBS firms

KIBS firms						
	Born globals			*Control groups*		
	Stringent	*Alternative*	*Modest*	*Spinoff firms*	*Future exporters*	*New firms*
Employee variables						
Female	0.468	-	0.633	1.196	0.932	0.933***
	[0.248]	-	[0.299]	[0.233]	[0.173]	[0.013]
Age	0.997	-	0.993	0.984**	0.997	0.987***
	[0.022]	-	[0.018]	[0.008]	[0.006]	[0.001]
Wage	0.922	-	0.891	0.862***	0.901**	0.966***
	[0.159]	-	[0.126]	[0.043]	[0.037]	[0.004]
Immigrant	2.524*	-	2.176*	1.754*	1.137	1.079***
	[1.234]	-	[0.919]	[0.544]	[0.222]	[0.027]
Schooling1	0.403	-	0.443	0.897	0.505***	0.777***
	[0.252]	-	[0.316]	[0.410]	[0.132]	[0.024]
Schooling2	0.449	-	0.551	1.081	0.616*	0.797***
	[0.327]	-	[0.391]	[0.470]	[0.162]	[0.027]
Schooling3	0.184**	-	0.216**	0.854	0.396***	0.764***
	[0.124]	-	[0.155]	[0.367]	[0.108]	[0.023]
Firm level variables						
Size	0.873	-	0.811	0.651***	0.915	0.702***
	[0.364]	-	[0.237]	[0.052]	[0.095]	[0.019]
Lp	0.959**	-	0.969	0.994	0.987	1.017***
	[0.028]	-	[0.027]	[0.011]	[0.010]	[0.002]
Sales	0.871	-	0.892	1.452***	1.136**	0.851***
	[0.147]	-	[0.148]	[0.098]	[0.066]	[0.005]
Profits	0.997	-	0.991	0.939***	0.951***	0.979***
	[0.046]	-	[0.045]	[0.010]	[0.011]	[0.002]
Equity share	0.084***	-	0.676	0.681**	0.926***	0.998***
	[0.065]	-	[0.500]	[0.124]	[0.024]	[0.000]
Observations	242	-	476	4904	3862	108624

Note: The estimations in the second column produce no results due to smallness of the sample. Control variables (dummies for time, industry class, regions and market concentration) are included but not reported in the estimations. Robust standard errors in brackets. * Significant at 10%; ** significant at 5%; *** significant at 1%.

5. Discussion

We have investigated how the resource base of born globals, distributed on employee- and firm-level characteristics, influences their survival rate compared to three control groups. To the best of our knowledge, no previous attempt has been made to differentiate between these factors when analyzing the survival

rates of born global firms. Furthermore, instead of applying qualitative data to these firms, as has been done in much of the previous literature, this analysis implements longitudinal quantitative data.

The findings reveal a clear but piecemeal influence of employee characteristics on firm survival among born global firms. We also find some sectoral differences between born globals in the manufacturing and KIBS industries. Given that we are looking at knowledge-intensive services, it is not surprising that higher education has a more distinct influence on born globals in the KIBS sector, as well as on KIBS startups more generally (future exporters and new firms), than in the manufacturing sector.

For the manufacturing sector, other skills seem more important, particularly among born globals. This may reflect that the globalization process looks different for the two sectors, where the importance of, for example, proximity and local presence may differ. Somewhat surprising, there is very little evidence of diversity (gender and foreign-born employees) having a positive impact on the survival rates of born globals. A conceivable explanation is lower productivity for those groups and very limited room in the Swedish institutional context to compensate for such differences through wages. Yet, this partly contradicts previous, albeit more general, findings that foreign-born employees facilitate access to foreign markets (Hatzigeorgiou and Lodefalk, 2016). Additionally, among the firm-level variables, it intuitively makes sense that size and economies of scale exert a more pronounced influence among born globals in the manufacturing sector, being more capital-intensive, than among KIBS firms.

When we increase the sample of new firms to include spinoff firms, future exporters and, ultimately, all new firms, more evidence is found on the importance of having the correct mix of resources for firm survival. This is particularly true for the samples including future exporters and the total bulk of new firms, where all the education variables are reported to be significant. Spinoff firms, where employees have previous work experience from private firms, deviate. In this case, human capital is likely to be reflected in the wage variable, which is also shown to be significant. For KIBS firms, experience (age) is also shown to be positively related to survival. Having access to other forms of human capital than education thus seem to matter more for spinoff firms.[32] Regarding firm level variables, size, profits and equity are shown to be important factors for survival. Again, these findings are likely to mirror the different origins of firms, where, for instance, spinoffs are acquired from former owners, implying that profits are important to serve debts.

