Masterstudiengang Wirtschafts- und Rechtswissenschaften

MASTERARBEIT:

Human Capital Signals as Success Drivers of Equity-Based Crowdfunding Campaigns

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Abstract

The purpose of this master thesis is to investigate the impact of human capital on a project's success in raising funds by way of equity-based crowdfunding. For this purpose, I analyze data of 105 crowdfunding campaigns from Seedmatch, one of the biggest German crowdfunding platforms, covering the period from the start of platform in 2011 to December 2017. The analysis is conducted by the means of ordinary least square regression, robustness tests – with negative binomial regression. The results of the analysis show that for the available data sample, the project's board size has a positive significant impact on the success of equity-based crowdfunding campaigns. Team size, business education, education in related industry, business work experience, work experience in related industry, having PhD board members, as well as heterogeneity of the board in terms of education and work experience are not found to have a significant impact on crowdfunding success. The results of the current thesis are relevant for companies seeking funding, crowdfunding platforms and potential investors. This research offers a step towards filling the gap in research on human capital success drivers of crowdfunding in Germany. Moreover, the current master thesis summarizes and analyses the previously researched human capital signals in one single piece of research. Future research should focus on expanding the data sample, improving the set of tested variables and combining data from crowdfunding platforms and data obtained in laboratory experiments and interviews.

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List of Abbreviations

CF – crowdfunding

B2C – business to client

B2B – business to business

BA – business angels

CFO – Chief financial officer

FCA – Financial Conduct Authority

MBA – master of business administration

OLS – ordinary least squares

PS – policy statement

SME – small and medium enterprises

VC – venture capital

VIF – variance inflation factor

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1.   Introduction

Now, where do I get the money? This question comes up in each and every entrepreneurial situation, usually very soon after an inspired idea for a new business appears. The answer to this question can be more difficult for entrepreneurs starting a new business or struggling to sustain an existing small business than for a CFO of a large corporation. Indeed, while small and medium enterprises (SME)[1] play an important role in terms of employment and economic activity in Germany[2], they face difficulties obtaining funds through traditional channels[3].

Micro and medium-sized enterprises[4] have several alternative ways to get finance for their projects, which are typically used at different stages of the company's lifecycle. At the start of their business, young companies typically gather finance from their founders, friends and family[5]. As the company begins to grow, these sources are too limited and the companies tend to turn to outside investors. The next possibility is getting finance from business angels (BA) and venture investors (VC) who can also bring know-how to the management of new projects[6]. Finally, when the company has a sufficient track record, it can seek funding from banks [7]. Helping to financially support companies on their way from early private financing to BA, VC and bank loans, a new form of raising funds has recently emerged – crowdfunding. Crowdfunding is defined as "…a collective effort by people who network and pool their money together, usually via the Internet, in order to invest in and support efforts initiated by other people or organizations"[8]. Equity-based crowdfunding is a form of crowdfunding in which entrepreneurs sell equity or bond-like shares in a company[9]. Usually, crowd investors

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[1] According to Bundesanstalt für Finanzdienstleistungsaufsicht (2015) and Institut für Mittelstandforschung (2016), small and medium enterprises (SME) are micro enterprises (employing less than 9 people and having less than € 2 Million annual turnover), small enterprises (less than 49 people and less than € 10 Million annual turnover) and medium-sized enterprises (less than 249 people and less than € 50 Million annual turnover). The current master thesis deals with a data sample which comprises startup companies with maximum of 43 people employed.
[2] As of 2015, 99.3 % of all enterprises in Germany were SME, they employed 60.7 % of the total employed and accounted for 33.25 % total market turnover. See Statistisches Bundesamt (2018)
[3] Due to their size and organizational features, SME in Germany are rarely publicly disclosed and normally do not issue debt or equity securities. Moreover, due to weaker profitability and lower capital positions, German SME pay significantly higher rates for bank loans when compared to large enterprises. See study for Deutsche Bank Research by Kaya (2014), pp. 5-7.
[4] Current master thesis deals with a data set comprising of startups, which satisfy the definition of micro and medium-sized enterprises (see Footnote 1 for definition). For this reason, further references to SME in the text consider startups which are micro and medium-sized enterprises.
[5] Haasis/Fischer/Simmert (2007), p. 336
[6] Funding by business angels and venture investors is explained in chapter 3.3
[7] Lukkarinen et al. (2016), p. 27
[8] Ordanini et al. (2011), p. 444
[9] Ahlers et al. (2015), p. 955

invest relatively small amounts into different projects, often being attracted by both financial and non-financial reasons (e.g., supporting friends or supporting the idea). Crowdfunding provides capital to companies without future participation from the investors in the projects in either a direct or indirect way[10]. This form of funding makes it possible to present the project idea to a large circle of people, thus continuing to raise funds from friends and at the same time making advertisement for the project and gaining the attention of potential BA and VC. From the time of its emergence in 2011 until today, the German crowdfunding market has grown rapidly: As of June 2018, € 500 Million have been invested through crowdfunding[11].

Just as with other forms of financing, crowdfunding entrepreneurs should show investors the high quality of the project they seek funds for. The crowd investors, being mostly unexperienced in making investment decisions, and making decisions based only on information obtained on the crowdfunding platform, face difficulties in assessing the quality of the company[12]. Scholars argue that information asymmetries are the main hurdle for entrepreneurs obtaining funds through crowdfunding. Based on signaling theory, researchers highlight that information asymmetries can be overcome by entrepreneurs by making information available which would signal the quality of their projects[13].

Researchers found evidence for the following information on companies' human capital to have an impact on crowdfunding success: numbers of board and team members[14], entrepreneurs' business education[15] and business work experience[16]. However, none of the studies on human capital crowdfunding success drivers conducted the analysis of all these human capital projects' characteristics simultaneously and based on data from German crowdfunding platforms.

The aim of this master thesis is to fill the gap in the literature and expand existing research by investigating the impact on crowdfunding success from all the previously identified human capital signals simultaneously. In order to achieve this target, three main tasks of this master thesis are being set as follows. First of all, the research should be made based on data which was not used in previous studies. Secondly, the results of the thesis must be comparable with the results of existing studies on human capital crowdfunding success drivers. Thirdly, the research must be conducted within

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[10] Fidrmuc/Louis (2015), p. 37
[11] Harms (2018), p.2
[12] Piva/Rossi-Lamastra (2017), p. 2
[13] See e.g. Ahlers et al. (2015); Block/Hornuf/Moritz (2018); Lukkarinen et al. (2016); Piva/Rossi-Lamastra (2017)
[14] Ahlers et al. (2015); Vismara (2016)
[15] Ahlers et al. (2015); Piva/Rossi-Lamastra (2017)
[16] Piva/Rossi-Lamastra (2017)

the chosen framework of financial theory. For this purpose, I will analyze data from 105 crowdfunding campaigns run on the one of the biggest German crowdfunding platforms, Seedmatch, between 2011 and 2017. To achieve comparability with previous research, I will derive the methods from papers written by scholars who have conducted analysis on related subjects. Econometric models used are ordinary least square regression and negative binomial regression. The branch of finance theory used as a framework for conducted analysis is signaling theory.

Results of the analysis conducted show that for the available data sample, the board size has a positive and significant impact on crowdfunding success measured as the raised share of target capital. Team size, board members' business education, education in related industry, business work experience, work experience in related industry, having PhD board members, as well as heterogeneity of the board in terms of education and work experience are not found to have a significant impact on crowdfunding success. The results of the current thesis may be relevant for funding seeking companies, crowdfunding platforms and potential investors.

The remainder of the thesis is structured as follows. Chapters 2.1 and 2.2 are dedicated to explaining the concept and types of crowdfunding, as well as describing the current state of the crowdfunding market. In Chapter 3 I will lead the reader through the theoretical background underlying success in raising funds through crowdfunding. Firstly, the concept of signals affecting success in raising funds is introduced through the perspective of information asymmetries and signaling theory in Chapter 3.1. Afterwards, the findings of scientific studies on the success drivers of crowdfunding campaigns (chapter 3.1), BA and VC funding (chapter 3.2) are presented and summarized. Based on what has been highlighted in previous chapters, hypotheses of the thesis' research are developed in Chapter 3.4. The data sample, construction of variables, descriptive statistics and econometric models are described, respectively, in Chapters 4.1, 4.2 and 4.3. Chapters 5.1 and 5.2 present the results of the analysis and robustness checks. Chapters 6.1 and 6.2 offer an overview of the practical implications of the analysis, mention the limitations of the study and reveal questions for future research.

2. Concept and Current State of Equity-Based Crowdfunding

2.1. Concept of Equity-Based Crowdfunding

"Where small business can borrow if the banks turn them down"[17] –
Crowdfunding has been defined in such a way in The Economist. This definition,
though not being scientific, reflects the very essence of crowdfunding. Indeed,
crowdfunding is being used by small companies when private financing is no longer
sufficient, but bank loans are not yet available[18]. In this chapter, I will briefly explain the
concept and the types of crowdfunding and present the motives for current research.

Crowdfunding can be defined as the form of fundraising where companies raise
funds in small amounts from investors via the Internet[19]. Before such a definition of
crowdfunding emerged, scholars used terms "social lending" and "peer-to-peer"
lending[20]. On its current stage of development, crowdfunding is used as an umbrella
term for four variations: donation-based, reward-based, debt-based and equity-based
crowdfunding. Donation-based crowdfunding is used to collect funds for charity goals.
In reward-based crowdfunding, contributors receive non-monetary rewards in
exchange for funds[21]. As of 2018, rewards-based crowdfunding is probably the most
well-known form of crowdfunding due to the size and popularity of the Kickstarter
crowdfunding platform[22]. Via debt-based crowdfunding, companies can get a loan
contract[23]. In equity-based crowdfunding, entrepreneurs offer potential investors equity
or bond-like shares in a company[24]. This master thesis focuses on equity-based
crowdfunding, which is seen as "…the most empirically relevant for studying
entrepreneurial signaling to small investors."[25] In Germany, the term "Crowdinvesting"
is used for equity-based crowdfunding[26].

Crowdfunding campaigns are offered in one of two models: "All-Or-Nothing" and
"Keep-It-All". Under the "All-Or-Nothing" model, the company seeking funds sets a
fundraising goal and keeps nothing after the crowdfunding campaign unless the goal is
achieved. In the "Keep-It-All" model the funding-seeking company sets a goal and
keeps all the funds raised, regardless of whether or not they reached the campaign

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[17] The Economist (2015)
[18] Ahlers et al. (2015), p. 955; Lukkarinen et al. (2016), pp. 27-28; Moritz/Block (2016), p. 25
[19] Ordanini et al. (2011), p. 444; Schwienbacher/Larralde (2012), p. 369
[20] Moritz/Block (2016), p. 26
[21] Lukkarinen et al. (2016), p. 26; Belleflamme/Omrani/Peitz (2015), p. 2
[22] As of July 2018, 147 702 projects have been funded via Kickstarter with the total funding amount of 3 805 831 901 $, See Kickstarter (2018)
[23] Belleflamme/Omrani/Peitz (2015), p. 2; Lukkarinen et al. (2016), p. 26
[24] Ahlers et al. (2015), p. 955
[25] Ahlers et al. (2015), p. 957
[26] Harms (2018), p. 10; Seedmatch (2018d)

goal[27]. The Seedmatch crowdfunding platform, data from which serves as a base for this research, acts according to the "All-or-Nothing" model.

As can be seen from the definition of crowdfunding, there are three main groups of participants in the crowdfunding process: entrepreneurs seeking funding, potential investors and a crowdfunding platform matching the former with the latter. These groups have different motives for being involved in the crowdfunding process. Using crowdfunding, entrepreneurs[28] can overcome difficulties in obtaining funds from traditional sources and reduce the cost of capital[29]. Besides getting needed financing, entrepreneurs also use crowdfunding platforms to get feedback and assess the market potential of the product or service they want to launch[30]. Furthermore, crowdfunding platforms can serve as a marketing and distribution tool[31]. Scholars outline several reasons for potential investors[32] to invest via crowdfunding: economic rewards, formalization of the financing family's or friends' business, social recognition, philanthropy and a sense of belonging to a community[33]. Crowdfunding platforms act in the first line with the goal of making profits, but they are also motivated by establishing a platform for socio-cultural phenomena of crowdfunding and creating funding possibilities for SME[34].

The goals of crowdfunding campaign researching success drivers are threefold. First, crowdfunding is a new socio-cultural phenomenon, and understanding the drivers of its processes gives a new insight into modern society and its business culture. Second, discovering the drivers which lie behind crowdfunding success will help entrepreneurs better prepare fundraising campaigns and thus overcome difficulties in getting funds via traditional channels. As of today, an explicit strand of economic literature already dedicates its attention to formulating guidelines for successful crowdfunding campaigns[35]. Third, the results of research on the crowdfunding success drivers will help crowdfunding platforms in organizing their processes and selecting projects to run fundraising campaigns for. As crowdfunding is a relatively new form of

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[27] Cumming/Leboeuf/Schwienbacher (2014)
[28] In this thesis, also referred to as "company", "project" or "project team"
[29] Butticè et al. (2018), p. 110
[30] Schwienbacher/Larralde (2012), p. 376
[31] Belleflamme/Lambert/Schwienbacher (2013), p. 27; Seedmatch (2017a), p. 13
[32] In the literature, also referred to as "backers"
[33] Agrawal/Catalini/Goldfarb (2015), p. 258; Butticè et al. (2018), p. 111; Gerber/Hui (2014)
[34] Seedmatch (2018a)
[35] See, e.g., Forbes/Schaefer (2017); Paschen (2017)

fundraising in Germany, research into crowdfunding in a German context is particularly interesting[36].

