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Factors Determining the Survival of New Companies

Abstract

This article discusses the determinants of the survival of new companies, with particular emphasis on their sources of financing. We have analysed the impact of experience in the same focal industry, of having a competitive advantage and intellectual property rights (patents and trademarks) and of debt financing on the probability of a start-up's survival, using a logit model based on the Kauffman Firm Survey (KFS) database data covering 4,928 American companies which operated from 2004 to 2011. Additionally, we can demonstrate that start-ups that use debt financing have a better chance of staying in business. Factors such as intellectual capital and competitive advantage are also positively correlated with the prospects for start-up survival.

Keywords

start-up | survival of new companies | sources of financing

JEL Codes

M13, G30

1 Introduction

Entrepreneurship is considered to be a major factor of socio-economic development and one of the key conditions for the competitiveness of the country's economy. One of the embodiments of entrepreneurship is the start-up of new companies. Newly founded businesses that are in the development phase are called start-ups. The definition of this concept is not clear and different authors distinguish different characteristics of start-ups. This article adopts a universal definition that says that a start-up is a venture focused on future profits and therefore burdened with uncertainty. Such a company is at the initial stage of its life cycle, which is characterised by constant changes resulting from customer needs.

Economic performance, which is measured also by the number of start-ups, is a very important predictor of both economic growth and the development of a sustainable and innovative economy today. In 2017, 361,143 new entities were registered in the Polish economy, which means an increase by 3.4% compared to the number of new entities registered in 2016; however, it is estimated that by only about half of the start-ups can survive on the market by the third year

of operations (GUS, 2017). Statistics show that new companies are more prone to failure than success. Therefore, it is worth analysing research conducted so far to examine what we know about the determinants of the survival of new businesses, what is conducive to their success, and what entrepreneurs should avoid.

This article aimed to discuss the factors affecting the survival of start-ups, with particular emphasis on funding sources, based on literature and empirical research results. The knowledge of factors influencing the survival of new businesses is important because of the role that these enterprises play in the economy. Start-ups are a vehicle of innovation and entrepreneurship; they accelerate the economic turnover and increase the added value of the economy. They are also a source of valuable jobs because they often operate in the new technologies sector, and their employees are highly qualified and have human capital. Not only start-ups affect the sphere of social capital, but other economic entities also use the positive externalities brought on by their innovative solutions. The research and development activity of start-ups and the constant expansion of knowledge generally available are becoming an accelerator of economic development based on knowledge (Deloitte, 2016).

The phases in a company life cycle have different capital requirements, and different structure and availability, which are conditioned by internal factors, for example, the current financial situation of a start-up. To effectively influence the process of birth and growth of new firms and to prevent unnecessary business failures (bankruptcies), it is necessary to know the factors influencing the survival of start-ups and the conditions conducive to their development. The survival and development of start-ups are influenced by various factors, the network of which can be called an ecosystem. A start-up-friendly ecosystem consists of business institutions, universities, investors and government institutions which encourage the development of entrepreneurship. Studying the company growth ecosystem is a new research trend, which we also follow by analysing the role of sources of financing firms at the beginning of the life cycle. This article aims to examine the impact of the features of start-ups, such as work experience, the owner's education, the industry in which they compete, and the capital structure using the database of the Kauffman Firm Survey (KFS). Using a logit model, the probability of start-up survival was estimated on a sample of 4,928 firms that were launched in 2004 and operated until 2011.

The structure of this article has been subordinated to this objective. In Section 2, we conduct a literature review: we present the methodological measures and approaches of start-up survival research and discuss the impact of financing sources on their survival. Other determinants of start-up survival used in empirical research were also investigated. In Section 3, we describe the course of the empirical study, while in Section 4, we present the findings, based on which, in Section 5, we discuss the outcomes and compare them with the literature. Finally, conclusions are drawn in Section 6.

2 Literature Review

2.1 Measures of survival of newly established companies

Survival is the most important and intuitive measure of the effectiveness of a business in early stages of development when it is usually difficult to obtain alternative performance indicators such as profits or growth opportunities or the incomplete data pertaining to them. Therefore, studies on factors

influencing the longevity of new companies usually model variables such as those that still operating on the market in the first year of business or several years after the launch of the company.

Although various types of models are used in start-up survival studies, probit and logit models are most commonly used. They are often used in finance studies to estimate the probability of an event occurring. Another approach to survival analysis is models using survival functions (the hazard model), as they allow tracking an entity over a period of time and observing when it experiences an event of large importance, as opposed to logit models, which do not provide such opportunities. Table 1 contains the definitions of the dependent variable and estimation methods used in empirical research on the survival of start-ups.

2.2 The impact of financing sources on the survival of start-ups

The sources of financing are one of the most important elements of running a business; they are of particular concern for new ventures, which are often forced to fight for survival without making a profit in the first years on the market. Thus, start-ups with greater access to funding sources can more easily overcome temporary difficulties or survive management failures. Equity also helps companies to improve their legitimacy among shareholders, acquire better technology assets and start operating on a larger scale by reaching or exceeding the minimum efficiency scale (Lima & Venâncio, 2011). Unfortunately, one of the most common obstacles when starting a new business is the lack of capital and the need to raise sufficient funds. Entrepreneurs often find it difficult to obtain adequate financing from capital markets. Due to limited access to capital markets, some entrepreneurs are forced to develop their business with insufficient capital. Unfortunately, these companies are more prone to failure in the short term (Honjo & Kato, 2016).

