Access to finance: an empirical assessment of venture determinants

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Abstract

Small companies and new ventures are key for economic growth and renewal. External funding is key for these new ventures to develop, bring innovation to the market and drive job creation (Carpenter & Petersen, 2002; Dutta & Folta, 2016). While these observations have been extensively researched and broadly embraced (e.g. Birch, 1990; Gompers, 1994; Scherer, 1991), the demand for funding has received considerably less attention (Bellavitis, Filatotchev & Souitaris, 2017; Wright & Robbie, 1998), as have the qualifications of access to finance (AtF) (Bhaumik, Fraser & Wright, 2015). The limited research is especially noteworthy since funding proves to be so essential, at the roots of the causal relations and established paths to economic growth. In addition, current research seems to suggest that AtF can be assessed by considering the KZ-index (Kaplan & Zingales, 1997) or selected variables thereof (Hadlock & Pierce, 2010). While these measurements may be proper means to assess AtF for publicly listed companies, or merely unlisted private companies that have a respectable size and history, early-stage ventures (i.e. companies that lack qualification on all postulated variables) appear to lack any AtF or are merely not considered in research at all.

This paper aims to contribute to the literature by considering ventures in various venture development stages and evaluating the qualifications of AtF empirically, using an extensive and novel dataset. The paper provides two analyses, first confirming that the qualifications affect AtF in general and, second, how these qualifications prove discriminative for specific venture funding sources. This paper focuses on the predictive value of the venture characteristics, and thereby also contributes to the ongoing 'bet on the jockey (entrepreneur) or on the horse (venture)'-discussion (Kaplan, Sensoy & Stromberg, 2009).

Key words: entrepreneurial finance, venture financing, access to finance, sources of capital, venture characteristics, country level impact

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1. Introduction

As of the 1980s, innovation and employment are acknowledged to come mainly from small companies or ventures (Birch, 1990; Scherer, 1991). These ventures have been recognized as important sources for economic growth, yet access to finance is crucial for these ventures to flourish, making the acquisition of funding a significant challenge for them globally (Baum & Silverman, 2004; Bellavitis, Filatotchev, Kamuriwo & Vanacker, 2017; Cochrane, 2005). Despite the recognition in the literature of this key dependence on access to finance as means to grow (e.g. Cosh et al., 2009a; Hechavarria, Matthews & Reynolds, 2015; Hustedde & Pulver, 1992; Mina, Lahr & Huges, 2013; Nofsinger & Wang, 2009), theories on (partial) explanations are competing for prominence and being embraced while often not even having been empirically confirmed.

In the current literature, a distinction can be made between supply-side (internal) and demand-side (venture) imperfections that impede a venture's access to finance (Cressy & Olofsson, 1997; Lee, Sameen & Cowling, 2015), resulting in missed societal wealth. The supply-side imperfections denote external or market imperfections, whereas the demand-side imperfections refer to factors internal to the venture that limit it from obtaining finance. Examples of both would be the funding challenges faced by ventures as a result of the financial crisis in 2008/2009 (supply-side) and the current owners' unwillingness to relinquish equity for the needed capital to grow the venture (demand-side). While the current research seems to address either supply of or demand for finance, it appears to leave unexamined aspects of how financing supply and demand actually meet. So, the funding sources that ventures resort to and the characteristics of 'jockey' and 'horse' (i.e. entrepreneur and venture (Kaplan, Sensoy & Stromberg, 2009)) that investors look for require more research (Bhaumik, Fraser & Wright, 2015).

In addition, when considering many of the much-referenced theories on both the demand and supply, they provide solid reasoning yet are also difficult to uphold empirically. For example, Myers & Maljuf (1984) postulated a pecking order on the demand side: internal debt is used before external debt and external equity. However, this theory was not confirmed in practice (Helwege & Liang, 1996). Likewise, on the supply side of financing ventures, the KZ-index (Kaplan & Zingalez, 1997) provides an assessment of a firm's financial constraint, yet also has compelling empirical evidence that rejects it (Hadlock & Pierce, 2010).

The importance of thriving ventures for the economy is recognized, yet what requirements must be met for a venture to gain support and finance in the midst of the growing number of funding sources is still unclear. This ongoing debate may seem surprising given the economic importance of the issue, since it is at the roots of the causal relations and established paths to economic growth (Harrison & Baldock, 2015; Kumar & Rao, 2015; Petersen & Rajan, 2002). However, this is true only to a limited

extent: there may be agreement on some essentials such as the costs of capital, yet new sources of funding are continually sprouting, leading to more tailored sources for ventures to resort to and a broader heterogenous profile of investors (Block, Colombo, Cumming & Vismara, 2018). The debate on how to best get early-stage funding and whether to 'bet on the jockey or on the horse' will therefore continue, if only for the growing number of funding sources and investors.

The purpose of this study is to understand an early-stage venture's ability to obtain funding and to support a venture's effectiveness in selecting potential funding sources by revealing the relationship between ventures' access and qualifications according to the literature. Our dependent variable is a venture's Access to Finance (AtF). The selection of explanatory variables was guided by prior studies that have revealed the relevance of these variables. This research therefore contributes to the discussion by complementing the prevailing theoretical perspectives with new empirical evidence. With the insights we generate, we hope to contribute to the discussion and facilitate the growth of ventures by clarifying their best go-to funding sources, given their traits and location.

We add to the literature by including early-stage ventures and testing relationships empirically. Our focus is on venture traits, not entrepreneur characteristics, building on the insight that the former primarily determine the capital structure (Cassar, 2004; Kaplan et al., 2009; Gartner et al., 2012). More specifically, we focus on early-stage ventures, enabling two research benefits: we address a research subject that differs fundamentally from the more extensively studied large public firms (e.g. Mina et al., 2013) with their information opaqueness (Ang, 1991) (partly due to the lack of a legal disclosure requirement (Ang, 1992)), and by doing so we address the information asymmetry and agency challenges investors face (Denis, 2004; Gartner et al., 2012) which, in turn, may lead to misallocation of financial resources (Martines-Cillero, Lawless, O'Toole & Slaymaker, 2020; Mina, Lahr & Huges, 2013). In addition, the research benefit of our focus on early-stage ventures is that we significantly reduce the survivor bias encountered in studies of more mature companies (Cassar, 2004; Gartner et al., 2012).