2.2. Current State of the Equity-Based Crowdfunding Market

This chapter provides an introduction into the current state of equity-based crowdfunding market with a focus on European, and specifically German, equity-based crowdfunding markets and presents reasons for choosing Seedmatch as the source of data for this research.

The state of the equity-based crowdfunding market depends mainly on the legislative regulations within its home country[37]. The efforts to establish legal regulations for equity-based crowdfunding began in Australia, where the Australian Small Scale Offerings Board (ASSOB, a stock-exchange-like facility for crowdfunding) was founded in 2007, regulated under the federal Corporations Act[38]. In the United States, regulations on equity-based crowdfunding were first issued with the Jumpstart Our Business Startups Act in November 2013[39], which came into force as late as May 2016[40].

The first European country to implement a complete regulation of equity-based crowdfunding market was Italy: in 2013, the "Decreto Legge no. 179/2012 − Decreto Crescita" was issued and a national registry for the crowdfunding operators was created[41]. Shortly after, France issued their own regulations, requiring the registration of crowdfunding investment advisers "Autorite´ des Marche´s Financiers"[42]. The country with the most developed equity-based crowdfunding market is the UK[43], and is followed by France and Germany[44]. While having actually emerged a few years earlier, the equity-based crowdfunding market in UK has got its regulation from the FCA's Policy Statement PS14/4 in April 2014[45]. As of 2015, UK platform Crowdcube was the world's largest equity-based crowdfunding platform, with an overall amount of £ 115 000 000 raised by 225 000 investors[46]. To give an overall impression about the

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[36] There are only a few papers dedicated to the research of crowdfunding based on data from German crowdfunding platforms. For more details for the current state of this research strand, see p. 20 of this thesis
[37] Ahlers et al. (2015), p. 958
[38] Vismara (2016), p. 581
[39] Ahlers et al. (2015), p. 958
[40] Companisto (2018)
[41] Vismara (2016), p. 582
[42] Vismara (2016), p. 582
[43] Vismara (2016)V, p. 581
[44] European Commission (2015)
[45] European Commission (2015)
[46] Vismara (2016), p. 582

equity-based crowdfunding market in Europe[47], Figure 1 depicts the overall number of platforms and successfully funded projects as well as the overall funding amount per country as of 2014[48].

Figure 1: The State of the European Equity-based Crowdfunding Market as of 2014
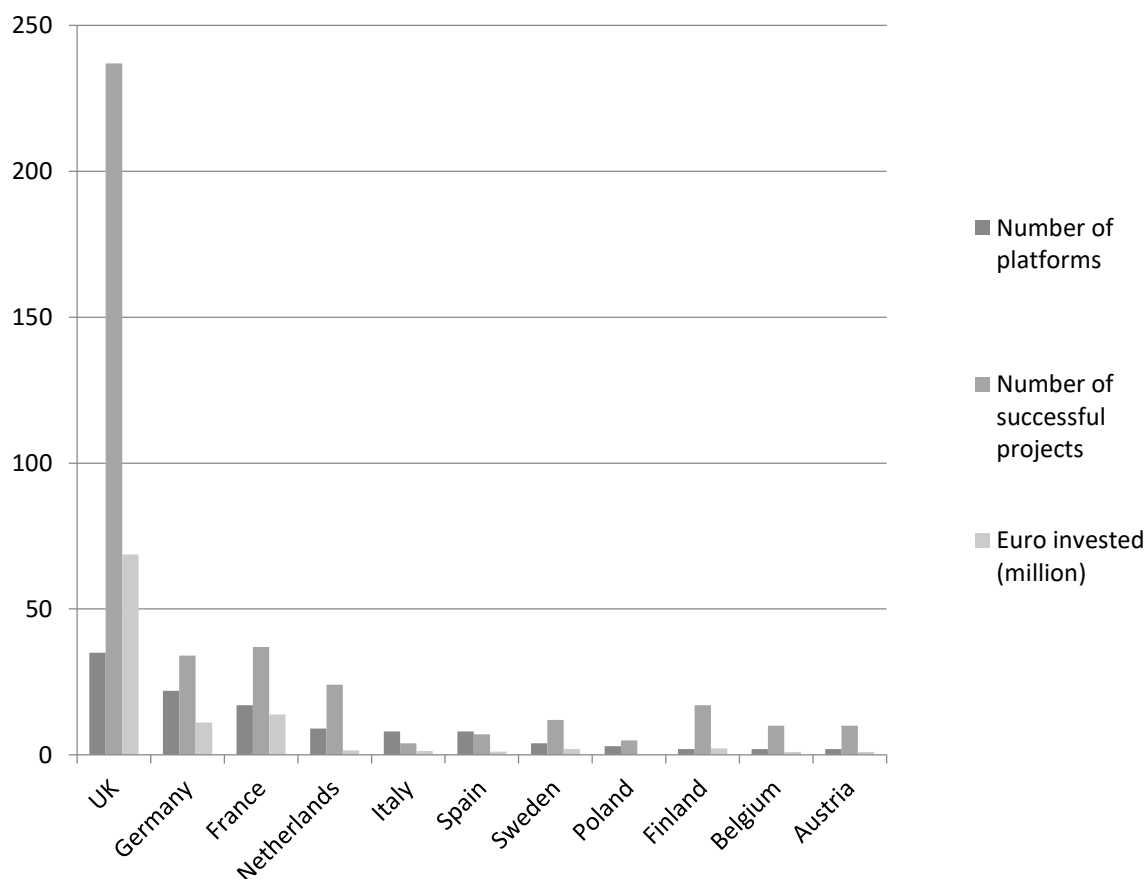
In Germany, the sale of shares carrying voting rights via crowdfunding platforms is not permitted. However, legislative framework allows for profit-participating loans, the so-called "Partiarische Darlehen", which are bond-like securities and do not carry voting rights[49]. The German equity-based crowdfunding market started in 2011 with the first crowdfunding platform Seedmatch, where profit-participating investments were possible[50]. However, the legislation needed four years for an explicit law regulating equity-based crowdfunding to be issued. In 2015 the Law on Protection of Small Investors (German: "Kleinanlegerschutzgesetz") came into force[51]. This law set

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[47] For the detailed overview of the regulations for equity-based crowdfunding across EU members, see European Commission (2017)
[48] Data source: European Commission (2015)
[49] Vismara (2016), p. 582
[50] Michels/Hoffmann (2017), p. 2; Seedmatch (2018b)
[51] Bundesanstalt für Finanzdienstleistungsaufsicht (2015); Grewe/Nordhues (2015)

limitations for possible private investments (up to € 10 000 Euro per investor) and has set strict rules for information posted on the crowdfunding project page, so that possible risks are clearly explained to the potential investors[52]. Figure 2 shows the dynamics of the German equity-based crowdfunding market[53]. According to data from German Startup Monitor, as of 2017, the overall crowdfunding market in Germany was responsible for 4.1 % of funding sources for startups[54].

Figure 2: Dynamics of the German Equity-based Crowdfunding Market
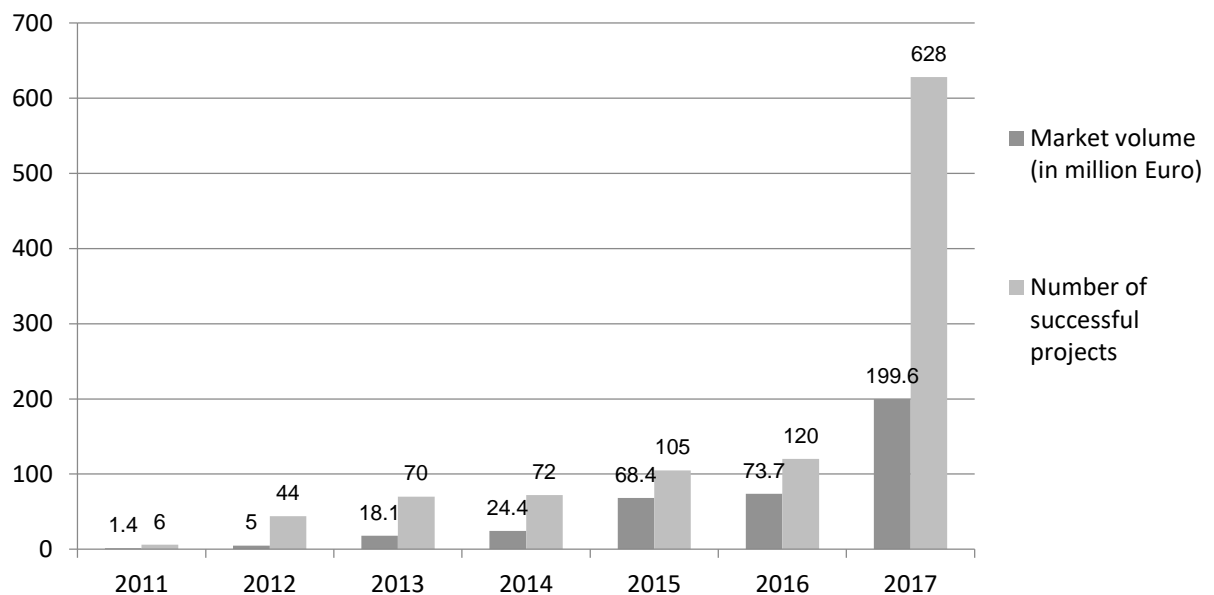
The key players on the German market are the following equity-based crowdfunding platforms: Companisto (30.6 % of the market), Kapilendo (24.6 %), Seedmatch (12.3 %), SEEDRS (11.4 %) and Finnest (4.4 %), with the rest of the market participants holding a share of 17 %[55]. At the same time, Companisto and Seedmatch are the biggest German platforms with a focus on equity-based crowdfunding for startups[56]. Being the first German crowdfunding platform and still being one of the biggest players on the market, Seedmatch is a good representational example for the German equity-based crowdfunding market. Moreover, as will be seen in Chapter 4.1, the dynamics of campaigns run on Seedmatch are in accordance with trends in the German equity-based crowdfunding market. The average Seedmatch

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[52] Fricke (2015)
[53] Data sources: Statista (2018a); Statista (2018b)
[54] Kollmann et al. (2017), p. 52
[55] As of 2017; data source: Harms (2017)
[56] Michels/Hoffmann (2017), p. 5

investor invests in 2.8 projects, whereas 54.3% of investors invest in only one project[57]. Seedmatch can thus be seen as being representative of the investors "crowds". This makes Seedmatch a good representative data source for researching human capital drivers of equity-based crowdfunding campaigns.

3. Theoretical Background of the Research and Hypotheses Development

3.1. Success of Equity-Based Crowdfunding Campaigns from the Perspective of Signaling Theory

Due to the specificity of crowdfunding, its investors usually lack experience[58]. Furthermore, these small capital providers[59] face significantly higher costs in obtaining information than larger and more experienced investors[60]. Consequently, they face serious difficulties in assessing the quality of the projects seeking crowdfunding financing[61]. The projects' founders are better informed about the qualities of the project than external investors[62]. There is, therefore, an inequality between project founders and investors, in terms of being informed about the project. The project's founders have all the information about the project, while potential investors lack this and would make better decisions if they had it. This inequality in information distribution is known in finance theory as **information asymmetry**[63]. Current chapter aims to find a possible solution for the problem of information asymmetry from the perspective of finance theory.

As a result of information asymmetry, two problems can arise: moral hazard and adverse selection[64]. Moral hazard arises if one party has information superior to the other party, and makes decisions affecting the welfare of the other[65]. To the point of time at which the investment decision is made by the investor, the founders of the crowdfunding project do not take action impacting the welfare of the investor. Therefore, moral hazard is not a relevant problem for the process of raising funds through crowdfunding platforms[66]. By adverse selection, one party lacks important

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[57] Seedmatch (2018e)
[58] Lukkarinen et al. (2016), p. 35; Piva/Rossi-Lamastra (2017), p.1
[59] Ahlers et al. (2015) classify crowdfunding investors as small investors because of the relatively small investments and relatively small stake of company they receive in return, p. 956.
[60] Ahlers et al. (2015), p. 359; Moritz/Block (2016) Moritz/Block, p. 37
[61] Hoenig/Henkel (2015), p. 1050
[62] Shane/Stuart (2002), p. 155
[63] Connelly et al. (2011), p. 42
[64] Arrow (1984)), p. 2; Pauly (1974), p. 45
[65] Arrow (1984), p. 3
[66] Kortleben (2016), p. 76

information and therefore cannot determine certain characteristics of the other party, relevant to predicting its future state[67]. Shortly before making an investment decision, an investor analyzes information about the crowdfunding project, given on the crowdfunding platform, and tries to assess the probability of a positive outcome in the project. Some investors may hesitate to invest in high quality projects because of the lack of verifiable information about the project, which would help to signal future success. In such a way, the problem of adverse selection as a result of information asymmetry takes place[68]. Therefore, information asymmetry is an important burden for all parties in crowdfunding. Consequently, in terms of crowdfunding campaigns, the main goal of making information about the project available on the crowdfunding platform is to reduce the information asymmetries between the projects' team and potential investors[69]. In the latest research on equity crowdfunding success drivers, the problem of information asymmetry was detected and analyzed by Ahlers et al. (2015), Lukkarinen et al. (2016), Vismara (2016), Block/Hornuf/Moritz (2018), Piva/Rossi-Lamastra (2017).