The conclusions of Crépon and Duguet (2003) not only emphasise the role of initial capital in the success of a start-up (survival in the market) but also can serve as a voice in the discussion about tools stimulating the economy. The scholars show that there are significant imperfections in the credit market; therefore, state aid is one of the most effective start-up support tools for groups experiencing the greatest limitations in accessing funding sources.

Tab. 1. Definitions of the dependent variable and models used in survival rates studies

Author	Definition of the dependent variable	The econometric model
Huynh, Petrunia, and Voia (2012)	Probability of start-up company bankruptcy	The hazard model
Honjo and Kato (2016)	Probability of start-up company bankruptcy	The hazard model
Cole and Sokolyk (2014)	Probability of company bankruptcy of at the end of the year t , ($t = 2005-2007$)	The hazard model
Lee and Zhang (2011)	Firm survival - a binary variable indicating whether the company stayed in business in 2007, i.e., three years after its launch	Probit
Åstebro and Bernhardt (2003)	Firm survival that takes the value of 1, if one of the original owners-founders remained the owner for 4 years, or if the company is still in business after 4 years, but in the hands of the new owners, otherwise 0	Probit
Nassereddine (2012)	Firm survival - binary variable equal to 1 if the company is in business (survived) and equal to 0 if it is out of business (dropped out of the market) in 2004, 2005, 2006, 2007, respectively	Probit
Lima and Venâncio (2011)	Firm survival - a binary variable that takes the value of 1 if the start-up did go out of business by 2007, and 0 otherwise	Logit

In Poland, about 60% of start-ups finance their activities only with the funds that they have accumulated. The second most popular source of financing is subsidies from European Union funds, with only one in twelve entrepreneurs applying for a bank loan. On the other hand, when it comes to high-risk funds or the financial help of business angels, every fifth Polish start-up has applied for funds from these investors. Start-ups that use only their own capital generate profits immediately after entering the market twice as often as other new businesses. However, the acquisition of these revenues does not necessarily affect the company's growth because every fourth start-up that finances its operations only from its own capital does not employ anyone except the founders, whereas nine out of ten other firms have employees (Skala, Kruckowska, & Olczak, 2016).

American enterprises have a completely different capital structure. Research conducted on a sample of American start-ups shows that they rely more on external financing (e.g. bank financing) and less on capital from family or friends. The higher extent of borrowing from external funders suggests a positive impact of well-functioning credit markets on the success of new ventures (Robb & Robinson, 2012). The main finding of Robb and Robinson (2012) is that start-ups are heavily dependent on formal debt financing and that financial dependence on family and friends is marginal. Their research indicates that

the finances of new enterprises are based mainly on external debt financing, and the basic source of capital in the first year are bank loans and credit cards. The average amount of bank financing is seven times the average amount of informal debt. Three times more firms are financed with external debt than informal funds. Even if businesses that do not use this source of financing are excluded, the average amount of external debt is almost twice that of internal debt (Robb & Robinson, 2012).

Even the smallest firms rely more on formal credit channels than informal ones in the early stages of the life cycle. In the analysed sample, medium-sized companies received twice as much of their funds from bank loans than from internal sources in the pre-revenue stage. The capital structure of an average enterprise that gains access to external markets (private equity raising) is still about 25% external debt for companies that have access to external sources of capital, such as venture capital or business angels (Robb & Robinson, 2012). When comparing Polish and American start-ups, the question arises whether own funds are a sufficient source of financing to ensure fast and consistent growth and whether they provide incentives for development. Therefore, the impact of capital sources on start-ups' performance is still a current and significant issue.

Åstebro and Bernhardt (2003) examined the correlation between the survival of new firms and

bank loan financing and presented their results on the selection of financing source by start-up business owners. Although the study was conducted many years ago, the factors that determine the survival of new enterprises are still an important contribution to the literature. Research shows that using bank loans has a negative impact on the prospects for new companies to stay on the market, although it seems to be a very positive predictor of the survival of start-ups (due to the positive verification of a business plan, and the credit rating may suggest a better condition of the start-up, etc.). This is the case even for firms with higher than average sales revenues.

On the other hand, the results show a positive correlation between financing from a non-bank loan and longevity. The study appears to report a significant number of start-ups with a high probability of survival, which did not receive a bank loan and compensated for this lack with funds from other sources. The authors used a simple probit model to estimate the probability of obtaining a bank loan among those owners who were actively seeking debt capital. The probability of the company owner applying for a loan decreases with education, industry experience and equity capital (Åstebro & Bernhardt, 2003).

The study provided evidence of self-selection of the highest-quality start-ups between commercial and non-commercial loans. On the other hand, banks can transfer their lending rights to highly qualified candidates to the informal market. Banks may find it more profitable to compete with higher default rates in a start-up niche, and thus charge higher interest rates for these companies. A possible explanation for this is the difference in the cost of obtaining information between banks and informal lenders. It should be noted, however, that banks rely mainly on the owners' credit rating and, to a lesser extent, on their human capital when making credit decisions. Moreover, it may turn out that the cost of verification is too high to justify granting a loan to the company on this basis alone. The problem may be more complex given the difficulties of measuring some informal elements of human capital, such as work experience and family circumstances. Verifying credit rating can be much easier for informal credit market lenders, that is, private non-financial companies (Åstebro & Bernhardt, 2003).