The majority of previous studies have focused on large established companies (Martinez-Cillero et al., 2020). This has been expanded upon by Audretscha, Bönteb & Mahagaonkar (2012). In addition to focusing on early-stage ventures, we also analyze established ventures, providing an analysis that goes beyond a merely partial examination as previously undertaken (Berger & Udell, 1998; Mina et al., 2013; Wallmeroth, Wirtz & Groh, 2018). By doing so, we hope to contribute to converging academic insights as well as the ability of ventures to enhance their focus when in search of capital by filtering out their best-bet source and so minimizing the work in order to concentrate on delivering entrepreneurial success. Or, as indicated by Gartner, Frid & Alexander (2012, p. 746), "Understanding what may drive the financing decisions of nascent entrepreneurs is important, since a number of

studies have drawn parallels between sources of financing and firm growth and survival (Astebro & Bernhardt 2003; Cressy 1996; Michaelas et al. 1999)."

Moreover, we extend the insight on the relationship between early-stage venture qualifications and AtF and test them empirically. The empirical test is conducted using a unique dataset with almost 1,000,000 observations on some 140,000 ventures worldwide. We also explore the moderating effect of AtF at country level on this relationship using GEM-data, thereby contextualizing our understanding of early-stage ventures' financing abilities.

This paper is organized as follows. Section 2 provides a review of the literature and sets out less documented aspects, thereby offering guidance on key AtF-insights and their implications for the expected effect of venture and country qualifications on a venture's AtF. Section 3 develops the hypotheses. Section 4 details the empirical data used and various analyses and explains the methods used. Section 5 provides the results, revealing the causal relations between key qualifications and AtF. Section 6 concludes with a discussion of the findings and suggestions for further research.

2. *Literature review*

Paralleling the growth in the number of funding sources that ventures may approach, research into which sources ventures may attempt to actually get funding from has also grown. This is not very surprising considering the impact funding sources can have. Yet, despite the research tradition, the findings on AtF have remained at quite a generic level and have identified different, and sometimes contradicting, arguments on how and where to reach out for particular funding sources.

Theoretical perspective

The decision to approach a particular funding source has been widely researched in the literature, from both a theoretical and empirical perspective. From a theoretical side, one of the most influential ideas is the pecking order theory (Myers & Maljuf, 1984). This theory on the demand side of finance postulates the sequence in which funding sources at the most generic level would be requested, building on information asymmetry and the cost of capital rationale. The pecking order suggests that a venture first resorts to internal debt, then short-term external debt, thereafter long-term external debt and to external equity as last resort. While this theory may be applied to established companies, the rationale and consequent sequence was not confirmed for early stage ventures (Helwege & Liang, 1996; Kaplan & Zingales, 1997): the lack of internal resources did not lead to raising external funding, neither did asymmetric information affect the funding choice between debt and equity.

In addition to the empirical limitation of the original pecking order, this theory only distinguishes between the sources of funding (i.e. mere equity and debt, with internal or external origin), whereas

a more precise determination of funding sources from a demand perspective (i.e. crowdfunding or business angels, each with their own distinct benefits and concerns) may be sought by ventures that seek funding.

In a similar vein, on the supply side of financing ventures, as referenced in the introduction, the KZ-index provides an assessment of a firm's financial constraint. It is based upon cashflows, leverage, dividends and assets (Kaplan & Zingalez, 1997), indicating the firm's dependency on raising external finance and inducing investment constraints (Hennessy & Whited, 2007). Although prominent in the literature on financial constraints, compelling empirical evidence has also revealed its limitations, especially for small firms, where the need and the costs of external funding should not necessarily be considered to coincide with the urge to grow and agency problems, despite their being indicators of need and costs. In particular, as indicated by Hadlock & Pierce (2010), "the same information is mechanically built into both the dependent and the independent variables" of/in the KZ-index (p. 1991), explaining why the Kaplan & Zingales obtained their findings while, in fact, proxies of venture size and age would interfere with the necessary conditions for the linear regression approach they chose.

As a result, one may wonder whether these well-respected analyses warrant extension across the full spectrum of ventures and thus serve analyses of nascent ventures as well. For example, when considering the KZ-index (Kaplan & Zingales, 1997), this index may be a proper means to assess AtF for publicly listed companies, or merely unlisted private companies that have a respectable size and history, yet early-stage ventures (i.e. companies that lack qualification on many postulated variables) appear to lack any access to finance or are merely not considered in research at all. In general, different theories seem to suggest different drivers for funding behavior (Abdulsaleh & Worthington, 2013). Also, as noted, while the pecking order (Meijers & Maljuf, 1984) rationale and practice seems to be recognized, proof of its validity for early-stage ventures is less convincing.

Our focus is on the early-stage growth of ventures, and also includes so-called nascent ventures. These early-stage ventures are ventures in their earliest stage (often even only idea or concept development stage) typically disregarded in research and for which limited AtF may have the most severe consequences by preventing potential entrepreneurs from even testing their ideas (Audretscha, Bönteb & Mahagaonkar, 2012), despite their being essential for the economy and employment (Acs & Audretsch, 1990; Mina et al., 2013). Particularly the funding challenge of these early-stage ventures seems to have received less attention (Gartner et al., 2012; Nofsinger & Wang, 2011), partly due to the lack of empirical data (Hainz & Nabokin, 2013), and yet also addressing this earliest-stage category is key to understanding AtF (Astebro & Bernhardt 2003; Cressy 1996; Michaelas et al. 1999; Cassar, 2004).

From an academic point of view, empirical evidence was found for a 'bridged pecking order' in early-stage ventures, revealing that these ventures move from internal equity to external equity and skip over external debt. The argument for skipping external debt seems to be that it is inaccessible (due to lack of collateral) or it is disregarded because a venture expects more than merely capital from an investor (Paul, Whittam & Wyper, 2007).

The adjusted KZ-index (Hadlock & Pierce, 2010), also referred to as the SA-index relying on venture size and age, counters many of the noted endogeneity shortcomings, as result of which only two out of the five explanatory variables (i.e. cash flow and leverage) remained significant when expanding the original sample. While intuitive and revealing that the AtF increases strongly when ventures start to grow and mature, proof for the SA-index has at least three biases from the outset: the empirical evidence fully relies on North American incorporated ventures with non-zero sales and assets; no reference is made to the funding source while in fact considering but not specifying preferred funding sources (Farre-Mensa & Ljungqvist, 2016); AtF equity and debt constraints have proven to vary and, although young and small, these do in fact indicate financial constraints for ventures, many of them are likely not (Hoberg & Maksimovic, 2015; Mina et al., 2013).