The significant and expected results on almost all the variables' hazard ratios when all new firms are considered indicate that born globals and spinoffs are dependent on more heterogeneous and firm-specific resources. Born globals may be active in highly specialized niches, where firms' competitiveness may be

32. See Prokop et al. (2019) for factors influencing survival of spin-offs.

attributed to a few key individuals, a software or a patent. An alternative explanation is that born globals may source strategic inputs in a different way and related to other criteria than those found in our data.

6. Conclusion

The resource-base a firm possesses constitutes a mix of different skills and firm-specific attributes. How these resources complement and reinforce each other and the extent to which they enable flexibility and continuous knowledge upgrading will shape firms' competitive advantage and hazard rates. In the present analysis, we have decomposed firms' resources into employee- and firm-level characteristics and estimated their respective importance for firm survival. Our focus has been on born globals, even though we compare with other types of start-ups that are included as controls.

This is an area where previous research is scarce. Still, knowledge about the determinants of survival is critically important not only for management but also for policymaking. The survival of firms is a selection process in which stronger and more competitive firms outperform less efficient ones. Obviously, only surviving firms are able to contribute to employment growth, innovation activities, tax revenues, etc. for an individual country. Hence, it is important to enhance our insights about the factors that influence firm survival in order to generate a better outcome at the macro-level.

Our results reveal that there are sector-specific differences between born global firms in the manufacturing sector and those in the knowledge-intensive service (KIBS) sector. Their respective resource requirements to survive look different. This should be a valuable insight for managers, but even more so for policymakers where "one-size-fits-all" approaches often characterize different policy measures. In addition, there are also clear firm-level differences regarding the relevant resource base, depending on firms' origin and ambitions to internationalize. Spinoffs come with another set of competencies and experiences than those of a more genuine start-up.

Still, we have only touched upon issues that deserve considerably more attention. One task to further elaborate in this context is the sourcing of knowledge through networks and new ways of organizing production. Similarly, other groups of covariates should be included in the analysis to enhance our understanding of the factors that determine the survival of born global firms.

In light of an increasingly globally competitive environment for new and small firms, studies attempting to explain hazard rates of firms striving to acquire foreign market shares are highly relevant. Since data sources in many countries are steadily improving and providing researchers with better and longer time series, the linking of the quantitative data of firms to those of their founders and entrepreneurs would, in future studies, contribute to a better understanding of who becomes a successful born global entrepreneur.

References:

Agarwal, R., Raj, E., Franco, A.M. and Sarkar, M.B. (2004), "Knowledge Transfer Trough Inheritance: Spinout Generation, Development and Survival", *Academy of Management Journal*, 47(4), p 501-522.

Almor, T. (2013), "Conceptualizing Paths of Growth for Technology-Based Born-Global Firms Originating in a Small-Population, Advanced Economy", *International Studies of Management & Organization*, 43(2), p 56-78.

Almor, T., Tarba, S.Y. and Margalit, A. (2014), "Maturing, Technology-Based, Born-Global Companies: Surviving Through Mergers and Acquisitions", *Management International Review*, 54(4), p 421-444.

Andersson, M. and Klepper, S. (2013), "Characteristics and Performance of New Firms and Spinoffs in Sweden", *Industrial and Corporate Change*, 22(1), p 245-280.

Andersson, S., Danilovic, M. and Hanjun, H. (2015), "Success Factors in Western and Chinese Born Global Companies", *iBusiness*, 7(1), p 25-38.

Atkinson, C., Mallett, O. and Wapshott, R. (2014), " 'You Try To Be a Fair Employer': Regulation and Employment Relationships in Medium-Sized Firms", *International Small Business Journal*, 34(1), p 16-33.

Audretsch, D. (1989), "The Technological Regime and Small-Firm Turbulence", *International Small Business Journal*, 9(1), p 80-97.

Audretsch, D. (1995), "Innovation, Growth and Survival", *International Journal of Industrial Organization*, 13(4), p 441-457.