In economic research, scholars agree that signaling activity of entrepreneurs is the most suitable instrument in overcoming information asymmetries[70]. Signaling helps to understand how parties resolve information asymmetries about latent and unobservable qualities in one of them[71]. First explained in paper of Spence (1973), signaling theory has been used in various research fields to find and to analyze the ways in which to overcome information asymmetries[72]. Scholars researching the question of crowdfunding success drivers often also base their research on the theoretical framework of signaling theory[73]. Therefore, I consider it reasonable to use signaling theory as a theoretical framework for this master thesis.

The key elements of **signaling theory** and the timeline of their interaction are depicted in Figure 3. They are: signaler, signal, receiver, and signaling context. By adjusting the definitions given by Connely et al. (2011) to the context of crowdfunding, the key elements of signaling theory can be explained as following. *Signalers* are information insiders - in the case of crowdfunding, the founders of the project seeking funding - who possess private information about the project. Insider information is not available to outsiders, for instance, potential investors. This could be, for example,

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[67] Arrow (1984), p. 3; Pauly (1974), pp. 44-45
[68] Ahlers et al. (2015), p. 959
[69] Piva/Rossi-Lamastra (2017), p. 3
[70] Connelly et al. (2011), p. 45
[71] Connelly et al. (2011), p. 42
[72] Ahlers et al. (2015), p. 956; Certo (2003), p. 434; Connelly et al. (2011), p. 46; Moritz/Block (2016), p. 5; Vismara (2016), pp. 580-581
[73] E.g. , Ahlers et al. (2015); Block/Hornuf/Moritz (2018); Piva/Rossi-Lamastra (2017)

information about the qualities of the product or service offered by the project, or about the project's team. The signalers can send positive signals to the receiver to reduce information asymmetries and cause a positive reaction from the receiver[74]. In terms of signaling theory, *signals* are actions which are intentionally taken by insiders to communicate positive, imperceptible qualities of the insider[75]. When considering crowdfunding projects, signals are information about the project, made available to potential investors on the crowdfunding platform[76]. Being outsiders who lack information about the crowdfunding project and would like to receive this information[77], potential investors are the *receivers*. In terms of signaling theory, crowdfunding platforms serve as *signaling context* by creating a scene for the actors by signaling interaction[78]. In the context of crowdfunding, three important features of signaling should be mentioned explicitly: 1) signalers (entrepreneurs) and receivers (potential investors) have partially conflicting interests, because the signaler gets investment benefits at the expense of the receiver; 2) signaling involves selection of the signaler (crowdfunding project) in favor of some alternatives, which is possible through parallel existing diverse crowdfunding platforms, with each platform usually offering a few crowdfunding projects in the same time; 3) a key point to the signaling is that the receivers (investors) aim to gain by making decisions based on information obtained from the signals sent by these senders[79].

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[74] Certo (2003), p. 434
[75] Connelly et al. (2011), p. 45
[76] Piva/Rossi-Lamastra (2017), p. 3
[77] Connelly et al. (2011), p. 45
[78] Though this was not explicitly mentioned in the scientific papers on crowdfunding success drivers based on signaling theory, I hold it reasonable to classify crowdfunding platforms as signaling context in terms of signaling theory elements.
[79] Connelly et al. (2011), p. 45

Figure 3: Elements of Signaling Theory[80]

t=0	t=1	t=2
SIGNALER - crowdfunding project- has an underlying quality[81]	SIGNAL - information about the project - is sent to the receiver	RECEIVER - potential investor - observes and interprets the signal, chooses whether to invest
Signaling Context		

As can be seen from the signaling theory elements and from the features of signaling mentioned above, signaling theory model is suitable for analyzing the process of crowdfunding. Consequently, signaling theory can be used to analyze the information asymmetries in crowdfunding and to find ways to reduce them. The information about the unobservable characteristics of the project, made available to potential investors via the crowdfunding platform, plays the role of the signals, which help to overcome the problem of information asymmetry[82]. Signals which effectively reduce information asymmetry affect the success of crowdfunding and serve, therefore, as crowdfunding success drivers[83].

In his paper, which is seen as essential for the development of signaling theory, Spence (1973) discusses the impact of obtained education on the size of workers' salaries. Spence stated that education, as a human capital signal, distinguishes high from low ability workers, and thus allows the former to obtain better salaries[84]. Researchers derive clear parallels from the employees' signaling as described by Spence (1973) for researching the human capital drivers of entrepreneurial success[85]. Piazza-Georgi (2002) defines human capital as "…a stock of personal skills that economic agents have at their disposal"[86]. Rauch et al. (2005) point out three attributes of human capital: education, experience and skills[87].

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[80] Modified from Connelly et al. (2011). The original table contents one further element, namely feedback, which the sender gets from the receiver after receiver had interpreted a signal and made a decision. However, feedback is not being seen by scholars as a key element of the signaling theory in terms of crowdfunding. See, e.g., Ahlers et al. (2015), Block/Hornuf/Moritz (2018); Piva/Rossi-Lamastra (2017), who skip feedback in applying signaling theory to the context of crowdfunding.

[81] "…quality refers to the underlying, unobservable ability of the signaler to fulfill the needs or demands of an outsider observing the signal". Connelly et al. (2011), p. 43

[82] Ahlers et al. (2015), p. 963

[83] Ahlers et al. (2015), p. 960

[84] Spence (1973), p. 370

[85] Gimmon/Levie (2010), p. 1215

[86] Piazza-Georgi (2002), p. 463

[87] Rauch/Frese/Utsch (2005), p. 683

In summary, finance theory offers a solution to the problem of information asymmetry within the framework of signaling theory. In the next two chapters, an overview of the literature on the success drivers of crowdfunding, angel investments and venture funding will be made. The goal of this overview is to find out which project characteristics have been found to have an impact on crowdfunding success. Following the link between the origin of signaling theory and human capital, special attention will be paid to human capital drivers of crowdfunding success. On the basis of the information obtained and within the framework of signaling theory, I will draw conclusions about the possibility of human capital signals reducing information asymmetries in crowdfunding, and I will develop the hypotheses of this master thesis in Chapter 3.4[88].

3.2. Scientific Research on the Success Drivers of Crowdfunding Campaigns

As with most investment decisions, crowdfunding decisions are made under the uncertainty about the future outcomes of the project being funded. To make an investment decision, investors apprehend and analyze the (usually scant) information about the project available on the crowdfunding platform. Some of the pieces of information are more valuable for investors, and therefore have a bigger impact on crowdfunding success driver than others. Scientific research on crowdfunding success drivers has been rapidly growing over the past few years[89]. The purpose of the following chapter is to provide an overview of the selected academic papers on the success drivers of crowdfunding campaigns. The chapter is structured as following: first, literature review papers are mentioned, which summarize the scientific papers on crowdfunding. After the definition of crowdfunding success is given, crowdfunding success drivers found by the scholars are introduced. Conference papers and working papers are excluded from the sources for this overview. At the end of the chapter, findings from the selected papers on the crowdfunding success drivers are summarized in Table 1.

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[88] At first sight, it seems reasonable that choosing the right signaling context in form of crowdfunding platform can also directly affect its success and should be researched in terms of crowdfunding success drivers. In management studies, however, signaling context is researched not as an independent success driver, but as a factor which indirectly affects success by strengthening or weakening signals. See Connelly et al. (2011), pp. 47-50. Because of the master thesis' time constraints and difficulties with manual data gathering, this master thesis is based only on the data from one crowdfunding platform. Therefore, the choice of crowdfunding platform cannot be a subject of this master thesis. However, in particular in a case of the positive crowdfunding market development, researching the influence of the crowdfunding platform choice on crowdfunding success would be an interesting issue for future research.
[89] Hoegen/Steininger/Veit (2017), p. 2

For the beginning, the existing papers should be mentioned, which aim to obtain an overview of the extant scientific literature on crowdfunding. To the best of my knowledge, such papers are not numerous. The first paper to be mentioned is a literature review of Banchmann et al. (2011), which discusses the findings of scientific papers on peer-to-peer lending, published as of 2010[90]. The next attempt to provide an overview of crowdfunding literature was made by Moritz/Block (2016), who classified papers (in existence as of 2014) in terms of the main actors (capital seekers, capital providers and intermediaries)[91]. The chapter dedicated to capital providers allows a systematic review of the studies on the success determinants of crowdfunding. In 2017, Hoegen/Steininger/Veit (2017) published an interdisciplinary literature review to summarize the factors influencing investment decisions in crowdfunding[92]. The review was conducted on the papers published as of 2016. The most recent literature review on the subject of crowdfunding success drivers stems from 2018. Butticè et al. (2018) made a summary of papers which discuss the elements and characteristics of crowdfunding campaigns related to crowdfunding success. The search of papers for this review is limited to 2015.

Studies which have researched the equity-based crowdfunding are not numerous. The results of those which have are consistent with literature on reward-based crowdfunding[93]. For this reason, in this chapter an overview of scientific literature on success drivers of two crowdfunding types is being made: equity- and reward-based.

Before reviewing literature on crowdfunding success drivers, it is necessary to reveal **the definition of success**, as provided by scholars. Due to the variety of crowdfunding types and financing models (all-or-nothing vs. keep-it-all), the nature of crowdfunding success is multifaceted[94]. The most commonly used metrics for success in all-or-nothing models is reaching at least the target amount of the campaign, represented in econometric analysis as a dummy variable. For the keep-it-all model, the total amount of capital raised is a more suitable measure. Scholars also use other metrics of success for their research, such as the total number of investors or the speed of investment[95].

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[90] Bachmann et al. (2011)
[91] Moritz/Block (2016), p. 25
[92] Hoegen/Steininger/Veit (2017), p. 1
[93] Butticè et al. (2018), p. 105; Lukkarinen et al. (2016), p. 28
[94] Ahlers et al. (2015), p. 261; Butticè et al. (2018), p. 104
[95] For the list of studies using one or another other crowdfunding success measure, see Table 1 at the end of the chapter.

According to scholars who have conducted research on the success drivers of crowdfunding campaigns, the drivers of crowdfunding success can be divided in two main groups. Taking the approach of Lukkarinen et al. (2016) and Butticè/Franzoni/Rossi-Lamastra (2018) as a base and modifying it according to the objective of this master thesis, these groups can be defined as the following: **the qualities of the crowdfunding campaign** and **the qualities of the project seeking funds on the crowdfunding platform**. Qualities of the crowdfunding campaign are the properties of the campaign itself, which only appear in connection with posting the crowdfunding campaign on the crowdfunding platform. In contrast, the qualities of the project underlying the crowdfunding campaign exist beyond the crowdfunding platform and beyond the financing campaign. In the following paragraphs, the distinction between these two groups becomes clear after the elements of which they consist are revealed.

Researchers distinguish four main **qualities of crowdfunding campaigns,** which influence success in financing. They are: funding target, campaign duration, rewards (if any) quality and the amount of information available on the crowdfunding platform[96].

Among others, *funding target and the duration* of the crowdfunding campaign have been found by scholars to have an impact on the campaigns' success. More specifically, researchers found consistent evidence that higher target capital has a negative impact on financing success[97]. In terms of campaigns' duration, findings are controversial. A negative relation between the duration of the crowdfunding campaign and the campaign's success has been shown in the studies of Mollick (2014), Lukkrainen et al. (2016) and Vismara (2016), while Boeuf/Darveau/Legoux (2014) and Liao/Zhu/Liao (2015) hold the opposite to be true.

Specific *rewards*, which are a distinctive feature of reward-based crowdfunding, have also been shown to have an impact on the success of the campaigns. For instance, Boeuf/Darveau/Legoux (2014) found evidence that symbolic rewards in the form of public acknowledgement stimulate crowdfunders to donate, but only when no material rewards are offered[98]. However, the opposite results were obtained by Colombo/Franzoni/Rossi-Lamastra (2015). The latter

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[96] Butticè et al. (2018), p.105; Lukkarinen et al. (2016), p. 28-29
[97] See, e.g., Colombo/Franzoni/Rossi-Lamastra (2015), Liao/Zhu/Liao (2015), Mollick (2014)
[98] Boeuf/Darveau/Legoux (2014), p. 34

study showed, however, evidence that the positive impact given by the rewards fostered a sense of belonging to a community.