Empirical perspective
Empirical proof for the impact of the qualifications age, size and venture development stage seems to be largely agreed upon (e.g. Beck, Demirgüç-Kunt & Maksimovic, 2008; Berger & Udell, 1998; La Rocca, La Rocca & Cariola, 2011; Moritz, Block & Heinz, 2016; Romano, Tanewski & Smyrnios 2001). The arguments for these three qualifications all revolve around the increased market proof of the venture and its market proposition. However, as these three qualifications do not fully coincide with a venture's AtF globally, they should be considered in addition to the macroeconomic environment (e.g. Booth, Aivazian, Demirguc-Kunt & Maksimovic, 2001; Claessens & Tzioumis, 2006; Mina et al., 2013) as indicators for legal stability, ownership structure and industry (e.g. Cassar, 2004; Degryse, De Goeij & Kappert, 2012; Hall, Hutchinson & Michaelas, 2000), since these three qualifications impact their business strategy and asset intensity. Finally, innovativeness of the venture also seems to affect AtF because of their higher risk, larger information asymmetries and more context dependent investment (e.g. Freel, 2006; Huyghebaert, Van de Gucht & Van Hulle, 2007; Lee, Sameen & Cowling, 2015). Some examples of the kind of research that has been conducted are further detailed in Table 1, emphasizing the key importance of SME funding for the economy, confirming the data challenge, and revealing that much of this research has tended to focus on survey data with limited observations.

Sample studies that addressed venture qualifications to predict the venture's AtF
Ownership structure (Cassar, 2004)

This research builds upon the Business Longitudinal Survey (BLS), which is conducted by the Australian Bureau of Statistics in the years 1996-1998. The survey samples 1 out of 300 SMEs in Australia and zooms in on ventures that are independent and younger than 2 years, across many industries. As result of all filters, the sample ended up with 292 ventures. It was found that the long-held belief that organisational type did not affect access to finance does not hold up. The found relationships are proof of the signaling effect that incorporation has on external providers of capital, yet restricts itself to the main categories of financing (i.e. debt and equity).
Innovativeness (Lee, Sameen & Cowling, 2015)
Based on the UK Small Business Survey, a governmental initiative amongst more than 10.000 SME employers in the years 2007/8, 2010 and 2012 across different industries, yet balanced to provide a representative view of UK business stock, providing information on venture characteristics, including their innovativeness and AtF. Key findings are that innovative SMEs are more likely to seek external funding, yet also that they are more likely to be turned down in their request for funding. Also seemingly implying that, in line with the view of Schumpeter (1939) on anti-cyclical investment, the financial crisis of 2008 has even further worsened the AtF of innovative ventures, even more so compared to their less innovative peers.
Stage (Moritz, Block & Heinz, 2016)
An explorative and descriptive analysis of SME financing patterns using survey data ('Survey on the access to finance of enterprises' (SAFE)) gathered for the European Central Bank and European Commission in 2013. The sample consists of 12.726 SMEs across 28 European countries, largely mature (64%) yet with very limited revenue (i.e. less than 2m euro, 90%). The study reveals that different financing patterns seem to exist, in addition to differing across nations and future growth expectations, the venture's life cycle (or stage) prove to affect the funding sources they use: earlier stage ventures seem to be using informal sources more extensively, while more mature ventures tend to substitute those for more formal funding sources.

Table 1 – AtF empirical proof

In practice, despite common ground in the literature on the challenges that entrepreneurs and investors face in the early stages of a venture's origination and growth – these core challenges being significant information asymmetries, agency challenges (Denis, 2004; Waltz & Hirsch, 2019; Fu, Ang & An, 2019), the lack of various resources to support growth ambitions (Block, Fisch, Obschonka & Sandner, 2019), and potentially, on the financial side, the strong interrelation between the financing and investment decision – empirical evidence on how to resolve these challenges is limited and has not led to a consensus on its key qualifications. Formulated differently, the rationale to choose for external funding (demand side) and considerations from investors in selecting investment opportunities (supply side) has been addressed in different empirical studies and gained attention, but not led to an agreed perspective on the key qualifications to overcome the core challenges in entrepreneurial finance allowing supply of and demand for finance to meet. At the same time, research seems to converge towards general venture qualifications, but also stresses that further research remains necessary (e.g. Abdulaziz & Worthington, 2013; Fraser, Bhaumik & Wright, 2016), especially for early stage ventures lacking track record and assets which requires investors to base their investment decisions on more subtle information (Ahlers et al., 2015).

In addition, while the number of venture finance sources has grown, research seems to address these sources in isolation (Wallmeroth et al., 2018), as if the entrepreneur's primary focus is on the source of capital as opposed to the amount of capital that needs to be raised. Furthermore, the literature seems to mix AtF with the actual external financing obtained (i.e. in Gartner, Frid & Alexander, 2012 and Nofsinger & Wang, 2011). While the former indicates the potential sources for external financing, the latter represents the realized external financing from these sources, reflecting the venture's ability

to convert the possibility. While not wanting to disregard the particular impact each funding source has on the development of ventures (Cassar, 2004), at the same time, there seems to be a need for ventures to understand what their most promising funding options may be.

Despite the empirical contribution that the seven qualifications of ventures (age, size, stage, macroeconomic environment, ownership structure, industry and level of innovation) provide as add-on to the largely theoretical perspectives on supply and demand of finance, their ability to provide a nuance is still quite limited. For example, two ventures that appear to be the same on these venture qualifications may still fundamentally differ in business model and potential profitability. The lack of empirical data is one of the core limitations in progressing academic insight (Claessens & Tzioumis, 2006; Hainz & Nabokin, 2013).

3. Hypotheses

Building on the insights on key qualifications gathered in the literature, we take specific venture traits into account and consider to what extent they impact AtF at venture level. We define AtF at venture level as the financing sources that a venture may approach. We measure this access by way of the specific sources that a venture has successfully obtained.