In their study, Cole and Sokolyk (2014) examined the impact of initial equity on the survival of start-ups and explored how the start-up capital structure of a business affects subsequent financial outcomes. As the

authors argue, the capital structure of start-ups affects the survival of firms, especially if they have taken out a loan or line of credit. Start-ups that use external debt to finance their business operations to a greater extent than loans from families, for example, have a significantly greater chance of survival for the first three years. Moreover, if they stay on the market, they achieve much higher revenues. Research shows that the availability of capital, especially market capital, is an important element that increases the chances of survival and success in the market.

Firms without bank debt may seem to be behaving irrationally because they do not use the benefits of such financings, such as a tax shield or leverage. Managers of companies may have no experience in obtaining financing sources or may be strongly prejudiced against debt in any form (Cole & Sokolyk, 2014). These firms are more likely to be located in rural areas and have owners with less experience and less educated staff than other types of companies. Owner characteristics not only affect the capital structure of a venture but also the chances of survival of start-ups.

A study by Lee and Zhang (2011) shows that both equity and formal debt have a statistically significant impact on the survival of new businesses, but this influence works in the opposite direction. Formal debt is a factor that increases the chances of success, while formal capital significantly shortens the life expectancy of start-ups (Lee & Zhang, 2011). The authors explain that the differences stem from different risk preferences of individual providers of financial capital, especially lenders and equity investors, who have a completely different pay-out profile. For lenders, the losses in the event of a failed investment can be significantly higher compared to the potential gains only from interest on principal payments. On the other hand, equity investors will give up an investment if it fails but can earn a multiple of the initial investment if it is successful. Hence, lenders tend to favour start-ups that pursue safer projects when selecting an investment, while equity investors seek relatively riskier projects despite the risk of bankruptcy. In addition, lenders often monitor the behaviour of borrowers and their effect on the company's liquidity. A positive coefficient at the formal debt variable suggests a real impact of lender monitoring on start-up survival (Lee & Zhang, 2011).

The literature review shows that debt financing can have a positive (Cole & Sokolyk, 2014; Lee & Zhang, 2011; Robb & Robinson, 2012) and a negative impact (Åstebro & Bernhardt, 2003; Nasserredine (2012) on

the survival of a start-up. Debt financing has many advantages. The founders of the venture do not have to be afraid of losing control over the start-up because they remain its sole owners, while the creditors do not take an active part in managing the company. In addition, the procedure of raising debt finance may often be simpler than applying for investor funding (e.g. there is no need to perform a due diligence investigation as in the case of VC funds). Monitoring the borrowers and meeting the appropriate loan conditions (a good business plan) can therefore help start-ups survive on the market. Therefore, it is necessary to fill the above-mentioned research gap by recognising the impact of debt financing on the probability of a start-up's survival. In the course of the study, the following hypothesis will be verified:

H1: Start-ups that use higher levels of external debt financing are more likely to survive on the market.

It is also worth mentioning a different method of raising capital, namely venture capital funds or business angels. Economic theory suggests that a combination of intense monitoring, tranche investments and control rights could reduce the agency problem between entrepreneurs and institutional investors. These factors can lead to improved management, fewer capital constraints and ultimately stronger company growth and efficiency (Crépon & Duguet, 2003). The study by Kerr, Lerner, and Schoar (2010) proves that start-ups that obtained capital from business angels have a 27% greater chance of survival for at least 4 years. Although the financial support of business angels plays an important role because it has a positive impact on the survival and performance of start-ups, the study findings reveal that some of the softer features, such as mentoring and networks of business contacts, may prove to be more helpful than capital itself.

Summing up, the research indicates that sources of financing are crucial for the company growth and financial results. Stable sources of finance are especially important for businesses that have to incur significant upfront costs before they launch and start bringing in profit. The availability of capital has a significant impact on the business operations, inclination to invest in innovations and the number of jobs created.

Table 2 presents the definitions and directions of the variables explaining the impact of capital structure on the survival of start-ups in selected studies.

2.3 Other determinants of the survival of new companies

Most of the analysed studies take into account the industry in which start-ups compete because of the increase in sales and demand in the business sector affects the financial results of new ventures. Most authors (Honjo & Kato, 2016; Cole & Sokolyk, 2014; Åstebro & Bernhardt, 2003) consider the type of industry, such as ICT, construction, and manufacturing, to be a qualitative criterion to measure the potentially different impact of the industry on start-ups. The second reason why the influence of the industry is taken into account in research may be different capital requirements in different business sectors so start-ups face different problems (Lima & Venâncio, 2011). The size of the company also matters here: start-ups in the industries that offer significant benefits to large enterprises can be expected to have a lower chance of survival than start-ups in those industries in which small firms perform better (Åstebro & Bernhardt, 2003). As shown by Nassereddine (2012), the start-up ecosystem is industry-specific, especially for smaller-scale businesses, as they have a better chance of survival on the market.