Audretsch, D. and Mahmood, T. (1995), "New Firm Survival: New Results Using a Hazard Function", *Review of Economics and Statistics*, 77(1), p 97-103.

Autio, E., Sapienza, H. and Almeida. J. (2000), "Effects of Age at Entry, Knowledge Intensity, and Imitability on International Growth", *Academy of Management Journal*, 43(5), p 909-924.

Becker, G.S. (1957), *The Economics of Discrimination*, Chicago, IL: University of Chicago Press.

Bernard, A.B., Bradford Jensen, J., Redding, S.J. and Schott, P.K. (2007), "Firms in International Trade", *Journal of Economic Perspectives*, 21(3), p 105-130.

Box, M., Gratzer, K. and Lin, X. (2017), "New-Firm Survival in Sweden: New Methods and Results", *International Review of Entrepreneurship*, 15(4), p 431-464.

Brambilla, I., Lederman, D. and Porto, G. (2012), "Exports, Export Destinations, and Skills", *American Economic Review*, 102(7), p 3406-38.

Braunerhjelm, P. (1999), "Sunk Costs, Firm Size, and Internationalization", *Review of World Economics*, 135(4), p 657-674.

Braunerhjelm, P. and Halldin, T. (2019), "Born Globals—Presence, Performance and Prospects", *International Business Review*, 28(1), p 60-73.

Carr, J., Haggard, K., Hmieleski, K. and Zahra, S. (2010), "A Study of the Moderating Effects of Firm Age at Internationalization on Firm Survival and Short-Term Growth", *Strategic Entrepreneurship Journal*, 4(2), p 183-192.

Cavusgil, S. and Knight, G. (2015), "The Born Global Firm: An Entrepreneurial and Capabilities Perspective on Early and Rapid Internationalization", *Journal of International Business Studies*, 46(1), p 3-16.

Chang, S.-J. and Rhee, J. (2011), "Rapid FDI Expansion and Firm Performance", *Journal of International Business Studies*, 42(8), p 979-994.

Chetty, S. and Campbell-Hunt, C. (2004), "A Strategic Approach to Internationalization: A Traditional Versus a 'Born-Global' Approach",

Choquette, E., Raks, M., Sala, D. and Schröder, P. (2017), "Born Globals—Is There Fire Behind the Smoke?", p 448-460.

Coviello, N. (2015), "Re-Thinking Research on Born Globals", *Journal of International Business Studies*, 46(1), p 17-26.

Cox, D.R. (1972), "Regression Models and Life Tables", *Journal of the Royal Statistical Society*, 34(2), p 187-220.

Cox, D.R. and Oakes, D. (1984), *Analysis of Survival Data*. London: Chapman and Hall.

Czaja, S. and Sharit, J. (1993), "Age Differences in the Performance of Computer-Based Work", *Psychology and Aging*, 8(1), p 59-67.

De Clercq, D., Sapienza, H., Yavuz, R. and Zhou, L. (2012), "Learning and Knowledge in Early Internationalization Research: Past Accomplishments and Future Directions", *Journal of Business Venturing*, 27(1), p 143-165.

Dolton, P.J. and Van der Klauw, W. (1995), "Leaving Teaching in the UK: A Duration Analysis", *Economic Journal*, 105(429), p 431-444.