Funding sources are distinct and entrepreneurs may seek a specific funding source, yet, at the same time, there is a kind of hierarchy (Berger & Udell, 1998; Gartner et al., 2012; Mina et al., 2013; Nofsinger & Wang, 2011). When starting a venture, in the idea or business plan development stage, funding sources (and needs) are typically limited to those in close proximity, i.e. funds from family and friends. For support in developing the business concept and plan, an entrepreneur may turn to incubators and accelerators. When the venture brings its products to market and grows, funding sources and needs increase, and may include business angels or even formal venture capital. As ventures develop, they gather a track record, become more transparent and have higher funding demands (Cosh et al., 2009), which often means internal funding sources are substituted by external ones (Abdulsaleh & Wortington, 2013). Funding sources therefore have a pecking order: from the first funding sources (e.g. family and friends) to the higher or later ones (e.g. venture capital).

These sources of finance may have different means to assess the venture as well as different expectations regarding the cost of capital and expected return (Mina et al., 2013). Given the particularly high early-stage information asymmetry between venture and investor, and the actual impossibility of complete disclosure between entrepreneur and investor, funding early-stage ventures inherently creates a 'lemon market' problem (Akerlof, 1970; Nofsinger & Wang, 2009), setting ventures or SMEs at a disadvantage in AtF compared to their larger corporate counterparts (Ang, 1991;

Cressy & Olofsson, 1997; Gartner et al., 2012; Mina et al., 2013). At the same time, obtaining equity capital is critical for these early-stage ventures to grow and create jobs (Hustedde & Pulver, 1992).

The literature provides a number of early-stage venture qualifications that affect ventures' AtF (e.g. Berger & Udell, 1998; Cassar, 2004; Hadlock & Pierce, 2010; Lee et al., 2015; Moritz et al., 2016). As stated in section 2, the seven qualifications that have been empirically tested and are established in the literature include a venture's age, size, stage, macroeconomic environment, ownership structure, industry and level of innovation. The rationale behind these qualifications is, in general, that they signal a willingness or ability to grow the venture, based on past performance and future potential.

Market performance or proof of a venture seems to contribute positively to a venture's AtF: the older and the bigger the venture, the more trustworthy (e.g. Abdulsaleh & Worthington, 2013). The high information asymmetry between investor and investee emphasizes credibility through signalling (Nofsinger & Wang, 2011), for which visible proof may help. While profitability per se does not improve AtF, since investors actually care about the future and no so much about past profits (Mina et al., 2013), it does impact venture survival (Cressy & Olofsson, 1997) and sustainable profitability may feed the expectation of future profitability. Other visible forms of market proof such as its incorporation, which shows the legal and tangible existence of a business, also appear to benefit its AtF (Cassar, 2004; Coleman & Cohn, 2000; Freedman & Godwin, 1994; Garner et al., 2012; Storey, 1994).

For market potential or venture ambition the literature also reveals an impact on AtF. For instance, Mina et al. (2013) reveal that ventures have a higher AtF when they show high growth ambitions. Furthermore, the higher potential for growth of ventures is also perceived as potential for rapid financial benefits (Hustedde & Pulver, 1992). Likewise, innovativeness is an indicator for potential future financial benefits and may affect AtF positively (Hustedde & Pulver, 1992), yet, at the same time, may also affect it negatively due to the increased information asymmetry and moral hazard challenges (Beck, Demirguc-Kunt & Maksimovic 2008; Nofsinger & Wang, 2011).

The AtF of ventures is also context dependent (Claessens & Tzioumis, 2006; Martinez-Cillero et al., 2020), for example: the financial development of a country and the economic cycle. Small and medium sized ventures prove to be more susceptible to the economic cycle than large corporations (Cressy & Olofsson, 1997). Investors appear to be more or less willing to invest in ventures dependent upon the financial development of the country (Demirguc-Kunt et al., 2006; Hustedde & Pulver, 1992), development of the legal system (Demirgüç and Maksimovic, 1998; Nofsinger & Wang, 2011) and the extent to which ownership is legally enforced (Beck et al., 2004; La Porta, Lopez-de-Silanes, Shleifer & Vishny, 1997; Martines-Cillero et al., 2020). The effect of venture qualifications on AtF are therefore

determined, at least in part, by variables on country level as more protection makes investors more willing to make capital available (Claessens & Tzioumis, 2006; Mouritz et al., 2016; Nofsinger & Wang, 2011).

H1 – The seven venture qualifications (venture's age, size, stage, macroeconomic environment, ownership structure, industry and level of innovation) affect a venture's AtF in general

H2 – The seven venture qualifications (venture's age, size, stage, macroeconomic environment, ownership structure, industry and level of innovation) can determine which specific funding sources are accessible to the venture

4. Method

In order to empirically test the hypotheses derived from theory, we have gathered a unique dataset at venture level from Equidam[‡] and complemented these with country-level data from GEM[§]. These data allow us to add the necessarily more subtle information (Ahlers et al., 2015) to both the academic discussion and practical insight on ventures' AtF.

The main dataset from Equidam consists of 991,991 observations on 137,643 ventures, gathered over 8 years (2013-2021) and spread across different venture development stages and 892 industries[**]. These ventures were established across 90 countries worldwide, representing all continents, yet with the larger part being in Europe (39%) and North America (29%). Equidam developed a platform to support entrepreneurship by making their decisions more transparent and value driven. Entrepreneurs provided their venture details to Equidam my means of an online questionnaire for the sake of obtaining an objective venture valuation, largely as input for their fundraising. Some of them already had invested capital in excess of 26 million euros, while others were still in the early business planning stage and working to get their first investors on board. The breadth of the dataset allows us to compare ventures across nations, stages and industries, and assess their qualifications for AtF. For example, we have data ranging from a nascent venture in the US aiming to setup operations in 2021, to a mature company in the Philippines that has been active for over 46 years.

[‡] Equidam, founded in 2013, is a tech company that focuses on factors influencing the success of private companies and industry-specific data and trends and how finance affects growth. Technology allows Equidam to leverage its financial knowledge, driven by its human side. See www.equidam.com.

[§] Global Entrepreneurship Monitor (GEM), started in 1999, is a consortium of national country teams, primarily associated with top academic institutions, that carries out survey-based research on entrepreneurship around the world. See www.gemconsortium.org.