The ***quality and amount of information available*** on the crowdfunding platform is the fourth campaign characteristic, which has been shown to have an impact on the success of the crowdfunding campaign. For instance, Mollick (2014) and Petitjean (2017) indicate that success is boosted when fundraisers post a video in the description of the project[99]. With the analysis of a data sample from two German crowdfunding platforms, Block/Hornuf/Moritz (2018) also find that the project updates posted through the duration of a crowdfunding campaign affect the success of the campaign positively. As Müllerleile/Joenssen (2015) and Petitjean (2017) show, the number of comments on the campaign page has a positive impact on the campaign success too[100]. Some campaigns presented on crowdfunding platforms include financial information, such as revenue forecast or excerpts of annual financial statements. Scholars indicate that disregarding the quality of financials, the mere provision of them increases the amount raised in the campaign. Ahlers et al. (2015) find that campaigns in equity- and reward-based-crowdfunding collect significantly less funding if they provide neither a financial forecast nor a disclaimer explaining the lack of the latter. As shown by study of Mollick (2014), the quality of the text, taking into account spelling errors, can have an influence on the campaign's success too.

The next large group of crowdfunding success drivers is represented by **the qualities of the project** sought for funding. Scholars have found that the projects' content, product or service offered by the project, previous funding experience, team demographics, human capital, social capital and intellectual capital have a significant impact on the project's success in crowdfunding[101].

The possible spectrum of reasons for conducting a financing campaign in terms of ***project content*** is very broad: from sponsoring artistic works, financing business ideas and scientific research to covering personal medical expenses[102]. Scholars often dedicate their research to seeking reasons for campaigns' success in some particular branches, e.g., technology[103], art[104] or video games[105]. However, the studies which aim

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[99] Mollick (2014), Petitjean (2017)
[100] Müllerleile/Joenssen (2015), Petitjean (2017)
[101]See, e.g., Ahlers et al. (2015), p. 960; Butticè et al. (2018), pp. 108-109; Lukkarinen et al. (2016), pp. 29-30
[102] Butticè et al. (2018), p. 105-106
[103] E.g., Cordova/Dolci/Gianfrate (2015); Greenberg/Mollick (2017)
[104] E.g., Agrawal/Catalini/Goldfarb (2015); Boeuf/Darveau/Legoux (2014)
[105] E.g., Cha (2017)

to show dependence of the campaign's success on the project's content within one industry branch are not numerous. One of the properties which have been shown to have an influence on the project's success is whether the project is for-profit or non-profit[106]. Belleflamme/Lambert/Schwienebacher (2013), Liao/Zhu/Liao (2015) and Pitschner/ Pitschner-Finn (2014) show in that non-profit projects are more likely to be successful than for-profit ones. Another finding by Boeuf/ Darveau/Legoux (2014) is that it is more likely for campaigns financing musicals to be more successful than campaigns financing other types of plays.

Lukkarinen et al. (2016) find evidence that projects which offer understandable and easily explainable **products** are likely to be successful in raising funds through crowdfunding. To proxy the understandability, scholars use the dummy variable for B2C products. On a related note, Belleflamme/Lambert/Schwienebacher (2013) find that companies offering products are more successful in getting funded than those offering services.

Scholars also suggest **previous funding experience** of two types to have an impact on the success of crowdfunding campaigns: funding experience and experience of getting funded. Funding other projects positively affects crowdfunding success (Boeuf/Darveau/Legoux (2014), Liao/Zhu/Liao (2015)). However, findings regarding the experience of getting funded are controversial: Boeuf/Darveau/ Legoux (2014) find them to have a positive effect on crowdfunding success, while Colombo/Franzoni/Rossi-Lamastra (2015) find the opposite to be true.

A currently growing number of scientific papers have investigated the effect of project team's **demographical characteristics** in leading to crowdfunding success. For instance, a lot of attention has been paid to gender issues and their impact on crowdfunding success[107]. The research in this direction is of particular importance because of the difficulties which women entrepreneurs experience in raising funds through traditional sources[108]. Fidrmuc/Louis (2016) find evidence of the surprisingly low rate of female founders seeking funds through equity-based crowdfunding. Marom/Robb/Sade (2015) and Vismara (2016) find that men, on average, seek and raise significantly higher levels of capital than women[109]. However, findings by Colombo/Franzoni/Rossi-Lamastra (2015),

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[106] E.g., Petitjean (2017); Pitschner/Pitschner-Finn (2014)
[107] Butticè et al. (2018), p. 109
[108] See, e g. Marlow/Patton (2005), Muravyev/Schäfer/Talavera (2007), Orser/Riding/Manley (2006), Stuart/Sorenson (2007)
[109] Marom/Robb/Sade (2014)

Greenberg/Mollick (2017) and Marom/ Robb/Sade (2014) show that women enjoy higher rates of success in reward-based crowdfunding than men. Furthermore, In terms of the gender and size of fundraisers' team, Colombo/Franzoni/Rossi-Lamastra (2015) find evidence that individual male fundraisers tend to be less successful than females or companies.

A body of crowdfunding research dedicated to ***human capital***[110] success drivers consists of papers on such team characteristics as the number of board and team members, as well as the entrepreneurs' education and work experience. Ahlers et al. (2015) and Vismara (2016) find that the size of the board and of the project's team positively affect crowdfunding success. As a proxy for the board members' education, Ahlers et al. (2015) use the share of the board members who hold an MBA degree to find that it positively impacts crowdfunding success. Lukkarinen et al. (2016) operationalize human capital by assigning a rating to each campaign in terms of its teams qualities (educational background, experience, industry expertise, track record, balance between team members' skill sets, perceived motivation, drive, passion, commitment, and honesty). The findings show that the campaign's rating in terms of human capital "…do not seem to predict success on equity crowdfunding"[111]. In contrast, Piva/Rossi-Lamastra (2017) show evidence of such human capital characteristics as business education and entrepreneurial experience to positively impact crowdfunding success. Research on human capital success drivers of crowdfunding is not widespread. As can be seen from summary in Table 1, existing studies have been conducted on the data samples from different crowdfunding platforms, using different proxies for operationalizing human capital success drivers. Regarding the kind of effect of human capital success drivers have on crowdfunding success, the results of the existing studies are contradictory. To the best of my knowledge, there is no such research conducted using data from German crowdfunding platforms[112]. This

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[110] Piazza-Georgi (2002) define human capital as "…a stock of personal skills that economic agents have at their disposal". Rauch/Frese/Utsch (2005) point out three attributes of human capital: education, experience and skills.
[111] Lukkarinen et al. (2016), p. 36
[112] In their paper, Fidrmuc/Louis (2015) took a look at 101 campaigns which sought funding on the German platforms Companisto and Seedmatch. The scholars aimed to analyze the composition of entrepreneurial teams in terms of their education, and found a high rate of founders with university education. However, the authors point out the selection biases which took place in their research. (Fidrmuc/Louis (2015), p. 39). Moreover, the authors do not provide the results of the conducted multivariate regression analysis in their paper. Therefore I assumed this paper to bring little explanation for human capital crowdfunding success drivers and have not included it in the literature overview for this master thesis.

master thesis aims to fill in this gap, and contribute to research on human capital crowdfunding success drivers by conducting research with data from one of the biggest German crowdfunding platforms, Seedmatch. To make the results comparable with the findings in the above-mentioned papers, quantitative research will be conducted with regard to the methods used by Ahlers et al. (2015), Lukkarinen et al. (2016) and Piva/Rossi-Lamastra (2017).

At first, the importance of network ties for raising funds seems undoubtable. Nevertheless, the findings on the role of ***social capital***[113] for crowdfunding success are contradictory too. Mollick (2014), Zheng (2014) and Vismara (2016) find the team's social media network to be an important driver of crowdfunding success[114]. However, Ahlers et al. (2015), Belleflamme/Lambert/ Schwienbacher (2013) and Colombo/Franzoni/Rossi-Lamastra (2015) find no evidence for the relevance of social media connections in a campaign's success[115].

To find the role of ***intellectual capital*** in crowdfunding success, scholars investigate the impact of holding a patent and find contradictory results. On the one hand, Ahlers et al. (2015) and Block/Hornuf/Moritz (2018) find, respectively, no effect or even a negative effect of the holding of a patent on crowdfunding success. On the other hand, Piva/Rossi-Lamastra (2017) find evidence of there being a positive effect of holding a patent on the crowdfunding success[116].

As the current master thesis is based on data from a German crowdfunding platform, the state of research based on data from German crowdfunding platforms should be mentioned explicitly. To the best of my knowledge, studies on the success of projects on German crowdfunding platforms are not numerous. Angerer/Brem (2017) conducted a study seeking success factors of crowdfunding campaigns by interviewing eight entrepreneurs who funded their projects through Conda, Fundernation and Companisto crowdfunding platforms. The results of the study indicate an attractive business model, an appropriate preparation in the pre-campaign period, ongoing activities during the campaign, and corresponding advertising activities to have a

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[113]Mostly operationalized trough quantifying the social media connections, see, e.g., Colombo/Franzoni/Rossi-Lamastra (2015), Mollick (2014), Vismara (2016)

[114] Zheng et al. (2014)

[115] Because of the controversial findings, social capital crowdfunding success drivers would also be an interesting subject to explore based on the data from Seedmatch crowdfunding platform. However, the amount of data on social networks available on the Seedmatch is not sufficient to conduct a deep research.

[116] On the subject of controversial findings, the question about the role of intellectual capital for getting funded on crowdfunding platforms would also be of great interest. The variable for holding a patent was included into the test econometric model for current research. However, the estimated coefficient for this variable was not significant and therefore the results of the regression are not reported in the current thesis.

positive impact on a crowdfunding success[117]. Block/Hornuf/ Moritz (2018), whose paper's results have already been mentioned in this thesis, analyzed the impact of updates on crowdfunding campaign's success, based on data from the Seedmatch and Companisto platforms. Though its results were not published as a paper, a PhD thesis by Kortleben (2016) is worth mentioning in this regard. The researcher has analyzed data from Seedmatch, Innovestment and Companisto crowdfunding platforms and found evidence for a positive impact from the patents number, number of founders and number of employees on the crowdfunding success of a project[118].

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[117] Angerer et al. (2017)
[118] Kortleben (2016), p. 228

Table 1: Selected Papers on Success Drivers of Crowdfunding Campaigns: Summary

Paper	Platform, Country, Sample Size	Success Measures (Dependent Variables)	Success Drivers (Independent Variables)
Reward-based Crowdfunding Projects			
Boeuf/ Darveau/ Legoux (2014)	Kickstarter, USA, 875 (only theater projects)	- amount of capital raised - average donation - target capital - ratio of capital raised to target capital	- campaign duration (+) - reward in form of public acknowledgement if no material reward offered (+) - genre (+ for musicals) - previous projects in CF (-) - other crowdfunding projects supported by the founders (+)
Mollick (2014)	Kickstarter, USA, 46 034	- whether the project reached the funding target (dummy variable)	- target capital (-) - campaign duration (-) - video on the project's page (+) - social networks (+)
Pitschner/ Pitschner-Finn (2014)	Kickstarter, worldwide[119], 46 888	- whether the project reached the funding target (dummy variable) - number of backers - capital raised - average donation	- profit vs. non-profit (dummy) (+ for non-profit)
Colombo/ Franzoni/ Rossi-Lamastra (2015)	Kickstarter, worldwide, 669	- whether the funding target was reached (dummy variable) - number of early backers - percentage of the target capital raised at the early stages of campaign	- target capital (-) - reward: community belonging (+) - reward: public recognition (-) - contributions on the early days of campaign (+) - social capital (+)
Liao/ Zhu/ Liao (2015)	Zhongchou.cn China, 1 231	- ratio of capital raised to target capital	- target capital (-) - campaign duration (+) - profit vs. non-profit (dummy) (+ for non-profit) - number of investments in other crowdfunding projects (+) - social capital (+ for for-profit)
Petitjean (2017)	KissKiss-BankBank (KKBB), France, 160	- whether the funding target was reached (dummy variable)	- video on the campaign page (+) - number of comments (+) - success in previous funding (+)

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[119] Before 2012, Kickstarter was only available to projects from the USA. As recently as 2012, the platform began to accept projects from the UK and Canada, in 2014-2015 – projects from European countries, and in 2016 – projects from Hong Kong and Singapore. Kickstarter (2013), Kickstarter (2015a), Kickstarter (2015b), Kickstarter (2015c), Leow (2016), McGregor (2013), McGregor (2014), Strickler (2015), Strickler/Chen/Adler (2012), Wood (2014). Therefore, if nothing is mentioned by the authors of the paper about the geography of the projects in data sample, it is being assumed here, that the papers published in 2014 and later base their data on projects founded worldwide.