The size of the start-up can be positively correlated with survival prospects as larger companies are usually more productive, which reduces their risk of bankruptcy. The initial size of a venture, measured by total employment and labour productivity, positively affects the probability of survival, as shown by Huynh et al. (2012). Although, for example, in the research by Lee and Zhang (2011), the size of the business (also measured by the number of employees) turned out to be a statistically insignificant variable, it is worth noting that in the surveyed sample, 58% of the companies did not hire any employees except for the owner.

Another factor influencing and differentiating the performance of start-ups is intellectual capital and human capital. Companies characterised by a higher level of human capital perform better on the market. To capture this difficult-to-measure effect, researchers use a set of various variables such as education, work experience, gender, age, ethnicity of the start-up founder, etc. The features of human capital may influence the capital structure (Cole & Sokolyk, 2014; Åstebro & Bernhardt, 2003; Nassereddine, 2012; Lee & Zhang, 2011). Moreover, there is an unintended selection of start-ups, as owners of high-quality start-ups choose sources of financing other than bank loans or lines of credit, although these start-ups

Tab. 2. Variables explaining the impact of the capital structure on the survival of start-ups

Authors and year of publication	Variable	Definition of the variable	Influence of the variable
Huynh et al. (2012)	Overall debt ratio	Foreign capital to total assets ratio	Negative
Honjo and Kato (2016)	Initial capital amount (total finance)	Log of total capital in the first accounting year	Positive
	Initial own capital	Log of own equity in the first accounting year	No impact
	Initial capital ratio	Own equity to total equity in the first accounting year.	Negative
Åstebro and Bernhardt (2003)	Loan	= 1 if the owner took out a commercial loan, in p.p.	Negative
	Other sources of capital	= 1 if the loan came from sources such as: family, spouse, former owner, in p.p.	Positive
	capital value 1	= 1 if the equity of all owners was between \$10,000 and \$25,000, in p.p.	Positive
	capital value 2	= 1 if the equity of all owners was at least \$25,000, p.p.	Positive
Lee and Zhang (2011)	Formal funds	Capital raised from all types of market financing sources, such as banks and venture capital.	Positive
	Formal debt	Financing obtained from lending institutions such as banks, non-bank financial intermediaries and the government	Positive
	Formal capital	Equity investments from venture capitalists (VCs) and business angels consisting mainly of formal capital	Negative
Nassereddine (2012)	Overall debt ratio	Foreign capital to total assets ratio	Negative
Lima and Venâncio (2011)	Start-up capital	Total amount of capital in the first year from the launch (in euros)	Positive

have significantly higher chances of staying on the market (Åstebro & Bernhardt, 2003). The selection between better and less educated start-up owners does not result from discrimination or preferences of the lenders (banks), but from the conscious choice of the entrepreneurs. Often, better-educated owners have more capital, which opens the way for other financing opportunities. Moreover, a higher level of human capital provides owners with the ability to create and manage enterprises in a way that brings greater benefits. Hence, we expect that

H2: Start-ups whose owners have work experience in the same industry have a higher probability of survival.

Human capital is not only a question of education but also a much more complex matter; therefore, the

models include predictors of informal human capital that are designed to capture the general and specific level of human capital. Such predictors may be, for example, family experience in running one's own business, previous experience as a business owner or manager, years of work experience in the same field or the number of owners. Many owners have greater availability of managerial skills, a larger variety of complementary skills and competencies, and more commitment to building a successful venture (Nassereddine, 2012).

Another factor that is increasingly recognised in the literature is the innovation of start-ups. Innovations are seen as a premium as they increase the chances of survival in the market and are a predictor of above-average performance after market entry. Colombelli, Krafft, and Vivarelli (2016) argued

that process innovations rather than just product innovations translate into higher longevity of young firms. The authors claim that attention should be shifted from simple companies to innovative start-ups, as they are an important source of sustainable value for the economy. Start-ups are often at the risk of bankruptcy at the launch, unless they have strong competitive advantages such as innovative drivers. Their findings suggest that innovative ventures show higher survival rates when process innovations are considered. While product innovation can be risky and expose a start-up to premature bankruptcy, process innovation emerges as a secure competitive advantage that increases the chances of premium survival. Therefore, both scientific research and political activities should promote an environment that facilitates the emergence of innovative start-ups and affects the survival of young innovative businesses (Colombelli et al., 2016).

A slightly different approach to innovation is presented in the study by Helmers and Rogers (2010) conducted in 162,000 British firms registered in 2001. The outcomes indicate that intellectual property as a predictor of innovation, measured as the possession of patents and trademarks, is associated with a much lower risk of start-up bankruptcy. There are significant differences in survival probability rates across industries. In some industries, owning a patent means lower probability of leaving the market and is positively correlated with longevity in manufacturing, R&D, IT and business services. In turn, having a trademark means a lower probability of bankruptcy in almost all industries and shows a positive correlation with the experience of three out of the ten industries identified in the study. In summary, the study by Helmers and Rogers (2010) reveals that intellectual property is associated with a much lower risk of going out of business in the first five years of a company's life. Based on the literature presented, the following hypotheses will be tested:

H3: Having a competitive advantage has a positive effect on the probability of survival of new companies.

H4: Start-ups that own intellectual property rights (patents and trademarks) have a higher probability of survival.