[**] Thomson Reuters Business Classification (TRBC), which is a market-based classification, able to order companies based on their market impact as opposed to the more traditional classifications based on establishment (e.g. NAICS)

For every venture that filled in the questionnaire, there was an average of 7.2 concrete observations. However, since the answers were filled in over time (often over one year), the observations were not always consistent, not even from a natural or accelerated growth perspective. Therefore, we consolidated the observations per venture and used the answers most often given. For example, one observation may have indicated that a venture was at the idea stage and funded with only crowdfunding, while three other observations that same year would indicate that it was in start-up stage and funded by family and friends, an incubator/accelerator and crowdfunding. In this case we would define it as in the start-up stage and funded by three investor sources. This sort of consolidation brought the list of observations down to 229,865. Taking into account the variables needed for our analysis and deemed interesting for predicting a venture's AtF, we also deleted some observations because of incomplete records: lack of information on funding sources took out 133,402 observations and lack of information on the independent variables another 47,258 observations. Finally, we also deleted observations with answers that were apparently an incorrect entry, such as ventures starting in year 0 (where the year indication was expected, e.g. 2018) or equity offered in excess of 100%. This cleaning up of the data reduced our list of observations by another 261. In all, this left 48,944 consolidated observations for our analysis.

To test the relationships expressed hypotheses H1 and H2 we operationalized the data. This operationalisation covered the venture qualifications agreed upon in the literature and we added additional aspects. Table 2 provides an overview of the variables used.

Hypothesis	Key concepts	Operationalisation
	Access to Finance	- Internal vs External finance - Six funding sources: entrepreneur's equity, family & friends, incubator & accelerator, crowdfunding, business angels, venture capital
	Control variables	Industry, B2B/B2C, reason for valuation
- 1	Venture qualifications: a) Venture market proof b) Venture growth potential	a) Market proof: incorporated, venture development stage, demand validation & profitability b) Growth potential: scalability of the business, international expansion planned, market growth rate & exit strategy available
- 2	Financial development of the country	GEM country qualification score by observation year
- 3 / 4	Demand for finance	Demand for finance and Strategic partnerships, relationship with a) Venture market proof (both, see 1) b) Venture growth potential

Table 2 – Variables used for empirical testing

We first empirically tested the qualifications that govern any venture's AtF, as identified by the literature so far. For this purpose, the seven qualifications or determinants – for they ultimately determine the success – were operationalized and tested for their predictive value, now only distinguishing between ventures with and without external funding. It is in the external funding, so excluding the founders' own capital and that of their family and friends, that, due to the information asymmetry, adverse selection needs to be overcome (Abdulsaleh & Wortington, 2013).

For this purpose, we assessed the effect of the determinants on a venture's ability to obtain external capital and also detailed the funding sources into five typical categories. This division allows us to build upon the distinction made in the core model (which references to hypothesis 1) and provide the sought-after insight on predictors of specific funding sources. Table 3 details the AtF sources.

AtF sources	Description	Core model usage
- Entrepreneur's own funding sources, family & Friends	Funding sources provided by the entrepreneur, family and friend	Internal capital
- Incubator & Accelerator	Support for ventures, providing early-stage facilities and training, complemented by direct financial means (accelerator)	External capital
- Crowdfunding	Means to obtain many small investments from the public[††]	External capital
- Business Angels	Informal capital provided by individuals that typically also seek to have an active role in the venture	External capital
- Venture Capital	Formal capital invested by professionals who seek to make a financial return for the providers of the capital	External capital

Table 3 – Operationalisation of dependent variable AtF

To test the hypotheses, we assessed the predictive value of the seven determinants on the venture's AtF. Investors themselves, in line with the literature, assess aspects pertaining to a venture's age, size, stage, ownership structure, macroeconomic condition, industry and innovation. From this dataset, we

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[††] Crowdfunding has different forms, each indicating a different condition under which the public provides capital to the venture, of which the main forms are (Wallmeroth et al., 2018): donation, reward, loan and equity based

developed more proxies for venture characteristics in relation to AtF, in line with for example Nofsinger & Wang (2011) and Gartner et al. (2012), as shown in Table 4.

Determinant	Operationalisation	Range
- Age	Years that the venture has been active	0 – 71 years
- Size	How many employees work for the company (excluding founders, interns and freelancers)?	0 – 200,000 employees, grouped into five classes (no employees; less than 10; less than 50; less or equal to 1,000; more than 1,000 employees)
- Stage	The venture development stage (idea, development, start-up & expansion stage)	Stage 1 – 4
- Macro-economic condition	Country where the venture is based (GEM score of this country, higher is more financially developed)	Score 1.71 – 3.71
- Ownership	Incorporated or not	0 – 1 scale
- Industry	TRBC rating on economic sector level (14 possible economic sectors)	Sector 50-63 (energy, basic materials, industrials, consumer cyclicals, consumer non-cyclicals, financials, healthcare, technology, utilities, real estate, institutions, associations & organisations, government activity, academic & educational services)
- Innovation	IP stage	1 – 4 scale (higher is more protected: not applicable, IP pending approval, IP protection secured regionally & IP protection secured globally)

Table 4 – Operationalization of core determinants

The analysis was thus conducted in two stages: first an assessment of the elements mentioned in the literature to assess the venture's ability to obtain external funding, and thereafter an assessment to determine the actual AtF, i.e. funding sources that ventures approached successfully. The latter stage includes both traditional variables, i.e. variables in line with the seven categories identified in the literature, and more exploratory variables, i.e. variables that from an investor's perspective make sense to consider but have not yet been formally confirmed by the literature. Developing the core model in the first stage serves two purposes: it validates the determinants identified in the literature and it provides a benchmark for testing our second hypothesis with more granulate AtF assessments (i.e. distinguishing between different external funding sources), as expressed in hypothesis 2 and sought in the literature (e.g. Moritz et al., 2016).

The challenge is, as will be shown in the results section, that quite a number of the answers were not given by the respondents. In addition, for the assessment of the macroeconomic conditions, for which we include the GEM-score of countries, the more recent (i.e. 2020 and 2021) scores were not available yet. The descriptives statistics of all variables are provided in Table 5.