Paper	Platform, Country, Sample Size	Success Measures (Dependent Variables)	Success Drivers (Independent Variables)
Equity-based Crowdfunding Projects			
Ahlers et al. (2015) ("…a first-ever empirical examination of equity crowdfunding …"[120])	Australian Small Sale Offerings Board (ASSOB), Australia, 104	- whether the funding target was reached (dummy variable) - number of investors - capital raised - speed of investment (number of days to reach the first round of funding)	- provision of financials (+) - number of board members (+), - share of board holding MBA (+)
Lukkarinen et al. (2016) ("…one of the first to identify and assess the success factors of equity crowdfunding campaigns …"[121])	Invesdor, Finland, 60	- number of investors - capital raised	- campaign duration (-) - provision of financials (+) - B2C product (+) - social media networks (-) - early funding from private networks (+)
Vismara (2016)	Crowdcube and Seedrs, UK, 271	- number of investors - ratio of capital raised to target capital	- campaign duration (-) - female founders (+) - number of team members (+) - social networks (+)
Piva/ Rossi-Lamastra (2017)	SiamoSoci, Italy, 129	- whether the funding target was reached (dummy variable)	- business education of founders (+) - entrepreneurial experience of founders (+)
Block/ Hornuf/ Moritz (2018)	Companisto, Seedmatch, Germany, 65	- number of investments, - amount of capital raised during the crowdfunding campaign on a given day	- number of updates (+) - number of updates about funding and business developments (+) - number of updates about campaign developments and cooperation projects (+) - number of updates about external certification (-)
Reward- and Equity-based Crowdfunding Projects			
Belleflame/ Lambert/ Schwienebacher (2013)	individually crowded projects, USA and Europe, 44	- funds raised, - ratio of funds raised to funds targeted	- profit vs. non-profit (+ for non-profit) - products vs. services (+ for products)

Legend: (+) – significant positive impact on the campaign's success
     (-) – significant negative impact on the campaign's success

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[120] Ahlers et al. (2015), p. 956
[121] Lukkarinen et al. (2016), p. 35

3.3. Scientific Research on Human Capital Success Drivers of Raising Funds from Business Angels and Venture Capital

Scholars who research crowdfunding success drivers often point out the growing but still small number of existing papers on the subject[122]. This is the reason to look for possible crowdfunding success drivers in other scientific sources, for instance in papers on success drivers of business angels (BA) and venture capital (VC) financing. This approach for researching crowdfunding success drivers has been used by Lukkarinen et al. (2017) and Piva/Rossi-Lamastra (2017), for example. In contrast to crowdfunding success drivers, success drivers and signaling mechanisms of BA and VC financing have been studied a great deal[123]. This chapter aims to obtain an overview on scientific literature on BA and VC financing success drivers. The overview is limited to papers on success drivers which can be transferred to crowdfunding campaigns. First the limitations for applying BA and VC financing success drivers in a crowdfunding context on the basis of existing scientific findings will be set. Then, papers on the relevant success drivers will be briefly introduced.

Comparing crowdfunding with BA and VC, as well as transferring success drivers of the latter to the former form of financing, is possible due to two main similarities: They both address growing companies' funding needs, and their investors have similar interests and motivations[124]. The similarities between investors can be explained by defining these different types of investors. *Crowdfunding investors* are classified by Ahlers (2015) as being small investors. They invest relatively small amounts of their own money and receiving a relatively small amount of stock in the company in return, and are private investors[125]. In contrast to business angels and venture capital funds, they lack financial sophistication and experience[126], and incur very high costs, in terms of obtaining information[127]. In equity-based crowdfunding, financial return is a key reason to invest, but not the only one. Investments are made through web platforms, so investors are often geographically very far from the projects. The post-funding participation of such investors in the activities of the project mostly remains passive[128].

Business angels are also private investors who invest their own money. However, they invest more intensively than crowdfunding investors, are often former entrepreneurs themselves and have therefore more investment knowledge and

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[122] See, e.g., Butticè et al. (2018), p. 98; Hoegen/Steininger/Veit (2017), p.2; Lukkarinen et al. (2016), p. 27
[123] Vismara (2016), p. 582
[124] Lukkarinen et al. (2016), p. 27
[125] Malmendier/Shanthikumar (2007), p. 462
[126] Freear/Sohl/Wetzel (1994), p. 109
[127] Ahlers et al. (2015), p. 956
[128] Lukkarinen et al. (2016), p. 28

experience comparing to crowdfunding investors[129]. Financial return is a key reason for business angels to invest, but not the only one, too[130]. Business angels invest mostly in local projects through social and angel networks, and take a 'hands-on' approach to the company in which they invest[131]. Unlike the investments, made by two these groups of investors, *venture capital* is represented by institutional investors (publicly trading companies, subsidiaries of large banks and other financial institutions, etc.). Venture capital investors act as intermediaries between financial institutions (such as large companies, pension funds, and so on) and unquoted companies, raising finance from the former and investing it in the latter[132]. Investments are being made nationally and internationally, mainly through social networks and proactive outreach[133]. Venture capital is an investment made by professionals, whose primary reward is capital gain with a dividend yield supplement[134]. As can be seen in the definitions given above, crowdfunding investors, BA and VC have some common characteristics. Crowdfunding investors and BA invest their own money. The main reason to invest for all three types of investors is financial reward. Moreover, not mentioned but still a very important characteristic for all these investors is the funding instrument – shares or bond-like shares in a company[135].

Due to the similarities between crowdfunding investors, BA and VC, and because of the same group of capital seekers, whom all they finance, it is possible to seek for crowdfunding success drivers among the success drivers of BA and VC financing. Despite of this fact, scholars do not find strong evidence that the success drivers of BA and VC can be transferred to the crowdfunding context. Ahlers (2015) note that, due to the above mentioned differences between the types of investors, the way the crowdfunding projects would signal their quality to the crowdfunding investors is likely to differ from the way of signaling to the BA or VC[136]. This idea is supported by Lukkarinen et al. (2016), who find that the criteria usually used by BA and VC is not relevant for equity crowdfunding investors[137]. On a related note, in their crowdfunding literature review Moritz/Block (2016) state: "Venture capital and business angel

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[129] The reader could may have already gotten an impression of the concept of business angels from the TV shows "Hölle der Löwen" (Germany), "Shark Tank" (USA), or "Dragons' Den" (UK), where entrepreneurs try to convince prominent business angels to invest in the entrepreneurs' business
[130] Lukkarinen et al. (2016), p. 28
[131] Avdeitchikova/Landstrom/Månsson (2008), p. 378
[132] Lumme/Mason/Suomi (1998), p. 6
[133] Lukkarinen et al. (2016), p. 28
[134] Wright (1998), p. 521
[135] Ahlers et al. (2015), p. 955; Lukkarinen et al. (2016), p. 28
[136] Ahlers et al. (2015), p. 956
[137] Lukkarinen et al. (2016), p. 36

research may provide some ideas about the decisive factors. However, whether crowd investors use similar decision criteria as professional investors is still unclear."[138] As the decision criteria of BA and VC could differ from those of crowdfunding investors, the success drivers of these financing forms should differ too.

Within the scope of obtaining a literature review for this master thesis, a single opposite piece of evidence was found, namely, in the field of crowdfunding human capital success drivers. Piva/Rossi-Lamastra (2017) derive the crowdfunding human capital success driver of entrepreneurial experience from literature on BA and CV success drivers[139]. Scholars find that entrepreneurial experience has a significant positive impact on the success of crowdfunding campaigns[140]. As mentioned in Chapter 3.2, the findings on crowdfunding human capital success drivers are contradictory, which makes these signals an interesting research subject. The previously mentioned results from transferring BA and VC funding success drivers to the context of crowdfunding reveal the relevance of researching crowdfunding human capital success drivers, from the point of view of BA and VC research.

As has been shown by scholars, the qualities of the project's team are among the most important factors for the investment decisions of BA and VC[141]. As well as for crowdfunding projects, the size of the team has also been shown to have a significant impact on the success of BA and VC financing[142]. One of the key team characteristics to have been researched is education of the project's team members. Behrens et al. (2012) find that team members' management and industry related education provides important signals for VC investors in young bio-pharmaceutical ventures. Becker-Blease/Sohl (2015) show that team members' industry related education is positively related to the BA evaluation of the project[143]. According to Hsu (2007) and Gimmon/Levy (2008), the technology-based start-ups with at least one PhD in the team have higher chances for success by BA and VC financing than others. Franke et al. (2008) find evidence that VC prefer to invest in start-ups with heterogeneous teams comprising members with business and industry-related education. The next team characteristic to be mentioned is entrepreneurial and industry related experience. Baum/Silverman (2004) and Gimmon/Levy (2008) show that the management experience of the projects' founders positively impacts the investment decisions of VC. MacMillan et al. (1985) and Becker-Blease/Sohl (2015) find the same

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[138] Moritz/Block (2016), p. 39
[139] Piva/Rossi-Lamastra (2017), p. 4
[140] Piva/Rossi-Lamastra (2017), p. 15
[141] Lukkarinen et al. (2016), p. 30
[142] Kirsch/Goldfarb/Gera (2009)
[143] Becker-Blease/Sohl (2015)

evidence for the industry related experience of the project's founders. The last group of team qualities which have been found to influence financing success are the personal characteristics of the team members: staying power and the ability to handle risk[144], trustworthiness and enthusiasm[145], sympathy and openness[146], realism[147] and passion[148].

This chapter has an important outcome, relevant to the subject of the current master thesis. The literature on BA and VC success drivers can give valuable ideas about the success drivers of crowdfunding campaigns, but only to a limited extent. Based on the findings of the scholars, only human capital success drivers of BA and VC can be researched in the context of crowdfunding. Based on this finding and on the findings of Chapters 3.1 and 3.2, in following chapter I will develop the hypotheses of the current research.

3.4. Development of Research Hypotheses

As shown in Chapter 3.1, information asymmetries create a hurdle for entrepreneurs seeking crowdfunding financing. This hurdle can be overcome by the project's founders by sending potential investors signals about the unobservable qualities of the project. In order to reveal the signals, which can impact the success of crowdfunding signals, a review of the literature on crowdfunding success drivers was made in Chapter 3.2. Human capital success drivers appear to be one of the groups with the most contradictory set of results. Due to the small number of studies on crowdfunding success drivers, literature on BA and VC financing success drivers was used as a source for further ideas about possible crowdfunding success drivers. However, based on the findings of the previous studies, only the human capital BA and VC financing success drivers can be of use in the context of crowdfunding. These findings allow for deriving human capital success drivers from those of BA and VC financing. This chapter is dedicated to developing the hypotheses of the current master thesis, based on considerations gleaned from previous chapters.

Table 2 helps to sum up the findings of existing literature on crowdfunding human capital success drivers, with regards to signaling theory framework and to BA and VC financing success drivers. As can be seen from the table, three out of five papers on crowdfunding human capital success drivers found evidence for the significant impact of the human capital drivers on crowdfunding success. Four out of these five papers

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[144] Macmillan/Siegel/Narasimha (1985)
[145] Sudek (2006)
[146] Moritz/Block/Lutz (2015)
[147] Feeney/Haines/Riding (1999)
[148] Cardon/Mitteness/Sudek (2009)

used signaling theory as a framework, and two of them derived the researched human capital success drivers from the literature on the BA and VC financing success drivers. As it can be seen in Table 1, research from none of these papers was conducted on the basis of data from a German crowdfunding platform. This fact, as well as the differences in findings and theoretical frameworks used, confirms the importance of the research presented in this master thesis.

Table 2: Studies on Human Capital Success Drivers of Equity-based Crowdfunding Campaigns: a Summary of Selected Findings and Theoretical Frameworks

Study	Do the human capital success drivers researched have a significant impact on crowdfunding success?	Signaling theory framework used?	BA and VC financing success drivers applied?
Ahlers et al. (2015)	yes: - number of board members (+), - share of board holding MBA (+)	yes	no
Lukkarinen et al. (2016)	no: - campaign's rating in terms of human capital (educational background, experience, industry expertise, track record, balance between team members' skill sets, perceived motivation, drive, passion, commitment, and honesty)	yes	yes
Vismara (2016)	yes: - number of team members	no	no
Block/Hornuf/ Moritz (2018)	no: - updates regarding the project's team	yes	no
Piva/ Rossi-Lamastra (2017)	yes: - business education of founders (+) - entrepreneurial experience of founders (+) no: - industry related education of founders - industry specific work experience of founders	yes	yes

Note: (+) – significant positive impact on the campaign's success

It is within the scope of this master thesis to research the impact of human capital success drivers on the success of crowdfunding campaigns. In order to achieve this target and to fill in the existing research gaps, three main objectives of this master thesis are being set as follows. Firstly, research should be made based on the data not used in previous studies. For this to be true, data from the German crowdfunding platform Seedmatch will be used. The process of data gathering and the sample taken will be described in chapter 4.1. Secondly, the results of the thesis must be complementary to existing literature on the same subject, and comparable with results from existing studies on human capital crowdfunding success drivers. For this reason, only human capital success drivers, as researched in previous studies, will be taken into account, by developing a hypotheses for the research of this master thesis. At the same time, the hypotheses will be developed with regard to the BA and VC financing success drivers that have already been researched, and to the available data. Thirdly, the research must be conducted within the framework of signaling theory. To fulfill this task, the human capital success drivers being researched must fit the signaling theory model. The basics of signaling theory have already been described in Chapter 3.1. At this point, before developing hypotheses, the issue of signal effectiveness should additionally be explicitly mentioned.