Dunne, T., Roberts, M.J. and Samuelson, L. (1988), "Patterns of Firm Entry and Exit in US Manufacturing Industries", *RAND Journal of Economics*, 19(4), p 495-515.
Efrat, K. and Shoham, A. (2012), "Born Global Firms: The Differences Between Their Short- and Long-Term Drivers", *Journal of World Business*, 47(4), p 675-685.
Eliasson, K., Hansson, P., and Lindvert, M. (2012), "Do Firms Learn by Exporting or Learn to Export? Evidence From Small and Medium-Sized Enterprises", *Small Business Economics*, 39(2), p 453-472.
Eriksson, T. and Kuhn, J. (2006), "Firm Spin-Offs in Denmark 1981-2000—Patterns of Entry and Exit", *International Journal of Industrial Organization*, 24(5), p 1021-1040.
Esteve-Pérez, S. and Máñez-Castillejo, J. (2008), "The Resource-Based Theory of the Firm and Firm Survival", p 231-249.
Etemad, H. and Wright, R. (2003), "Internationalization of SMEs: Toward a New Paradigm", *Small Business Economics*, 20(1), p 1-4.
Eurofound (2016), *Job Creation in SMEs: ERM Annual Report 2015.* Luxembourg: Publications Office at the European Union.
Fan, T. and Phan, P. (2007), "International New Ventures: Revisiting the Influences Behind the 'Born-Global' Firm", p 1113-31
Faroque, A., Mostafiz, M., Kuivalainen, O. and Sundqvist, S. (2020), "Prior Experience and Export Performance: The Missing Link of Global Vision", *International Review of Entrepreneurship*, 18(1), p 73-98.
Fernhaber, S., McDougall, P. and Oviatt, B. (2007), "Exploring the Role of Industry Structure in New Venture Internationalization", *Entrepreneurship Theory and Practice*, 31(4), p 517-542.
Freeman, S., Edwards, R. and Schroder, B. (2006), "How Smaller Born-Global Firms Use Networks and Alliances to Overcome Constraints to Rapid Internationalization", *Journal of International Marketing*, 14(3), p 33-63.
Fukuda, K. (2013), "Decomposition of New Venture Growth into Firm Age, Survey Period and Vintage Effects", *Applied Economics*, 45(1), p 85-97.
Gabrielsson, P. and Gabrielsson, M. (2013), "A Dynamic Model of Growth Phases and Survival in International Business-to-Business Ventures: The Moderating Effect of Decision-Making Logic", *Industrial Market Management*, 42(8), p 1357-73.
Gabrielsson, M. and Kirpalani, V. (Eds.) (2012), *Handbook of Research on Born Globals*. Cheltenham, UK: Edward Elgar Publishing.
Gabrielsson, M., Kirpalani, V., Dimitratos, P., Solberg, C.A and Zuchella, A. (2008), "Born Globals: Propositions to Help Advance the Theory", *International Business Review*, 17(4), p 385-401.
Grazzi, M. and Moschella, D. (2018), "Small, Young, and Exporters: New Evidence on the Determinants of Firm Growth", *Journal of Evolutionary Economics*, 28(1), p 125-152.
Hannan, M.T. and Freeman, J. (1989), *Organizational Ecology.* Cambridge, MA: Harvard University Press.
Hashai, N. (2011), "Sequencing the Expansion of Geographic Scope and Foreign Operations by 'Born Global' Firms", p 995-1015.
Hatzigeorgiou, A. and Lodefalk, M. (2016), "Migrants' Influence on Firm-Level Exports", *Journal of Industry, Competition and Trade*, 16(4), p 477-497.
Heckman, J. and Singer, B. (1984), "A Method for Minimizing the Impact of Distributional Assumptions in Econometric Models for Duration Data", *Econometrica*, 52(2), p 271-320.
Hitt, M., Hoskisson, R. and Kim, H. (1997), "International Diversification: Effects on Innovation and Firm Performance in Product-Diversified Firms", *Academy of Management Journal*, 40(4), p 767-798.
Hornsby, J. and Kuratko, D. (2003), "Human Resource Management in U.S. Small Businesses: A Replication and Extension", *Journal of Developmental Entrepreneurship*, 8(1), p 73-92.
Hosmer, D. and Lemeshow, S. (1999), *Applied Survival Analysis*. New York: Wiley.
Huselid, M., Jackson, S. and Schuler, R. (2017), "Technical and Strategic Human Resources Management Effectiveness as Determinants of Firm Performance", *Academy of Management Journal*, 40(1), p 171-188.
Hymer. S. (1976), *International Operations of National Firms.* Boston, MA: MIT Press.
Johanson, J., and Vahlne, J.-E. (1977); "The Internationalization Process of the Firm—A Model of Knowledge Development and Increasing Foreign Market Commitment", *Journal of International Business Studies*, 8(1), p 23-32.
Johanson, J., and Vahlne, J.-E. (1990), "The Mechanism of Internationalization", *International Marketing Review*, 7(4), p 11-24.