	Overall (N=10099)
External funding	
no	7272 (72.0%)
yes	2827 (28.0%)
Funding type (highest)	
no information on funding type	4588 (45.4%)
own equity, family & friends	2684 (26.6%)
incubator/accelerator	207 (2.0%)
crowdfunding	425 (4.2%)
business angels	1452 (14.4%)
venture capital	743 (7.4%)
Age group	
0 - 2	329 (3.3%)
3 - 5	4470 (44.3%)
6 - 10	3481 (34.5%)
11 - 20	1180 (11.7%)
more than 20	639 (6.3%)
Size group	
0	2411 (23.9%)
1	888 (8.8%)
2 - 3	1961 (19.4%)
4 - 7	2035 (20.2%)
8 - 20	1751 (17.3%)
21 - 100	888 (8.8%)
more than 100	165 (1.6%)
Venture development	
idea stage	510 (5.1%)
development stage	2985 (29.6%)
startup stage	3086 (30.6%)
expension stage	3518 (34.8%)
GEM	
GEM very low	143 (1.4%)
GEM low	614 (6.1%)
GEM moderate	3954 (39.2%)
GEM high	3951 (39.1%)
GEM very high	1437 (14.2%)
Incorporated	
no	2407 (23.8%)
yes	7692 (76.2%)
Sector	

	Overall (N=10099)
energy	214 (2.1%)
basic materials	133 (1.3%)
industrials	1630 (16.1%)
consumer cyclicals	2232 (22.1%)
consumer non-cyclicals	1222 (12.1%)
financials	796 (7.9%)
health care	705 (7.0%)
technology	2806 (27.8%)
telecommunications	317 (3.1%)
utilities	44 (0.4%)
IP established	
not applicable	6326 (62.6%)
IP pending	2010 (19.9%)
IP regional	1136 (11.2%)
IP global	627 (6.2%)

Table 5 – Descriptive statistics

As becomes apparent from the descriptive statistics, despite the selection upfront, the overlap of variables for all observations is still limited: of the 48,944 observations for which we know whether they have obtained external funding, ultimately only 10,099 contain information on all five variables and can be used for the regression analysis.

Our variables are largely categorical variables. This impacts our analyses for the correlation and regression. The Pearson corelation matrix is not very meaningful, because it assumes normally distributed variables while we work with ordinal variables. Therefore, we have included only the Spearman correlation matrix, which is able to deal with non-normally distributed variables. The regression, as result of the many nodes (43,200, the product of all categories we created) that have originated, will have quite some nodes lacking observations, as result of which it is a challenge to converge. To deal with the latter, we will treat the venture qualifications as continuous variables.

Correlation Matrix

	Age	Size	Venture stage	GEM	Incorporated	IP established
Age (venture age)	—					
Size (number of employees)	0.275 ***	—				
Venture stage	0.457 ***	0.459 ***	—			
Country (GEM score)	-0.064 ***	-0.028 ***	-0.010	—		
Incorporated	0.019 **	0.193 ***	0.155 ***	0.098 ***	—	

Correlation Matrix

	Age	Size	Venture stage	GEM	Incorporated	IP established
IP established	-0.084 ***	0.080 ***	-0.008	0.077 ***	0.125 ***	—

Note. * p < .05, ** p < .01, *** p < .001

Table 6 – Correlation matrix (Spearman)

Industry is excluded from the correlation table, as it is an ordinal variable. The highest correlation coefficients are between venture development stage, size and age. These correlation coefficients are still below 0,45, which is low enough not to expect multicollinearity in our regression analysis.

5. Results

The test of the literature was twofold: assessing whether the seven determinants (or qualifications for funding) can generally distinguish between the likelihood of a venture obtaining funds internally or externally (potentially in addition to internally), and, if the latter, whether these determinants also provide information on the specific funding source relevant to a venture. For our base model, the dependent variable is whether the venture was able to secure external funding. We performed a binary regression analysis in which we assessed whether the seven venture determinants from the literature can be confirmed to impact a venture's ability to obtain external funding. Thereafter we performed a multinominal regression analysis, assessing to what extent the determinants could do more than that, by distinguishing between the different external funding sources, i.e. reveal to what extent these determinants can provide a distinct predictive value for specific risk-bearing funding sources.

H1 Core model – predictors for external funding

The output of our binary regression includes the Hosmer & Lemeshow test, revealing the statistical goodness of fit of our model, with a significance of 0.488, revealing an initial positive assessment for the presumed relationship of the variables and external funding. In addition, the Omnibus Likelihood Ratio Tests showed a significance of six out of seven variables (see Table 7).

Likelihood Ratio Tests

Predictor	χ^2	df	p
Age (venture age)	103.446	4	< .001
Size (# employees)	286.299	6	< .001
Venture development	41.064	3	< .001

Likelihood Ratio Tests

Predictor	χ^2	df	p
Country (GEM score)	7.027	4	0.134
Ownership (Incorporated)	13.955	1	< .001
Industry (TBBC Sector)	130.808	9	< .001
Innovation (IP established)	90.238	3	< .001

Tables 7 –Likelihood Ratio Tests

Table 7 confirms the ability of each determinant (except for country) to significantly distinguish between fully internally and (also) externally funded ventures. Table 8 allows us to further detail the relationships found.

Binominal logistic regression - Model Coefficients for External funding

Predictor	Estimate	SE	Z	p	OR	95% Confidence Interval	
						Lower	Upper
Intercept	-1.676	0.302	-5.543	< .001	0.187	0.103	0.338
Age group (*ref. group 0-2):							
3 – 5	0.244	0.140	1.746	0.081	1.276	0.971	1.677
6 – 10	0.340	0.143	2.370	0.018	1.405	1.061	1.861
11 – 20	-0.118	0.159	-0.742	0.458	0.889	0.651	1.213
more than 20	-0.750	0.185	-4.051	< .001	0.472	0.329	0.679
Size group (*ref. group 0):							
1	0.231	0.100	2.312	0.021	1.260	1.036	1.534
2 – 3	0.704	0.075	9.415	< .001	2.021	1.746	2.340
4 – 7	0.928	0.075	12.433	< .001	2.530	2.185	2.928
8 – 20	1.096	0.081	13.607	< .001	2.992	2.555	3.504
21 – 100	1.208	0.102	11.840	< .001	3.347	2.740	4.088
more than 100	1.487	0.193	7.701	< .001	4.423	3.029	6.457
Venture development (*ref. group idea stage):							
development stage	-0.097	0.115	-0.840	0.401	0.908	0.725	1.137
startup stage	-0.158	0.117	-1.352	0.176	0.854	0.679	1.074
expansion stage	-0.496	0.122	-4.053	< .001	0.609	0.479	0.774
GEM (*ref. group GEM very low):							
GEM low	0.353	0.227	1.551	0.121	1.423	0.911	2.221
GEM moderate	0.380	0.211	1.801	0.072	1.463	0.967	2.212
GEM high	0.295	0.211	1.396	0.163	1.343	0.888	2.032
GEM very high	0.417	0.216	1.926	0.054	1.517	0.993	2.318