Other factors that may affect the survival of start-ups are the age of the company, the share of exports in sales and the location. According to Garavito and

Uribe-Bermúdez (2016), the probability of market exit (start-up bankruptcy) decreases with age, as the learning process may take several years. Firms oriented toward international markets have a better chance of survival. Exporters have a lower risk of failure than start-ups that do not export goods. The high share of exports in sales increases the likelihood of survival. The research also takes into account the influence of the company's location. The concentration of industry in some geographic regions facilitates the spread of knowledge from which start-ups can benefit, with growing profits as external effects. Larger agglomerations tend to provide more fertile ground for business development, and these positive experiences can spread to nearby areas. Businesses operating in local key industries are less likely to fail. The benefits of being based in an agglomeration, partnerships with other companies, and collaboration with research institutions increase the chance of survival of start-ups.

Table 3 contains the definitions of the most important variables, such as employment, industry and education, used in selected empirical studies.

3 Research Design

The study was conducted on a sample of 4,928 companies that were set up in 2004 and operated until 2011. The data were collected from the Kauffman Firm Survey (KFS) database, created based on a survey conducted by an American non-governmental organisation supporting entrepreneurship development - Ewing Marion Kauffman Foundation. It is a panel study that tracks the performance of enterprises in their early stages of the life cycle, focusing on financial aspects, the characteristics of both start-ups and owners and corporate strategies.

In the KFS study, the target population was all new entities that went into business in the US in the 2004 calendar year. This population does not include any branch or subsidiary belonging to an existing company or company inherited from another person. For the surveyed population, a business founded in 2004 was defined as a new, independent company created by one person or team of people, purchase of a franchise or an existing company. The enterprise panel was created using a random sample from the Dun & Bradstreet (D&B) database. Initially, the random sample included 32,469 companies that could potentially take part in

Tab. 3. Definitions of selected explanatory variables

Potential determinants	Honjo and Kato (2016)	Cole and Sokolyk (2014)	Lee and Zhang (2011)	Åstebro and Bernhardt (2003)	Lima and Venâncio (2011)
Employment			Number of employees		Number of employees
Business sector	Binary variables for construction, manufacturing, ICT wholesale and retail	North American Industry Classification System (NAICS)	NAICS		
Work experience		Owner's work experience (in years) in the same industry	The number of years of the owner's work experience in the same industry	Percentage of owners: with 2–9 years of experience; with 10–19 years of experience; with at least 20 years of work experience	Work experience (in years)
Education		Three binary variables: (1) graduated from high school, (2) college education and (3) university graduate	Variable in the range from 1 to 10, where 1 means less than 9 years of education, and 10 represents education with a doctorate	Three variables - the percentage of owners who graduated from: (1) secondary schools; (2) colleges; (3) have not graduated from college	
Number of owners		Binary variable = 1 when the company has more than one owner	Binary variable = 1 when the company has more than one owner	Number of owners	

the basic survey. A total of 17,258 businesses were verified for eligibility, which allowed me to identify 6,030 eligible businesses, and the questionnaires were finally completed by 4,928 firms. An Internet survey and computer-assisted telephone interview were used to collect the data. In addition, the respondents received \$50 for completing the survey. The first two parts of the questionnaire were devoted to verifying the appropriate respondent and making sure that the company is eligible for participation in the survey. The other sections covered business characteristics (legal form and industry), strategy and innovation (intellectual property, R&D and manufacturing/service business), information on business organisation and employee benefits (responsibilities and employee benefits), corporate finance and work experience and features of the owners (gender and background) (Kauffman Firm Survey). In the course of the study, the following hypotheses will be verified:

H1: Start-ups that use higher levels of external debt financing to fund their operation are more likely to survive on the market.

Work experience is the factor describing human capital that positively correlates with the experience of a start-up on the market. Lee and Zhang (2011) demonstrated that the owner's lack of work experience in the same industry as the start-up has a negative impact on the start-up's performance. Therefore, we posit that:

H2: Start-ups whose owners have work experience in the same industry have a higher probability of survival.

Huynh et al. (2012) indicated that entities with a competitive advantage achieve higher revenues three years after their launch. Hence, we expect that:

H3: Having a competitive advantage has a positive effect on the probability of survival of new companies.

H4: The start-ups that have intellectual properties (patents, trademarks) are more likely to survive on the market.

Table 4 shows the variables used in the study.

A logit model will be used to verify the research hypotheses. A logistic regression model is used to explain the probability of an event where the dependent variable is a binary variable, taking the values 0 (failure) or 1 (success). The dependent variable is the *survival in the market* variable, which takes the value of 1 if the firm is in business in 2007, three years after it was founded, and 0 otherwise. The dependent variable was created from the *out of business* variable, which contains information on the reasons for the new companies' bankruptcy. If the company has not given any reason for going out of business, it is still considered to be on the market. The main reasons for leaving the market are as follows: permanent closing of operations (58%), temporary suspension of operations (23%), acquisition of a start-up by another enterprise (10%), merger with another entity (3%) or other reasons (5%).