Johanson, J. and Vahlne, J-E. (2006), "Commitment and Opportunity Development in the Internationalization Process: A Note on the Uppsala Internationalization Process Model", *Management International Review*, 46(2), p 165-178.
Johanson, J. and Vahlne, J.E. (2009), "The Uppsala Internationalization Process Model Revisited: From Liability of Foreignness to Liability of Outsidership", *Journal of International Business Studies*, 40(9), p 1411-31.
Jones, M. and Coviello, N. (2005), "Internationalization: Conceptualizing an Entrepreneurial Process of Behavior in Time", *Journal of International Business Studies*, 36(3), p 284-303.
Jovanovic, B. (1982), "Selection and Evolution in Industry", *Econometrica*, 50(3), p 649-670.
Keupp, M. and Gassmann, O. (2009), "The Past and the Future of International Entrepreneurship: A Review and Suggestions for Developing the Field", *Journal of Management*, 35(3), p 600-633.
Kitching, J. (2016), "Between Vulnerable Compliance and Confident Ignorance: Small Employers, Regulatory Discovery Practices and External Support Networks", *International Small Business Journal*, 34(5), p 601-617.
Klepper, S. (2009), "Spinoffs: A Review and Synthesis", *European Management Review*, 6(3), p 159-171.
Klepper, S. and Sleeper, S. (2005), "Entry by Spinoffs", *Management Science*, 51(8), p 1291-1306.
Knight, G.A. and Cavusgil, S.T. (1996), "The Born Global Firm: A Challenge to Traditional Internationalization Theory", In: S.T. Cavusgil and T.K. Madsen (Eds.), *Export Internationalizing Research—Enrichment and Challenges. Advances in International Marketing*, New York: JAI Press.
Knight, G.A. and Cavusgil, S.T. (2004), "Innovation, Organizational Capabilities, and the Born-global Firm", *Journal of International Business Studies*, 35(2), p 124-141.
Koch, A., Späth, J. and Strotmann, H. (2013); "The Role of Employees for Post-Entry Firm Growth",
Kotey, B. and Folker, C. (2007), "Employee Training in SMEs: Effect of Size and Firm Type — Family and Nonfamily", *Journal of Small Business Management*, 45(2), p 214-238.
Krieger, A., Block, J. and Stuetzer, M. (2018), "Skill Variety in Entrepreneurship: A Literature Review and Research Directions", *International Review of Entrepreneurship*, 16(1), p 29-62.
Laantia, R., Gabrielsson, M. and Gabrielsson, P. (2007), "The Globalization Strategies of Business-to-Business Born Global Firms in the Wireless Technology Industry", *Industrial Marketing Management*, 36(8), p 1104-1117.
Lazear, E. (2005), "Entrepreneurship", *Journal of Labor Economics*, 23(4), p 649-680.
Lee, H., Kelley, D., Lee, J. and Lee, S. (2012), "SME Survival: The Impact of Internationalization, Technology Resources, and Alliances", *Journal of Small Business Management*, 50(1), p 1-19.
Love, J. and Roper, S. (2015), "SME Innovation, Exporting and Growth: A Review of Existing Evidence", *International Small Business Journal*, 33(1), p 22-48.
Mata, J. and Portugal, P. (1994), "Life Duration of New Firms", *Journal of Industrial Economics*, 42(3), p 227-245.
Matthew, J. and Zander, I. (2007); "The International Entrepreneurial Dynamics of Accelerated Internationalization", *Journal of International Business Studies*, 38(3), p 387-403.
McAuley, A. (1999), "Entrepreneurial Instant Exporters in the Scottish Arts and Crafts Sector", *Journal of International Marketing*, 7(4), p 67-82.
McDougall, P.P., Shane, S. and Oviatt, B.M. (1994), "Explaining the Formation of International New Ventures: The Limits of Theories from International Business Research", *Journal of Business Venturing*, 9(6), p 469-487.
McKinsey & Co. (1993), *Emerging Exporters: Australia's High Value-Added Manufacturing Exporters*. Melbourne: McKinsey and Company and the Australian Manufacturing Council.
Mishina, Y., Pollock, T. and Porac, J. (2004), "Are More Resources Always Better for Growth? Resource Stickiness in Market and Product Expansion", *Strategic Management Journal*, 25(12), p 1179-97.
Mudambi, R. and Zahra, S (2007), "The Survival of International New Ventures", *Journal of International Business Studies*, 38(2), p 333-352.
Myerson, J., Hale, S., Wagstaff, D., Ponn, L.W. and Smith, G.A. (1990), "The Information Loss Model: A Mathematical Theory of Age-related Cognitive Slowing", *Psychological Review*, 97(4), p 475-486.
Onkelinx, J., Manolova, T. and Edelman, L. (2016), "Human Capital and SME Internationalization: Empirical Evidence from Belgium", *International Small Business Journal*, 34(6), p 818-837.
Oviatt, B.M. and McDougall, P.P. (1994), "Toward a Theory of International New Ventures", *Journal of International Business Studies*, 25(1), p 45-64.