Binominal logistic regression - Model Coefficients for External funding

Predictor	Estimate	SE	Z	p	OR	95% Confidence Interval	
						Lower	Upper
Incorporated (*ref. group not incorporated):							
Yes	0.218	0.059	3.705	< .001	1.244	1.108	1.396
Sector (*ref group energy sector):							
basic materials	-0.715	0.250	-2.862	0.004	0.489	0.300	0.798
Industrials	-0.768	0.156	-4.926	< .001	0.464	0.342	0.630
consumer cyclicals	-0.959	0.154	-6.233	< .001	0.383	0.284	0.518
consumer non-cyclicals	-0.748	0.160	-4.684	< .001	0.473	0.346	0.647
financials	-0.300	0.164	-1.833	0.067	0.741	0.537	1.021
health care	-0.209	0.164	-1.274	0.203	0.811	0.588	1.119
Technology	-0.448	0.150	-2.990	0.003	0.639	0.476	0.857
Telecommunications	-0.450	0.192	-2.340	0.019	0.638	0.438	0.930
Utilities	0.131	0.343	0.381	0.703	1.140	0.582	2.231
IP established (*ref group not applicable):							
IP pending	0.393	0.059	6.637	< .001	1.481	1.319	1.663
IP regional	0.489	0.072	6.756	< .001	1.630	1.415	1.879
IP global	0.564	0.092	6.119	< .001	1.757	1.467	2.105

Note. Estimates represent the log odds of "External funding = yes" vs. "External funding = no"

Tables 8 – Model Coefficients - External funding

A closer consideration of the predictive value of the seven determinants' operationalisation reveals that they are not in all cases able to properly distinguish success. The venture age, for instance, seems to have a tipping point: it is only significant for two categories (6-10 years and more than 20 years) and also has an opposite effect on obtaining external funding. This means that whereas ventures in their early days (up to 10 years) have an increasing odds of obtaining external funding, older ventures (more than 20 years) see that odds decrease. Venture size, just as innovation, prove to have a significant positive effect on external funding. Incorporating a venture also contributes to having a venture externally funded. Venture development stages only prove to be significant in the expansion stage, and then, negatively affect external funding. The industry sectors sometimes appear to be significant, yet, as a categorical variable, it is comparable to an arbitrary sector like energy. Compared to the energy sector, basic materials, industrials, consumer cyclicals, consumer non-cyclicals, technology and telecommunications surprisingly all have smaller chances of obtaining external

funding. The country qualification seems not to have an effect on a venture's ability to obtain external funding .

H2 Enhanced model – predictors for specific external funding sources
The core model validated the value of the seven determinants, while the enhanced model assessed to what extent the venture traits may also predict the specific type of external funding sources. So, while we were able to do a binominal regression for the basic model that assesses to what extent the determinants predict a venture's AtF by merely defining it as the step from internal funding to external funding, for testing the enhanced conceptual model we relied on multinominal regression. Doing so allowed us to differentiate between four key external funding sources: incubator/accelerator, crowdfunding, business angels and venture capital. We then related these funding sources to the venture traits.

The multinominal regression took the funding obtained by the entrepreneur him/herself (or from their family and friends) as a reference in seeking how the venture traits seemingly evolved to improve access to each of the external funding sources. Table 9 shows the outcome of the Loglikelihood ratio tests.

Likelihood ratio tests

	X^2	df	p
Age (venture age)	48.340	4	< .001
Size (# employees)	97.275	4	< .001
Venture development	24.184	4	< .001
Country (GEM score)	17.267	4	0.002
Ownership (Incorporated)	24.718	4	< .001
Industry (TBBC Sector)	32.977	4	< .001

Tables 9 – Likelihood ratio tests

Table 9 reveals that the multinominal logistic regression perceives all determinants to have a significant effect on the venture's external funding sources. Table 10 provides more detail for each variable's effect on external funding sources. Again, as will become apparent, quite some variables prove to be significant, revealing that these variables affect the venture's odds to obtain that funding source.

Multinominal logistic regression - Parameter Estimates for Funding sources

Dependent	Names	Estimate	SE	OR	95% Exp(B) Confidence Interval		z	p
					Lower	Upper		
incubator/accelerator - own equity, family & friends	(Intercept)	-2.633	0.077	0.072	0.495	0.564	-34.049	< .001
	Age group	-0.093	0.093	0.912	0.712	0.839	-0.996	0.319
	Size group	0.047	0.049	1.048	1.073	1.174	0.957	0.339
	Development	-0.425	0.093	0.653	0.865	1.025	-4.594	< .001
	GEM	-0.041	0.084	0.960	1.052	1.223	-0.490	0.624
	Incorporated	-0.065	0.170	0.937	1.235	1.750	-0.383	0.701
	Patent	-0.061	0.084	0.941	1.100	1.256	-0.729	0.466
crowdfunding - own equity, family & friends	(Intercept)	-1.891	0.055	0.151	0.136	0.168	-34.510	< .001
	Age group	0.035	0.064	1.036	0.913	1.176	0.549	0.583
	Size group	-0.068	0.036	0.935	0.871	1.002	-1.891	0.059
	Development	-0.155	0.068	0.857	0.749	0.980	-2.262	0.024
	GEM	-0.082	0.060	0.921	0.818	1.037	-1.359	0.174
	Incorporated	-0.137	0.123	0.872	0.685	1.109	-1.117	0.264
	Patent	-0.099	0.061	0.906	0.804	1.021	-1.623	0.105
business angels - own equity, family & friends	(Intercept)	-0.638	0.033	0.528	0.062	0.084	-19.122	< .001
	Age group	-0.258	0.042	0.773	0.760	1.094	-6.188	< .001
	Size group	0.116	0.023	1.122	0.952	1.154	5.065	< .001
	Development	-0.060	0.043	0.942	0.545	0.784	-1.380	0.167
	GEM	0.126	0.039	1.134	0.815	1.131	3.267	0.001
	Incorporated	0.385	0.089	1.470	0.671	1.308	4.339	< .001
	Patent	0.162	0.034	1.175	0.798	1.109	4.774	< .001
venture capital - own equity, family & friends	(Intercept)	-1.322	0.043	0.267	0.245	0.290	-30.697	< .001
	Age group	-0.194	0.051	0.824	0.745	0.911	-3.796	< .001
	Size group	0.251	0.030	1.286	1.213	1.363	8.436	< .001
	Development	-0.052	0.055	0.949	0.853	1.057	-0.952	0.341
	GEM	-0.023	0.048	0.978	0.890	1.075	-0.468	0.640
	Incorporated	0.110	0.107	1.116	0.904	1.377	1.022	0.307