In the empirical study conducted in this article, the following explanatory variables were used to describe the capital structure and the sources of financing used:

- *Start-up capital*: a discrete variable specifying the level of the owners' own capital. A value of 0 means that when the firm was established, the source of financing was not capital raised by the owners (and other investors). The variable is an interval, with each successive level representing a higher level of contributed capital. A high level of capital increases the likelihood of survival in the market as it reduces the company's sensitivity to revenue variation.
- *External own equity*: a discrete variable that takes the value of 1 if the share capital of the start-up comes from government organisations, venture capital companies or other enterprises. Economic theory suggests that a combination of factors, such as intense monitoring, phased investments and control rights in such ventures, should alleviate agency problems between entrepreneurs and institutional investors. The above-mentioned factors can lead to improved management and operations in portfolio companies, lower capital constraints, and ultimately to stronger start-up growth and productivity, including a greater probability of survival in the market (Kerr et al., 2010).
- *Total debt*: a discrete variable specifying the total level of incurred debt, where 0 means that the start-up does not finance its operations with debt, while each subsequent level (1–9) means a range of the amount of debt incurred. Debt financing generates interest payments that often burden start-ups beyond their expectations because business start-ups need time to generate an operating profit. While third-party equity providers may be able to permit the cancellation or temporary suspension of payments, they usually hesitate to defer debt payments if a start-up does not have a long history of the business.
- *External debt*: a discrete variable that takes the value of 1 when the start-up is financed from at least one of the following sources: a loan taken out by the owners, a loan taken out by the start-up, a line of credit for the start-up, loans from non-bank institutions, corporate credit cards, personal credit cards of the owners, loans from government institutions, loans from other enterprises and loans from other sources. The decision whether to finance with debt or capital affects the probability of survival and has certain consequences. Owners of businesses that do not rely on loans do not take advantage of this type of financing, which may have negative consequences in the long run. The variable will allow me to verify the research H1 hypothesis.

The study also used the following explanatory variables describing human and intellectual capital, the features of which are presented in Figure 1 and Table 5:

- *Number of owners*: the variable determines the number of owners who actively participate in running the firm. The variable takes values from 1 to 10. The vast majority of start-ups are run by a single owner (69.9%) or by two owners (23.7%). A larger number of owners may increase the chances of success, as it means greater availability of work resources in managerial positions, which allows for better implementation of tasks related to development or entering the market. More owners also mean a greater variety of skills as well as a stronger commitment to the implementation of the project.
- *Work experience*: the variable determines how many years of professional experience the owner has in the focal industry. Although a start-up may be a joint venture of many people, the study simplifies that the primary owner is the shareholder with the largest share in the capital. The lowest value

Tab. 4. Characteristics of the *survival in the market* variable and the explanatory variables

Variable definition	Frequency	Percentage of observations
Survival in the market (dependent variable)		
1- The company survived on the market	922	19
0- Otherwise	4,006	81
	4,928	100
Explanatory variables for the capital structure:		
Initial capital		
Own		
0- No equity financing	991	20
1- Equity does not exceed \$500	181	4
2- Equity in the range between \$501 and \$1,000	229	5
3- Equity in the range between \$1,001 and \$3,000	422	9
4- Equity in the range between \$3,001 and \$5,000	419	9
5- Equity in the range between \$5,001 and \$10,000	599	12
6- Equity in the range between \$10,001 and \$25,000	701	14
7- Equity in the range between \$25,001 and \$100,000	890	18
8- Equity in the range between \$100,001 and \$1,000,000	411	8
9- Equity higher than \$ 1 million	65	1
	4,908	100
External equity		
1- If the start-up is financed with external equity	4,630	94
0- Otherwise	298	6
	4,928	100
Total debt		
0- No debt financing	2,231	45
1- Debt does not exceed \$500	152	3
2- Debt in the range between \$501 and \$1,000	127	3
3- Debt in the range between \$1,001 and \$3,000	321	7
4- Debt in the range between \$3,001 and \$5,000	241	5
5- Debt in the range between \$5,001 and \$10,000	342	7
6- Debt in the range between \$10,001 and \$25,000	422	9
7- Debt in the range between \$25,001 and \$100,000	582	12
8- Debt in the range between \$100,001 and \$1,000,000	435	9
9- Debt higher than \$ 1 million	66	1
	4,919	100
External debt		
1- If the start-up is financed with external debt	2,823	57
0- Otherwise	2,105	43
	4,928	100

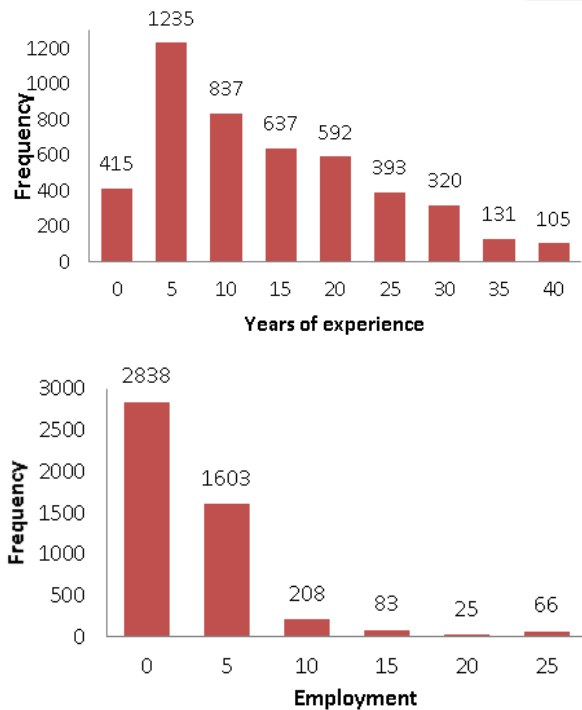


Fig. 1. Histograms of the start-up founder's years of experience and employment variables

is one year of experience; the highest is 40 years, while the median is 12 years.