Oviatt, B.M. and McDougall, P.P. (2005), "Defining International Entrepreneurship and Modeling the Speed of Internationalization", *Entrepreneurship Theory and Practice*, 29(5), p 537-553.
Oyna, S. and Alon, I. (2018), "A Review of Born Globals", *International Studies of Management & Organization*, 48(2), p 157-180.
Parastuty, Z. (2018), "Systematic Review of Research on Exit: A Bibliometric Analysis and Future Directions", *International Review of Entrepreneurship*, 16(4), p 587-629.
Peña, I. (2002), "Intellectual Capital and Business Start-Up Success", p 180-198.
Penrose, E. (1959), *The Theory of the Growth of the Firm*. New York: John Wiley and Sons.
Prashantham, S. and Young, S. (2011), "Post-Entry Speed of International New Ventures", *Entrepreneurship Theory and Practice*, 35(2), p 275-292.
Prokop, D., Huggins, R. and Bristow, G. (2019), "The Survival of Academic Spinoff Companies: An Empirical Study of Key Determinants", *International Small Business Journal*, 37(2), p 502-535.
Rauch, A., Frese, M. and Utsch, A. (2005), "Effects of Human Capital and Long-term Human Resources Development and Utilization on Employment Growth of Small-scale Businesses: A Causal Analysis", *Entrepreneurship Theory and Practice*, 29(6), p 681-698.
Rialp, A., Rialp, J. and Knight, G.A. (2005), "The Phenomenon of Early Internationalizing Firms: What Do We Know After a Decade (1993–2003) of Scientific Inquiry?", *International Business Review*, 14(2), p 147-166.
Rialp, A., Rialp, J. and Knight, G. (2014), "International Entrepreneurship: A Review and Future Directions", In: Fernhaber, S. and Prashantham, S. (Eds.), *The Routledge Companion to International Entrepreneurship*, pp. 7-28. London: Routledge.
Rugman, A., Verbeke, A. and Nguyen, Q. (2011), "Fifty Years of International Business Theory and Beyond", *Management International Review*, 51(6), p 755-786.
Rutherford M.W., Buller, P.F. and McMullen, P.R. (2003), "Human Resource Management Problems Over the Life Cycle of Small to Medium-Sized Firms", *Human Resource Management*, 42(4), p 321-335.
Salomon, R. and Wu, Z. (2012), "Institutional Distance and Local Isomorphism Strategy", *Journal of International Business Studies*, 43(4), p 342-367.
Sapienza, H.J., Autio, E., George, G. and Zahra, S.A. (2006), "A Capabilities Perspective on the Effects of Early Internationalization on Firm Survival and Growth", *Academy of Management Review*, 31(4), p 914-933.
Saridakis, G., Mole, K. and Storey, D.J. (2008), "New Small Firm Survival in England", *Empirica*, 35(1), p 25-39.
Sharfman, M., Wolf, G., Chase, R. and Tansik, D. (1988), "Antecedents of Organizational Slack", *Academy of Management Review*, 13(4), p 601-614.
Skirbekk, V. (2008), "Age and Productivity Capacity: Descriptions, Causes and Policy Options", *Ageing Horizons*, 8, p 4-12.
Sleuwaegen, L. and Onkelinx, J. (2014), "International Commitment: Post-Entry Growth and Survival of International New Ventures", *Journal of Business Venturing*, 29(1), p 106-120.
Stinchcombe, A.L. (1965), "Organizations and Social Structure", In: J.G. March (Ed.), *Handbook of Organizations*, pp. 153–193. Chicago, IL: Rand-McNally.
Sui, S. and Baum, M. (2014), "Internationalization Strategy, Firm Resources and the Survival of SMEs in the Export Market", *Journal of International Business Studies*, 45(7), p 821-841.
Unger, J.M., Rauch, A., Frese, M. and Rosenbusch, N. (2011), "Human Capital and Entrepreneurial Success: A Meta-Analytical Review", *Journal of Business Venturing*, 26(3), p 341-358.
Vernon, R. (1966), "International Investment and International Trade in the Product Cycle", *Quarterly Journal of Economics*, 80(2), p 190-207.
Vernon, R. (1971), *Sovereignty at Bay: The Multinational Spread of US Enterprises*. New York: Basic Books.
Wan, P., Hoskisson, R., Short, J. and Yiu, W. (2011), "Resource-Based Theory and Corporate Diversification: Accomplishments and Opportunities", *Journal of Management*, 37(5), p 1335-68.
Weerawardena, J., Mort, G.S., Liesch, P.W. and Knight, G. (2007), "Conceptualizing Accelerated Internationalization in the Born Global Firm: A Dynamic Capabilities Perspective", *Journal of World Business*, 42(3), p 294-306.
Westhead, P., Wright, M. and Ucbasaran, D. (2001), "The Internationalization of New and Small Firms: A Resource-Based View", *Journal of Business Venturing*, 16(4), p 333-358.
World Bank (2019), *Doing Business 2019: Training for Reform*. Washington DC: World Bank (http://www.worldbank.org/content/dam/doingBusiness/media/Annual-Reports/English/DB2019-report_web-version.pdf).