Multinominal logistic regression - Parameter Estimates for Funding sources

Dependent	Names	Estimate	SE	OR	95% Exp(B) Confidence Interval		z	p
					Lower	Upper		
	Patent	0.091	0.043	1.095	1.007	1.192	2.113	0.035

Table 10 – Parameter estimates

Access to incubators/accelerators only seem to be affected significantly negatively by a venture's development stage, which coincides with the contribution incubators and accelerators have: support in the design and formation of early-stage ventures. This negative significant effect of the venture development stage also applies to crowdfunding. Business angels are being triggered by all but the venture development stage, with expected and surprising preferences. As expected business angels prefer younger ventures that drive innovation and are incorporated in more financially developed nations. Surprising is that venture size increases the likelihood of obtaining business angel funding, especially since business angels are qualified as active investors that still aim to shape the venture. Venture capital is negatively affected by venture age, yet positively by venture size, thereby revealing their preference for young yet rapidly growing ventures, coinciding with their interest in innovation.

The venture characteristics are thus able to, in addition to affect AtF generically, discriminate between specific funding sources. This provides an insight that is useful for both investors and entrepreneurs. For example, it is noteworthy that business angels seem perceptive of more venture characteristics than venture capital is, and take those signals seriously (i.e. reveal a considerable effect in the odds ratio).

6. Conclusion and suggestions for further research

The outcomes reveal that by analyzing with a new dataset we provide two contributions to the literature: insight into the factors that determine an early-stage venture's access to external funding (i.e. determinants to external AtF) and insight into the odds of obtaining this external funding from particular funding sources on the basis of venture characteristics.

The seven venture qualifications identified in the literature (i.e. venture's age, size, stage, macroeconomic environment, ownership structure, industry and level of innovation) are shown to affect a venture's AtF. This effect proves to apply to both the general access to external finance and in determining which specific funding sources are accessible to the venture.

The contribution of small companies and new ventures to the economic development of nations is irrefutable, as is the importance of external funding for reaching their full potential. This paper contributes to the understanding of both the demand and the supply side of capital by examining current theoretical challenges and by testing insights empirically. In addition, by relating the funding sources to venture characteristics, it provides a much-needed context for what makes funding searches successful (Moritz et al., 2016).

Limitations

The empirical testing of the determinants noted in the literature may be impeded by the limited quality of data used. Equidam, being a new venture as well, started with a freemium model to rapidly increase their footprint. This model allowed ventures to submit their details at no cost, which may have resulted in questionable input and observations. As of 2019, Equidam provides their analyses on a paid basis.

Although initially containing 991,991 observations on 137,642 ventures from 90 countries, once consolidated this became 48,944 observations on 48,944 ventures. The dynamic element of venture funding is therefore only indirectly assessed. When Equidam becomes more established and develops relationships with the ventures they advise, ventures may return for their services and the dataset may therefore include the development of ventures themselves.

Next to the data from Equidam, this research also relied on data from GEM to include an assessment of the country variable in the analysis. GEM's data is only available up to 2019, and only for selected countries. This limited our research, as the observations from 2020 and 2021 could not be included in the regression analysis. An alternative country assessment (e.g. La Porta et al., 1997; 1998) could be considered.

This research fully focuses on equity sources of funding, and within these we have only taken the most developed funding sources for early-stage ventures into account. The funding sources available to early-stage ventures are more extensive (e.g. trade credit and governmental subsidies) and new forms develop rapidly (e.g. ICOs), though we have not taken into account the full funding variety. Extending research to include these additional sources would further enrich the value of our findings for practice. In addition, the interrelationship of funding sources has not been considered, even though, for instance, certification value may be expected.

Finally, the research does not consider the impact of the cyclical element in investing: in times of financial crisis, the AtF becomes more difficult (Lee, Sameen & Cowling, 2015). This cyclical economic element should be included, especially when the data provides multiple years of oversight.

Suggestion for further research

The limitations of this research already provide some pointers for further research. Follow-up research on AtF could also stimulate the collection of more empirical data (including qualitative), consider the interrelationship of funding sources, and feed the 'jockey-horse debate'.

The analyses with empirical data on AtF are still limited, as are the datasets on which research can be done. This is surprising given the insight this could provide into the economy as a whole. Gathering these data and performing analyses may help to improve the chances of success for small companies and new ventures in obtaining the key financial resources, allowing their growth to contribute to the economy. At the same time, we want to prevent Goodhart's law (or crowding effect): "when a measure becomes a target it ceases to be a good measure". Further refining insights on venture characteristics in relation to funding sources may create false positives, yet that saturation point still seems far away.

Another suggestion for further research is to complement data collection with case studies or interviews. These more qualitative studies could enable verification of the relationships found and a better understanding the conditions under which established relationships materialize. This may also trigger more exploratory research on conditions and variables, which will presumably surface during such studies. The variables that investors use in their assessment to invest are likely to multiply and may include the venture's profitability, the market size and growth that the venture addresses, whether a venture's B2C or B2B approach affects their AtF, what the finance need of the venture is, whether the equity offered matters, whether the venture provides exit strategies for the investor, and finally to what extent internationalization of the venture is planned.

More advanced modelling using structural equation, for example, may also improve our insight. Particularly studies in which mediator effects are taken into account may contribute to understanding mutual relationships. Likewise, when perceived relationships unexpectedly do not become apparent in data, adding moderators to the analyses may help to nuance relationships and clarify the conditions under which they can be expected.

Finally, since this research has fully focused on venture qualifications for accessing finance, further research may address more inherent entrepreneur characteristics and, by doing so, contribute to the ongoing 'jockey-horse debate'.

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