- **Employment:** a quasi-continuous variable describing the number of people employed in start-ups, both full-time and part-time, but excluding contract employees. Although such employees often work full time, they are not included in the payroll. The variable takes values from 1 to 25 people, the top value meaning that the company employs 25 people or more. The size of the firm is positively related to its survival in the market, as it indicates its financial resources. A business must obtain the necessary capital and its larger initial size points to high financial resources; therefore, the risk of start-up bankruptcy should be negatively correlated with the size of the company. Larger entities can be more efficient, not because they operate at a different point on the cost curve, but because they may have different management potentials. This translates into lower costs regardless of the size of the company, which enables large-scale operations (Huynh et al., 2012). All these reasons suggest that the size of a start-up is likely to be positively related to its survival.
- **Competitive advantage:** a binary variable that takes the value of 1 if the respondent answered 'yes' to

Tab. 5. Characteristics of explanatory variables describing human and intellectual capital

Variable definition	Frequency	Percentage of observations
Number of owners		
1	3,445	70
2	1,168	24
3	219	4
4	73	1
5	10	0
6	6	0
7	5	0
10	2	0
	4,928	100
Competitive advantage		
1- the company has a competitive advantage	1,719	35
0 - otherwise	3,139	64
	4,858	100
Intellectual property		
1- if the start-up has proprietary rights	3,859	78
0 - otherwise	1,069	22
	4,928	100

the question whether the company has any unique or distinguishing feature that gives it an advantage over its competitors.

- **Intellectual property:** a discrete variable taking the value 1 if the start-up has patents, copyrights or trademarks. Intellectual property sends a signal to the investors about the quality of the project and also protects against competitors quickly copying the products. This variable will be used to verify the H4 hypothesis.

Annex A1 in Appendix shows the matrix of correlation between the variables, and Annex A2 in Appendix shows the descriptive statistics of the variables used in the study.

Tab. 6. Model estimation results

Variables	Model without limits	Model with limits	Partial effects
External own equity	-0.019 (0.19)		
External debt (H1)	0.193** (0.09)	0.158** (0.08)	0.024**
Total equity	-0.003 (0.02)		
Total debt	-0.009 (0.02)		
Number of owners	0.148** (0.06)	0.145** (0.06)	0.022**
Employment	0.029** (0.01)	0.028** (0.01)	0.004**
Professional experience (H2)	0.015* (0.00)	0.015* (0.00)	0.002*
Competitive advantage (H3)	0.153 (0.08)	0.158** (0.08)	0.024*
Intellectual property (H4)	0.130*** (0.1)	0.131** (0.1)	0.019*
Constant	0.853* (0.12)	0.835* (0.11)	
N number of observations	4,490	4,506	4,506
LR statistic	47.46	47.59	47.59

Standard errors are given in brackets under the coefficients.

*Means statistical significance at the level of 10%.

**Means statistical significance at the level of 5%.

***Means statistical significance at the level of 1%.

4 Results

Table 6 shows the results of the logit model estimation. The dependent variable is the start-up's survival (a binary variable with the value of 1 if the business survived on the market and 0 otherwise). The results of the study allow us to verify the research hypotheses, indicating that there are no grounds for rejecting them. The following variables turned out to be statistically significant: the number of owners, employment, work experience, external debt, competitive advantage and intellectual property. The interpretation of parameter signs is consistent with the research hypotheses. It has been shown, in accordance with H1 hypothesis,

that start-ups that use higher levels of external debt financing to finance their activities are more likely to survive on the market. This is an important contribution in the field of recognising the impact of debt financing on the probability of a start-up's survival.

As formulated in H2 hypothesis, start-ups whose owners have professional experience in the same industry have a higher probability of survival. A competitive advantage increases the probability of survival of new businesses, which indicates that there are no grounds to reject H3 hypothesis. Likewise, no grounds have been found to reject H4 hypothesis, according to which start-ups that own intellectual

property rights (patents, trademarks) are more likely to survive on the market.

In the logit model, partial effects show us the impact of the unit change of the independent variable on the probability of success (survival of the start-ups). The obtained results allow us to interpret the partial effects for the estimated model. In other words, it has been shown that as the number of owners increases by one, the probability of a start-up's survival on the market increases by 2.2 percentage points, with other characteristics at an average level.

As the number of employees goes up by one, the probability of a start-up's survival increases by 0.4 percentage points, with other characteristics at an average level. A longer work experience in the same industry increases the probability of surviving on the market by 0.2 percentage points by one year. If a new company uses external debt financing, it is more likely to make it in the market by 2.4 percentage points. Start-ups with a competitive advantage have a 2.4 percentage point greater chance of staying in business than entities that do not have a competitive advantage. Ownership of intellectual property rights enhances the probability of survival in the market by 1.9 percentage points.