Zaheer, S. and Mosakowski, E. (1997), "The Dynamics of the Liability of Foreignness: A Global Study of Survival in Financial Services", *Strategic Management Journal*, 18(6), p 439-463.
Zahra, S.A., Ireland, R.D. and Hitt, M.A. (2000), "International Expansion by New Venture Firms: International Diversity, Mode of Market Entry, Technological Learning, and Performance", *Academy of Management Journal*, 43(5), p 925-950.
Zander, I., McDougall-Covin, P. and Rose, E.L. (2015), "Born Globals and International Business: Evolution of a Field of Research", *Journal of International Business Studies*, 46(1), p 27-35.
Zhang, T. and Acs, Z. (2019), "Does Generation Matter to Entrepreneurship? Four Generations of Entrepreneurs", *Southern Economic Journal*, 86(2), p 459-477.
Zhou, L., Barnes, B.R. and Lu, Y. (2010), "Entrepreneurial Proclivity, Capability Upgrading and Performance Advantage of Newness Among International New Ventures", *Journal of International Business Studies*, 41(5), p 882-905.

Appendix

Survival analysis focuses on the distribution of survival times across firms and the standard methodology is the Cox proportional hazard model. The advantage of the Cox proportional hazard model is its unspecified baseline hazard function whereas more traditional estimation techniques, e.g., OLS, assume a specific form that may be improperly chosen and thus render unreliable estimates (Heckman and Singer, 1984). In addition, the Cox hazard model is proportional in that all subjects face the same underlying hazard, which is only proportionally changed as a set of explanatory variables change.

Hence, the potential problem of unobserved heterogeneity that might be present when the baseline hazard function is not properly specified is overcome by the choice of the Cox proportional hazard model (Dolton and Van der Klauw, 1995). It explicitly takes into account the time it takes for an event to occur, which in our case is the exit of firms. Standard estimation techniques cannot account for firms that do not fail within a given period (right-censored variables). This problem is circumvented using hazard models. The basic structure of the model is as follows:

Let T denote the survival time, i.e., the time to death, with the cumulative distribution function $F(t) = \Pr(T \leq t)$ and probability density function $f(t) = dF(t)/dt$. The complement to the cumulative distribution function, i.e., the survival function, S(t), can then be written as,

$$S(t) = \Pr(T > t) = 1 - F(t) \tag{A1}$$

which denotes the probability of survival beyond time t. The instantaneous rate of failure at time t, conditional on survival until that time, is represented by the hazard function h(t):

$$h(t) = \lim_{\Delta t \to 0} \frac{\Pr\left[\left(t \leq T < t + \Delta t\right) \middle| T \geq t\right]}{\Delta t} = \frac{f(t)}{s(t)} \tag{A2}$$

The lower the hazard rate is, the lower the risk of failure at that exact moment. There are a number of ways to model the hazard function. For instance, a constant hazard, $h(t) = v$, implies that the survival times are exponentially distributed with density function $f(t) = v*\exp(-vt)$. We have however chosen to implement the multivariate log linear hazard model described in Section 3.