To reduce information symmetries, the information must reveal the unobservable qualities of crowdfunding projects. For this purpose, information must fulfill the criteria of effective signals. Otherwise, such information could be perceived as "cheap talk"[149]. The characteristics of effective signals are signal observability and signal cost.

Signal observability is the extent to which the signal can be noticed and understood by the signal receiver[150]. In the context of equity crowdfunding, human capital signals are more or less observable to investors, depending on where the information on entrepreneurs' human capital is located[151]. Some information is posted directly on the crowdfunding platform, while more is posted on other Internet pages, with links of them being available on the crowdfunding platform. For this research, only the data gathered directly from the crowdfunding platform will be used. Therefore, all the success drivers that have been researched are assumed to be observable signals.

The signal cost is the transaction cost associated with obtaining and implementing a signal[152]. Effective signals must be costly, and must also be structured

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[149] Ahlers et al. (2015), p. 960
[150] Connelly et al. (2011), p. 45
[151] Piva/Rossi-Lamastra (2017), p. 17
[152] Connelly et al. (2011), p. 45

in such a way that the cost of producing the signal does not outweigh its benefits[153]. Moreover, the payoff for sending the costly signals is higher for high-quality projects than for low-quality projects[154]. Hence, signals distinguish high-quality projects from low-quality ones. The human capital success drivers researched in this master thesis have different costs. Therefore, the signal efficacy of the researched human capital success drivers will be separately proven by developing each hypothesis.

According to a meta-study by Unger et al. (2011), the extant entrepreneurship literature on human capital finds strong evidence for a positive relationship between human capital and success. Human capital increases a project's chance of discovering and exploiting business opportunities, helps to acquire financial and physical capital, and assists in the accumulation of new knowledge and skills[155]. Moreover, Rauch et al. (2005) find evidence that human resources are important factors in predicting the growth of small-scale enterprises.

In general, a founders' team size has been shown to be positively associated with the growth of new firms[156]. A larger team signifies a stronger endorsement of the project[157]. Following Ahlers et al. (2015), the amount of human capital in the crowdfunding project can be broadly captured using the number of board members. In the context of crowdfunding, project teams are rather small and therefore each member of the team has a decisive role for development of her field of activity in the project. As crowdfunding projects are small, growing start-ups seeking funding, gaining each new person into the board or into the team incurs a relatively high cost for them. Intuitively, adding one more team member should be the result of one of the following: either the project goes well and the revenue growth makes it possible to hire a new team member, or the project idea is so good that it attracts new members, working in an unsalaried position. Therefore it seems reasonable to expand the arguments presented by Ahlers et al. (2015) and Vismara (2016), to capture the amount of human capital by also using the number of members of the board members and the size of the whole project's team.

In terms of signaling theory, to be an effective signal for the unobservable project's quality, the board size and the team size must be costly to obtain. As crowdfunding projects are small, growing start-ups seeking funding, gaining each new person on the board or team has a relatively high cost. Therefore, making the

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[153] Spence (1973), p. 358
[154] Connelly et al. (2011), p. 45
[155] Unger et al. (2011), p. 341
[156] Eisenhardt/Schoonhoven (1990), p. 523
[157] Kirsch/Goldfarb/Gera (2009), p. 493

information about the size of the project's board and project's team available on the crowdfunding platform can be an effective signal of the project's quality.

According to the considerations mentioned above, hypotheses 1a and 1b are formulated as follows:

Hypothesis 1a: Projects with larger boards are more successful in equity-based crowdfunding campaigns than projects with smaller boards.

Hypothesis 1b: Projects with larger teams are more successful in equity-based crowdfunding campaigns than projects with smaller teams.

In his paper, thought to be essential in the development of signaling theory[158], Spence (1973) discusses the role of workers' education on the size of their salaries. Spence states that education, as a human capital signal, distinguishes high ability workers from low ability workers, and thus allows the former to obtain better salaries[159]. Scholars researching signaling in the context of crowdfunding assume, in analogy to Spence (1973), that not only employees but also entrepreneurs effectively signal their unobservable qualities by means of giving information about certain characteristics of their own educational history[160].

Ahlers et al (2015) show that share of the board members possessing an MBA title is an effective human capital signal in equity crowdfunding. Piva/Rossi-Lamastra (2017) expand on the research of Ahlers et al. (2015) and argue that the diverse fields of the entrepreneurs' education are differently effective, as signals of the start-ups' unobservable qualities. The scholars distinguish business education, industry-related education and education in other fields. By doing so, Piva/Rossi-Lamastra (2017) assume, that the business and industry-related education of the project's founders has a positive impact on crowdfunding success. To potential investors, the business education obtained by the entrepreneurs should fuse with their innate abilities to identify business opportunities, assess the viability of business, evaluate costs and arrange organizational processes, develop realistic business and marketing plans, and understand the markets' and customers' needs[161]. Similar reasoning can be applied to entrepreneurs' industry-related education, which includes the knowledge and skills to master industry specific technologies, solve industry

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[158] Block/Hornuf/Moritz (2018), p. 5
[159] Spence (1973), p. 370
[160] Backes-Gellner/Werner (2007), p. 187
[161] Piva/Rossi-Lamastra (2017), p. 4

specific problems and understand industry specific markets' and customers' needs[162]. These arguments are in line with findings from Behrens et al. (2012) and Becker-Blease/Sohl (2015) on success drivers of BA and VC financing.

Franke et al. (2008) find evidence that VC prefer to invest in the start-ups with heterogeneous teams comprising business and industry-specific educated individuals. Piva/Rossi-Lamastra (2017) include the dummy control variable for heterogeneous education in their research and find that it has no significant effect. Nevertheless, I find the arguments of Franke reasonable and applicable to the crowdfunding environment. A heterogeneous team with a combination of members who possess business and industry related education, have complete competence in all fields, and are involved in founding and conducting business. Therefore, a composition of such a team should positively affect the project's success in crowdfunding. Based on this argument, Hypothesis 2c is formulated.

Considering the findings of the literature on human capital success drivers of BA and VC financing, it seems reasonable to focus on one more aspect of the education characteristics of the project's board members: academic status. According to signaling theory, degrees and education credentials in general signal the differences in abilities, persistence and other valuable characteristics of individuals[163]. Moreover, high status is argued to attract resources and increase the likelihood of success[164]. Consequently, having a PhD on the project's board can mean a high academic status of this board member and thus signal the project's quality to investors. Consistent with this, Hsu (2007) and Gimmon/Levy (2008) found that the technology-based start-ups with at least one PhD in the team (regardless of the field in which the PhD was obtained) have higher chances for success by BA and VC financing than others. On a related note, JantjeFranck/Opitz (2004) show that holding a PhD title is used as a signal for being talented by the top managers in Germany. I propose applying these considerations to the context of crowdfunding. In doing so, I expand the research undertaken by Hsu (2007) and Gimmon/Levy (2008) on start-ups across all industries, presented on Seedmatch. To this end, I assume that the holding of a PhD title by board members, regardless of the PhD field, positively impacts the crowdfunding success of the project. Considering these arguments, Hypothesis 2d is formulated.

For information about the education of the project's board members to be an effective signal for the unobservable project's quality, obtaining such information must be costly. All the education human capital signals discussed are combined with

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[162] Piva/Rossi-Lamastra (2017), p. 4
[163] Spence (1973)
[164] Gimmon/Levie (2010), p. 1216

obtaining a certain educational degree or level. Acquiring any educational degree and level is costly, due to tuition fees and time taken completing educational programs[165]. Therefore, making the information about the education of the project's board members available on the crowdfunding platform can be an effective signal for the project's quality.

Hypothesis 2a: Projects with board members who possess business education are more successful in equity-based crowdfunding than other projects.

Hypothesis 2b: Projects with board members who possess education related to the industry of the project are more successful in equity-based crowdfunding than other projects.

Hypothesis 2c: Projects with boards containing members with business education and members with industry related education are more successful in equity-based crowdfunding than other projects.

Hypothesis 2d: Projects with boards containing members with PhD titles are more successful in equity-based crowdfunding than other projects.

In a similar way to having education in different fields, work experience in different areas of expertise can give differently effective signals for equity crowdfunding investors. In particular, Piva/Rossi-Lamastra (2017) argue that the entrepreneurial and industry related work experience of a project's board members has a positive impact on the project's success in crowdfunding. Studies on BA and VC financing show that investors appreciate the entrepreneurial experience of the project's founders[166]. Feeney/Haines/Riding (1998) also find evidence that private investors appreciate prior commercial experience of the new firms' owners. Experienced entrepreneurs likely have skills and competences which are fundamental for founding and developing new businesses[167]. Additionally, while running their former business, they are likely to have established social relations with customers and suppliers, which now become a vital resource for their new start-ups[168].

In a similar vein, the industry related experience of the project's founders would mean familiarity with the start-up's environment, industry specific knowledge of technologies, production processes and competitive dynamics. Moreover, having already worked in the same industry in the past, the entrepreneur has developed social

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[165] Piva/Rossi-Lamastra (2017), p. 3
[166] Baum/Silverman (2004); Gimmon/Levie (2010)
[167] Gimeno et al. (1997), p. 759
[168] Piva/Rossi-Lamastra (2017), p. 4

contacts with customers, suppliers and other relevant stakeholders which can be applied to the current project[169]. MacMillan et al. (1985) show that familiarity with the target market of the projects' founders positively impacts the investment decisions of VC. Moreover, a number of studies found evidence for the positive impact of industry related experience of the project's founders on the business characteristics of the project. Colombo/Grilli (2009) found that industry related work experience is positively associated with growth of new technology-based firms. In the literature review for their paper on the survival of new ventures, Gimmon/Levy (2010) list 9 studies which identify industry related experience as a factor which contributes to the new venture's survival[170]. Based on these arguments, Hypotheses 3a and 3 b are formulated, as stated below.

Eesley/Hsu/Roberts (2013) find evidence that functionally diverse founding teams are likely to achieve high performance in a competitive commercial environment. Scholars define a functionally diverse team as a team with members having either technology, or finance, or sales (marketing), or other roles[171]. Piva/Rossi-Lamastra (2017) include the dummy control variable for heterogeneous work experience, and find that it yields no significant results. Nevertheless, considering the arguments of Eesley/Hsu/Roberts (2013) and those of Hypothesis 2c, I propose that projects with boards containing members with business work experience and members with industry related work experience are more successful in equity-based crowdfunding than other projects. This consideration leads to Hypothesis 3c.

For information about the work experience of the project's board members being an effective signal for the unobservable project's quality, obtaining such information must be costly. Obtaining work experience is time-consuming, and therefore can be seen to be costly. Consequently, making information about the work experience of the project's board members available on the crowdfunding platform can be an effective signal for the project's quality.

Hypothesis 3a: Projects with board members who have prior business work experience are more successful in equity-based crowdfunding than other projects.

Hypothesis 3b: Projects with board members who have prior industry related work experience are more successful in equity-based crowdfunding than other projects.

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[169] Gimeno et al. (1997), p. 771
[170] Gimmon/Levie (2010), p. 1217
[171] Eesley/Hsu/Roberts (2014), p. 1817

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Hypothesis 3c: Projects with boards containing members with business work experience and members with industry related work experience are more successful in equity-based crowdfunding than other projects.

As can be seen, not all human capital success drivers mentioned in the selected papers from Chapters 3.2 and 3.3 were directly considered in formulating the hypothesis of this research. This was for the following reasons. Holding an MBA degree by the board member of the project, as researched by Ahlers et al. (2015), has been expanded to research on business education as a success driver and considered in Hypothesis 2a. The campaign's rating in terms of human capital as in Lukkarinen et al. (2016) cannot be the subject of the current research because of the chosen research design. The number of updates about the project's team on the campaign page, as in Block/Hornuf/Moritz (2018), was not considered in the current research because of the reasonable argument of Block/Hornuf/Moritz (2018) regarding their findings. Scholars argue that investor value updates signaling dynamic qualities of the start-up (such as updates about new funding or business developments) and not the qualities which should have been provided at the funding start and do not change during the funding campaign (such as team characteristics)[172]. Personal characteristics of the project's team members which have been shown to have a positive impact on BA and VC financing success were not considered in the current research because of the chosen research design: to operationalize personal characteristics of the team members, a series of interviews should be conducted.

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[172] Block/Hornuf/Moritz (2018), p. 17

4.   Data and Methodology

4.1.   Data Collection and Sample

As there is no database containing information on Seedmatch crowdfunding campaigns, the qualitative analysis for this master thesis is being conducted on the hand collected data. In this chapter I will first introduce a Seedmatch crowdfunding platform as the source for my data sample. Then I will briefly describe the data collection process.

Seedmatch was founded in 2011 and was the first German crowdfunding platform for startups[173]. As of June 2018, the platform is the fourth big crowd-investment platform in Germany and counts for 7.2% of the German crowd-investment market[174]. At the same time, Seedmatch is the second biggest German platform with a focus on equity-based crowdfunding for startups, which makes it a good representational example for the German equity-based crowdfunding market[175].