5 Discussion of the Findings as Compared with the Literature

In our study, the total amount of equity raised and total debt turned out to be statistically insignificant. Thus, the results of the estimated model indicate that the start-up's survival does not depend on the accumulated cash resources. Nevertheless, in a study by Honjo and Kato (2016) conducted on Japanese start-ups, the amount of capital in the first fiscal year had a positive impact on the life expectancy of a new company. It seems that in the sample of businesses that we analysed, factors that characterise start-ups and company features are of greater importance. The only variable that determines the financial survival of start-ups is debt financing. This discovery fills the identified research gap.

The literature indicates that newly registered economic entities have limited access to bank loans due to the lack of a bank account history or credit history; therefore, they more often rely on informal sources of financing (loans from family, friends or their own savings). However, as the KFS database

shows, 43% of American start-ups use debt financing from formal sources (bank loans, etc.). The outcomes of our study demonstrate that the impact of debt financing on the probability of a start-up's survival is positive. This may mean that liabilities resulting from incurring debt are not such a large barrier for start-ups, and that obtaining funds to cover, for example, investment expenses has bigger benefits than drawbacks. However, it is worth considering the findings of Honjo and Kato (2016) and Huynh et al. (2012), which reveal that a higher overall debt ratio (the ratio of foreign capital to total assets) has a negative impact on the survival of start-ups. Although in our study the variable describing financing with external capital turned out to be statistically insignificant, it is worth noting that in the surveyed sample only 298 start-ups launched their business based on this form of financing. This is a thought-provoking finding, as the United States has a highly developed financial market and a favourable ecosystem for the development of start-ups.

Professional experiences, the number of owners, intellectual property rights or a competitive advantage are predictors of human capital. In line with our predictions and the results of previous studies (Cole & Sokolyk, 2014; Åstebro & Bernhardt, 2003; Lima & Venâncio, 2011), these variables are statistically significant and their effect on start-up survival prospects is positive. The activity of start-up founders is determined by both economic and psychological factors. Finding opportunities and market niches is conditioned by certain cognitive and motivational processes that make individuals achieve specific goals. However, entrepreneurial orientation, setting up new companies and caring for their further development is another thing. It is impossible to rule out hard-to-estimate random factors that undoubtedly shape the reality in which a start-up operates.

6 Conclusion

Launching and running a business is risky; therefore, it is very important to examine the factors influencing the success of new ventures, which is survival on the market in the first, often the most difficult period of doing business. The article focuses on start-ups, that is, ventures in their early stages of development. These stages consist primarily of searching for and testing the idea of a business model, where high risk is an inherent factor. The article analyses the literature to

identify factors determining the success and survival of new firms, which focus on internal determinants connected with the characteristics of the entrepreneur and the company.

Sufficient equity increase is the essential requirement for the development of not only a start-up but also all companies. The availability of capital and its costs determine the investment opportunities of the company. In our study, the variables that proved to be statistically significant are the variables that determine the capital structure of the start-ups: external debt financing (added value that fills the identified research gap), and variables that describe the number of owners, work experience of start-up founders and a competitive advantage and intellectual property rights (e.g. patents). We have positively verified our research hypotheses, according to which start-ups whose owners have professional experience in the same industry as well as start-ups with competitive advantages, and intellectual property rights (patents and trademarks) have a higher probability of survival.

In the sample of new companies examined in this article, factors that characterise start-up founders and the company features are of larger importance for the likelihood of survival. The variables for work experience, the number of owners and intellectual property rights are the predictors of human capital. Human capital, which is defined as knowledge, skills, competences and other attributes of an individual, significantly increases a start-up's chances of staying in business. These factors are becoming more and more important not only in the context of the transformation of the economy toward a knowledge-based economy but also most of all they show that companies that can effectively manage human capital have a competitive advantage.

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Appendix

Annex A1. Correlation matrix

	1	2	3	4	5	6	7	8	9	10
1. Survival	1									
2. Number of owners	0.05	1								
3. Employment	0.05	0.21	1							
4. Work experience	0.06	-0.04	0.02	1						
5. External own capital	0.01	0.17	0.18	0.01	1					
6. External debt	0.04	0.08	0.20	0.00	0.07	1				
7. Initial own capital	0.02	0.19	0.21	0.00	0.23	0.19	1			
8. Total debt	0.02	0.07	0.25	-0.05	0.11	0.54	0.26	1		
9. Competitive advantage	0.04	0.06	0.10	0.03	0.04	0.06	0.13	0.07	1	
10. Intellectual property	0.03	0.12	0.11	-0.02	0.10	0.01	0.10	0.02	0.14	1

Annex A2. Descriptive statistics of the variables used in the study

Variable	Number of observations	Mean	Standard deviation	Minimum	Maximum
Survival	4,928	0.81	0.39	0	1
Number of owners	4,928	1.39	0.72	1	10
Employment	4,823	1.68	3.83	0	25
Work experience	4,665	12.42	10.40	0	40
External own equity	4,928	0.06	0.24	0	1
External debt	4,928	0.43	0.49	0	1
Initial capital	4,908	4.26	2.79	0	9
Total debt	4,919	2.99	3.15	0	9
Competitive advantage	4,858	0.65	0.48	0	1
Intellectual property	4,928	0.22	0.41	0	1