Seedmatch offers funding for two types of companies, based in Germany, Austria and Switzerland, namely for startups (so-called seed investments) and young, high-growth companies (Venture Debt loans, which are explained below). To be able to seek funding on Seedmatch, companies must be registered as corporate entities, (German: "Kapitalgesellschaft") either as limited companies (German: "GmbH") or entrepreneurial companies (German: "Unternehmergesellschaft (haftungsbeschränkt)")[176]. Moreover, companies have to have a heterogenous entrepreneurial team and be able to present their proof of concept. The young, high-growth companies must have proof of a constant and sustainable business model, with significant and increasing revenue in recent years[177]. Private investors can invest from 250 to 10 000 Euro, and the investments of institutional investors can be higher than 10 000[178]. If the crowdfunding campaign is successful, Seedmatch is awarded an honorary portion, amounting to 5-10% from the investing sum. Seedmatch operates under the "all-or-nothing" model. The average Seedmatch investor invests in 2.8 projects, whereas 54.3% of investors invest in only one project[179]. Consequently, Seedmatch can be seen as representative for the "crowds" rather than for small groups of professional recurring investors like business angels or venture capitalists.

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[173] Seedmatch (2018b)
[174] Harms (2018)
[175] Michels/Hoffmann (2017), p. 5
[176] Seedmatch (2017b)
[177] Seedmatch (2018e)
[178] Seedmatch (2017b)
[179] Seedmatch (2018e);

Investments in the start-ups on the Seedmatch are conducted on the basis of profit participation. Besides their financial return on investment, investors also profit from exclusive discounts and investor goodies. Essential return potential arises from participating in the economic success of the project, and from participating in the so-called exit proceeds, when the project is sold to an external investor. Investments in growing companies on Seedmatch are conducted on the base of Venture Debt loans. The investors provide a loan to the projects with a daily fixed interest rate of up to 9% p. a. for a term of up to 5 years. The so-called "venture kicker" is an additional one-time return opportunity which depends on the size of the project's revenues. Both forms of investments are subordinated loans, which leaves the entrepreneurs freedom in their business decisions[180].

Figure 4 depicts the crowdfunding process on Seedmatch[181]. After the selection process, during which 99% of candidates are rejected, the platform and the project begin the preparation of the crowdfunding campaign. The crowdfunding campaign lasts 60 days and can be extended to a further 60 days after reaching the funding threshold before the end of the campaign. At this point, three important definitions must be explained: funding limit, funding target and funding threshold. Funding limit is the maximum funding which the project aims to gather[182]. The definition of the funding target is not clarified by Seedmatch. At the same time, it is often used by researchers in papers on crowdfunding success. As can be seen from the definition of funding limit, for Seedmatch, funding target can be assumed to be the same as the funding limit. Another important milestone in the crowdfunding process is the funding threshold. The funding threshold is normally smaller than the funding target. The funding threshold is the point at which a successful funding campaign has been attained: according to Seedmatch rules, the crowdfunding project has failed if it did not manage to reach the funding threshold. If this happens, all the investments are returned to the investors[183].

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[180] Seedmatch (2018d)
[181] Information for the figure: Seedmatch (2018c), Seedmatch (2017b). The Figure is modified from Lukkarinen et al. (2016), p. 29.
[182] Seedmatch (2017a), p.15
[183] Seedmatch (2018d)

Figure 4: Investment Process on Seedmatch

| Application from the company to Seedmatch with a project presentation | → | Intern evaluation from Seedmatch (1 week). Project eligible? | 1%: yes → | Crowdfunding campaign: -preparation (4-5weeks) - funding campaign (60 days). - Funding threshold reached? | 95%: yes → | Campaign successful: project receives money |

99%: no ↓

No campaign

5%: no ↓

Campaign unsuccessful: Funds return to investors
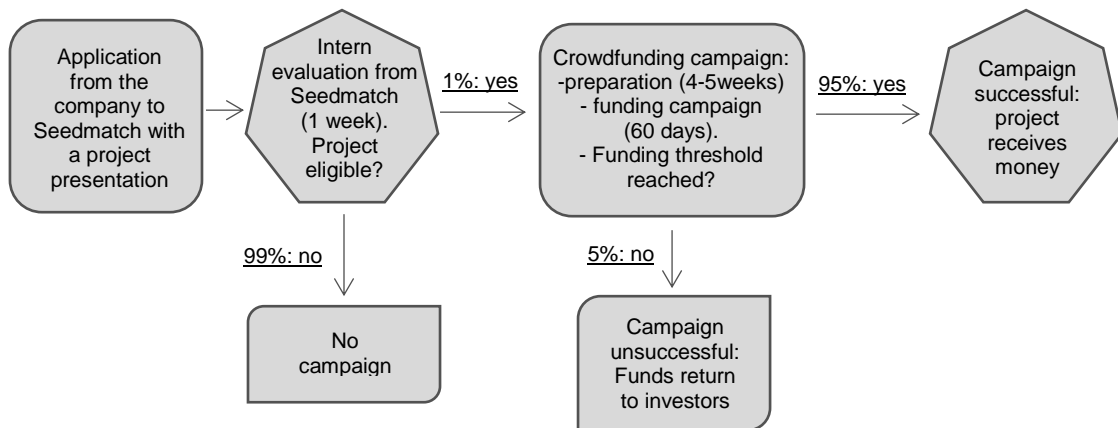
Note: % - percent of projects from the previous phase.

The population of the analysis for this master thesis consists of 105 projects, which were launched and closed on the Seedmatch between its foundation in 2011 and the 1st of December 2017. The data for the analysis was collected by hand. For each project, I have consulted the dedicated page on Seedmatch and gathered information needed for operationalizing the variables, as described in the next chapter. Data has been obtained solely via Seedmatch. To be able to assess the importance of the information placed on the crowdfunding platform, so that it is not mixed with the effects of social network Internet pages, I have decided not to gather information from external links placed on the projects' pages on Seedmatch. 100 of the 105 campaigns included in the data sample (95.24%) reached the funding threshold and have been funded. The investments for the remaining 4.76% of the campaign were returned to the investors, because the respective campaigns did not reach the funding threshold.

Making conclusions about the crowdfunding success drivers based on the results of the analysis conducted on data from Seedmatch has limitations. The pages of selected projects which did not reach the funding threshold were deleted in order to maintain a good image of the platform. Therefore the number of unsuccessful projects, the data for which is available on Seedmatch, is lower than in reality. Consequently, the current analysis investigates drivers impacting the success magnitude in terms of crowdfunding, and does not provide evidence on the drivers of success or failure in terms of crowdfunding.

4.2. Variables for Econometric Models

This master thesis aims to find out the impact of the selected projects' human capital characteristics on crowdfunding success. The goal of this chapter is to describe the process of constructing variables for quantitative analysis on subject. Following Ahlers et al. (2015), Lukkarinen et al. (2016), Vismara (2016) and Block/Hornuf/ Moritz (2018), as the unit of analysis, I use a project seeking funding on the crowdfunding platform Seedmatch. The variables for the current analysis are defined by taking measures and determinants of success, used by scholars in prior research, and eliminate measures and determinants, which cannot be used because of data limitations. All variables are based on the data collected from the Seedmatch crowdfunding platform Internet site.

As can be seen from Table 1, the researchers of equity-based crowdfunding use following **dependent variables** to measure crowdfunding success: capital raised, ratio of capital raised to the target capital (share of the target capital raised), reaching the funding target (dummy variable), and the number of investors.

Following Vismara (2016) and Piva/Rossi-Lamastra (2017), the ***target_capital_share*** variable is measured as the percentage of the target capital raised[184]. The variable *target_capital_share* is a fine-tuned measure for the crowdfunding success: *target_capital_share* indicates how close the pitch came to reaching the funding target, or by how much it exceeded the funding target[185].

Following Ahlers et al. (2015) and Lukkarinen et al. (2016), the amount of capital raised (variable ***funding_amount***) is used as a measure of the crowdfunding success, irrespective of whether the threshold was reached or not.

The ***no_investors*** variable, as applied in research by Ahlers et al. (2015), Lukkarinen et al. (2016) and Vismara (2016), measures the number of investors at the end of the crowdfunding campaign, regardless of whether the threshold was reached or not. This variable is a multidimensional measure for crowdfunding success for several

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[184] I also include into analysis natural logarithm of funding target (variable *ln_funding_target*) as a control variable. However, using target capital as a base for calculating *target_capital_share*, as well as of *ln_target_capital* is complicated due to the data availability on Seedmatch. In the case of the funding target being reached within 60 days, funding campaigns are extended and a new target capital is set. In this case, information on the original target capital is not available on Seedmatch. Under these circumstances, the funding threshold could be a better measure for the campaign's starting point. However, the information about the size of the funding threshold on Seedmatch is only available for the campaigns, which failed to reach it (4.76% of the data sample). At the same time, the information on the funding target or funding limit for these campaigns is not available. Thus, the campaign's Seedmatch page contains only one measure at a time: either the funding target, the funding limit, or the funding threshold. To have a target capital of the crowdfunding campaign which I can account for, I use one of these measures, which is currently available on the campaign's Seedmatch page: either the funding target, the funding limit, or the funding threshold.

[185] Vismara (2016), p. 584

reasons. First, the projects often use crowdfunding platforms not only to gather funds but also as marketing and distribution tool[186]. For this reason, a higher number of investors means a higher success in advertisement and increasing the customer base. Second, if the target capital was reached within 60 days after starting the campaign, Seedmatch allows the target capital to be increased and extends the campaign for a further 60 days[187]. At the same time, the minimum size of the investments on the Seedmatch is € 250. As investors cannot make arbitrary small investments, each investment increases the raised capital at a minimum of € 250 and thus increases the probability of reaching the target capital early, thus prolonging the campaign. Third, in line with the literature on public offers, existing shareholders prefer a dispersed set of shareholders to a small number of large shareholders[188]. This consideration can also be applied to crowdfunding. It may be unfavorable for the project to have big investors: A few big investors can be better organized than many small investors and can thus try to influence the business decisions of the entrepreneurs.

Using a dependent variable in form of dummy variable for reaching the funding target has its limitations in the context of the Seedmatch funding platform. As has already been mentioned, the crowdfunding campaign lasts for 60 days and can be extended to a further 60 days after reaching the funding threshold before the end of the campaign[189]. If this is the case, Seedmatch sets a new funding target and the count of 60 days starts again from the beginning. Thus, the funding target as seen on the project's Seedmatch page does not reflect the original funding target. Some projects go for the funding campaign extension until they come to the point where the updated funding target cannot be reached. Other projects choose to end the funding campaign, not willing to raise more funds though being able to do so. Moreover, the pages of projects which did not get any funding at all are deleted by the platform in order to maintain a good image of the platform. Therefore, the number of projects for which dummy for reaching the target would be equal to 0, would be much lower than in reality[190]. Thus, defining crowdfunding success by the means of reaching the funding target can give little explanation about the characteristics, distinguishing the successful and the unsuccessful projects.

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[186] Belleflamme/Lambert/Schwienbacher (2013), p. 27; Seedmatch (2017a), p. 13
[187] Seedmatch (2017a), p. 15
[188] Vismara (2016), p. 584
[189] Seedmatch (2017a), p.15
[190] Though deleting the pages of completely unsuccessful projects affects all measures of success, I assume that fine-tuned countable measures like target capital share, funding amount and number of investors are less affected by the process of deleting campaigns than a dummy variable indicating success would be.

The *target_capital_share,* as a fine-tuned measure for the crowdfunding success, will serve as a dependent variable for the main part of the analysis of this master thesis. *Funding_amount* and *no_investors* will be used as dependent variables in the robustness tests.

Explanatory variables, used for this research, are of two types: variables to test the research hypotheses and control variables. The first group of variables is derived from the research hypotheses and hence contains three subgroups, testing different characteristics of the project's human capital: 1) variables for operationalizing the size of the project's human capital (to test Hypotheses 1a and 1b); 2) variables for operationalizing different characteristics of the board members' education (to test Hypotheses 2a, 2b, 2c, and 2d); 3) variables for operationalizing different characteristics of the board members' work experience (to test Hypotheses 3a, 3b, and 3c). The second group of the explanatory variables, the control variables, will be selected based on the previous research on crowdfunding success. Due to the small sample, however, the number of control variables will be limited, in order to get unbiased results for the central questions of the research[191].

According to Hypotheses 1a and 1b, the first subgroup of the independent variables should serve to test the impact of the project's board and team size on crowdfunding success. Following Vismara (2016) and Ahlers et al. (2015), the variables ***no_board*** and ***no_team*** will be used to broadly capture the amount of human capital. For these variables, the number of project's board and team members as reported on the project's Seedmatch page[192] will be counted, and *no_team* = *no_board* + number of employees. Sometimes, the project's page contains little or no information about the composition of the project's board and its employees, whereas it is difficult to distinguish the former from the latter or to identify the board members. Therefore, I needed to set the following rules to be able to identify the board members and distinguish them from employees, consultants, advisors and business angels. If the Seedmatch project's page contains no information about the board but it contains information about the founders acting like executive managers, they are referred to as the board members. The board members have the words "Chief", "Head" or "Leiter" (English for "Chief") in the name of their position. If from the content it is clear that a project member is solely responsible for the large field of business, and the project's page contains a short description of their responsibilities and the word "verantwortlich"/"verantwortet" (English: "responsible for"), and takes part in making

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[191] The large amount of explanatory variables means a small amount of events per variable and can cause overfitting problems. See, e.g., Hawkins (2004), Peduzzi et al. (1996).
[192] Section "Wer steht hinter …" on the projects' Seedmatch page

business decisions for a particular field of business in line with CEO (German: "Geschäftsführer"), they are referred to as a board member. At the same time, the project's member is only referred to as a board member if their name is mentioned on the Seedmatch project's page. If the Seedmatch project's page contains no information about the project employees, it is assumed that the project has no employees. Experts, consultants, advisors and business angels, mentioned on the project's description page are not referred to, either as board members or employees.

The next subgroup of explanatory variables will serve to test the impact of the board members' education on the project's crowdfunding success, as stated in Hypotheses 2a, 2b, 2c, 2d. To operationalize business education, I will first refer to Piva/Rossi-Lamastra (2017) and Ahlers et al. (2015), who researched the impact of MBA and business education on crowdfunding success. To operationalize business education, Piva/Rossi-Lamastra (2017) used the variable counting the total number of years spent in education in economics. In my opinion, this approach does not reflect the quality of business education and can erode the results of the research. A board member can spend more than 10 years in education in economics, with or without passing exams and getting a degree in economics. They could also be very talented and get a degree in two years, or quit the studies after two years. In both cases, the duration of the studies is clearly not a direct indicator of the quality of business education. Therefore, the method proposed by Piva/Rossi-Lamastra (2017) does not suit the needs of the current research.

Ahlers et al. (2015) used holding an MBA title as an indicator and proxy for business education. However, Germany has a smaller number of MBA courses when compared to countries like the USA, UK or Australia[193]. Therefore, Germans have less opportunities to obtain n MBA degree than Australians do (Ahlers et al. (2015) based their research on the Australian crowdfunding platform ASSOB). This means that German investors would appreciate not only MBA but also other forms of business education as a sign of deep business understanding and knowledge. According to a study by German Federal Ministry of Education and Research, with regards to their content, MBA programs are comparable to bachelor and master academic studies in economics and business management[194] (German: Wirtschaftswissenschaften, Betriebswirtschaftslehre/ Entrepreneurship). Consequently, I find it reasonable to operationalize business education with educational degrees similar to MBA with regard to their content and duration. This manner of operationalizing the business education of

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[193] See, e.g., Brackmann/Kran (2001), Randlesome (1993)
[194] Brackmann/Kran (2001), pp. 34-36. For the history and quality of traditional German business education see Randlesome (1993)

the board members was also used by Behrens et al. (2012) in their research on the success drivers of the BA financing[195]. I assume holding any bachelor and master degree in economics or business administration to be a good proxy to operationalize the business education of the crowdfunding project board members. Moreover, I assume that big boards should need more members with business education to satisfy the needs of bigger company in business expertise than small companies. For this reason, a dummy variable accounting for at least one board member with business education would not be a suitable proxy for the board members' business education. Taking into account the company size, I assume that the share of board members having business education is more suitable to reflect the amount of the board's business expertise. Therefore the variable *board_bus_educ_share* is calculated as a share of the project board members, holding a bachelor or master degree in economics or business administration, including an MBA.

To test Hypothesis 2b, I need to operationalize the industry related education of the board members. To the best of my knowledge, until now, only Piva/Rossi-Lamastra (2017) have researched the question about the impact of the industry related education of the board members on the success of the crowdfunding project. To operationalize industry related education, these scholars built a variable computing the number of years spent in the education, related to the start-up industry. The arguments about the purpose of using duration as proxy for business education, mentioned in the previous paragraph, are also applicable to using duration as proxy for industry related education. Therefore it seems reasonable to look for another proxy to operationalize industry related education in the literature on the BA and VC financing success drivers. Furthermore, as well as they would need more business expertise to conduct their business, companies with bigger boards should also need more members with industry expertise, than companies with smaller boards. In line with argumentation applied for building a proxy for business education, I assume the share of board members having education in related industry to be suitable to proxy the amount of the board's industry expertise. For this reason, and in line with Behrens et al. (2012) and Becker-Blease/Sohl (2015), I build a variable *board_ind_educ_share* as a share of board members, holding a bachelor or a master's degree in the field, related to the project's industry.

To test Hypothesis 2c, an interaction term *board_bus_educ_share x board_ind_educ_share* will be used in the econometric model. For testing the Hypothesis 2d, I follow the research done by Gimmon/Levy (2010) and build a dummy

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[195] Behrens et al. (2012)

variable *d_phd.* This variable distinguishes the project with at least one PhD in a board from those which have no board members with such academic credentials.

The third subgroup of the explanatory variables operationalizes work experience. According to Gimeno et al. (1997), a common measure for work experience is the number of years of work experience[196]. To the best of my knowledge, at the time of writing this master thesis, only Piva/Rossi-Lamastra (2017) have researched work experience as a crowdfunding success driver. To operationalize work experience, scholars counted the number of years in business or in the industry related to the start up[197]. This measure seems to be a suitable proxy for operationalizing work experience. However, before applying the variables used by Piva/Rossi-Lamastra (2017), one important feature of their research must be paid close attention to. The unit of analysis in their research is an entrepreneur, whereas the unit of analysis of the current master thesis is a crowdfunding project. I must therefore consider the impact of the each board member's work experience on the overall evaluation given to the project by potential investor. In order to do this, I assume that the work experience of each board member adds quality to the project. This argument is also in line with previously mentioned findings by scholars on the importance of the project's team size. Consequently, it seems reasonable to operationalize the work experience of the projects board by summing up the years of work experience in business or in the related industry of all the board members. The available data sample, however, contains little information about the duration of the board members' work experience. In contrast, the information about the field of work experience is mentioned for almost all of the board members. Furthermore, companies with big boards should need more board members having work experience in business or in related industry than companies with small boards. To account for this fact I build proxies for board members' work experience as shares of the board members having particular work experience. Taking into account the limitations of the data sample, I operationalize work experience with the share of the board members having business work experience (independent variable *board_bus_work_share*) and experience in the industry related to the start-up(independent variable *board_ind_work_share*). In doing so, as an indicator for business experience I will consider the board members having worked as a CEO in a company, having been an executive manager/project manager/business development manager, having worked as business consultants (German: "Unternehmensberatung"), as well as having founded their own business before the current project. At the same time, I will indicate work experience as having been obtained only if the former

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[196] Gimeno et al. (1997), p. 756
[197] Piva/Rossi-Lamastra (2017), p. 7

employer, a previously held position or functionality in a company is mentioned. The mention of business work experience, without mentioning the employer/position or without precise description of their functions in the previous work place, are not seen as constituting having obtained business work experience. As having obtained work experience in the industry related to the start-up, I will consider mentioning the board member having worked in the industry of the project as classified, according to the ISIC Rev.4 industry classification[198]. To test Hypothesis 3c, an interactive term **board_bus_work_share x board_ind_work_share** will be used in the econometric model.

In line with the crowdfunding literature, a list of **control variables** is included in the econometric model. As described in Chapter 3.2, scholars found a number of crowdfunding campaigns and project characteristics to have an impact on equity-based crowdfunding success. However, due to the limitations of the available data and time constraints, not all of these variables can be included in the current analysis. Moreover, the number of control variables must be limited in order to avoid the overfitting problems, as already mentioned[199]. In line with Ahlers et al. (2015), Vismara (2016), Lukkarinen et al. (2016) and Piva/Rossi-Lamastra (2017), I control for the target capital of the crowdfunding campaign. The variable **ln_target_capital** is measured as a natural logarithm of the target capital. Following the approach of Piva/Rossi-Lamastra (2017), to control for the gender of the board members, I include the variable **female_on_board_share**, which equals the share of the female board members of the project. In one of the robustness tests, on a related note with Lukkarinen et al. (2016), I involve a dummy variable **d_b2c** to control for B2C products and services, and, according to Ahlers et al. (2015), a control variable **years_in_business**, counting years from project's founding until the campaign's year.

Given that not all relevant explanatory variables could have been controlled for, I follow the approach of Block/Hornuf/Moritz (2018) and include year dummies to control for crowdfunding market development and changes in regulations. The projects' pages on Seedmatch contain neither the information about the campaigns' starting date nor their duration, and only the date of crowdfunding campaign's end is available. Given that all the campaigns on Seedmatch are of limited duration and do not last more than a few years, I include a dummy variable accounting for the year the campaign ended. Thus, the regression model includes **dummy variables for each year** from 2012 to 2017. 2011 is chosen as a base and is not included into the regression models.

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[198] For the conducted industry classification, see the paragraphs regarding control variables in the current chapter

[199] For the process of selecting control variables, see the last paragraph in the current chapter

Besides controlling for market changes, the specific of each industry should also be accounted for by involving industry dummies into the analysis. The available data sample includes companies from 26 industry branches. Taking into account the small data sample, including dummies for all the presented industries would lead to the overfitting problem described above. Therefore, to shorten the number of industry dummies and at the same time account for the most important changes in the market, I followed Piva/Rossi-Lamastra (2017), and included a dummy variable **d_high_tech**. Being a high-velocity environment with rapid changes and difficult predictable success, high-tech industries offer the companies more uncertain prospects than other industries[200]. For this purpose, I have first grouped the projects according to their belonging to a particular industry based on the two-digit ISIC Rev.4 industry classification (United Nations International Standard Industry Classification)[201]. Secondly, I have selected the projects operating in the industries 26 (manufacture of computer, electronic and optical products) and 62(computer programming, consultancy and related activities) from the ISIC Rev.4, as those which operate in high-tech industries. In doing so, I have constructed a dummy variable *d_high_tech*, which equals 1 if the project deals either with manufacturing of computer, electronic and optical products, or with computer programming, consultancy and related activities. Some projects act in a few industries at the same time[202], which makes classifying them into industries difficult. If the information for the revenue share in each industry field for such a project was mentioned on the Seedmatch project's page, I have classified the project as belonging to the industry where it obtains the highest revenue. As the current research analyses crowdfunding success, the apprehension of the investors and how the investors asses the project's industry is much more important for the results of the research than the precise industry classification according to ISIC Rev.4. Therefore, in cases of doubt, I have tried to take the perspective of the investor to conduct the projects' industry classification.

The set of control variables for the regression is chosen as following: *ln(target_capital)*, *female_on_board_share[203]*, *d_high_tech* and *campaign_year*. Table 3 summarizes all the variables used in the reported results (including variables involved in the robustness tests).

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[200] Piva/Rossi-Lamastra (2017), p. 9
[201] Department of Economic and Social Affairs, Statistic Division (2008)
[202] E.g., the project LeaseRad sells bicycles via leasing and offers repair services for them thus acting in three different industries: retail of bicycles, leasing services, repair services.
[203] Though the board members' gender is seen by researchers as a demographical characteristic, it has a direct connection to the human capital and is thus being included into the main regression, reported in this master thesis. Further explanation for selection the control variables for econometric models, see the last paragraph in this chapter.

Besides variables mentioned, previous research on crowdfunding success drivers found evidence for the campaign duration, monetary vs. non-monetary rewards, quality and amount of information available on the crowdfunding project page, project's content, previous funding experience, social capital and intellectual capital to have an impact on the crowdfunding success (see Table 1). The projects' pages on Seedmatch contain no information either about the campaigns' starting date, or about their duration. Consequently, based on the available data, including the variable for campaign duration into the analysis is not possible. Current research deals only with equity-based crowdfunding projects. Therefore, including variable distinguishing monetary and non-monetary rewards, which is specific for the reward-based crowdfunding, is not relevant for it either. The quality and amount of information available on the crowdfunding platform would be the next characteristic to control for in the current analysis. Scholars found the number of videos, number of certain updates, number of comments, financial information (revenue forecast or excerpts of the annual financial statement) and quality of texts to have an impact on crowdfunding success. However, including the corresponding variables and gathering data for them would go beyond the limits of this master thesis in terms of time constraints. Therefore including such control variables is being left to future research. As mentioned in Chapter 3.2, the project's content has been researched in terms of distinguishing between the for-profit and non-profit projects. Data sample, used for the current research, does not contain any non-profit projects, so that the project's content is not relevant for the current analysis. As social capital has also been shown to have an impact on crowdfunding success, the list of control variables should include the proxies for it. To operationalize social capital, scholars use the number of the social networks links on the project's description page as well as number of Facebook friends or LinkedIn connections. From all these possibilities for operationalizing social capital, Seedmatch projects' description pages typically contain only a link to the project's Facebook page (77.1% of the projects). However, the number of the Facebook friends, as seen on the project's description page, is permanently updated due to the properties of the external Facebook links. Consequently, the number of Facebook friends, available on the Seedmatch project's page, reflects the number on the day of data gathering, not on the day a potential investor first saw the project's page. Due to the lack of data, the proxy for the social capital cannot be included in the list of control variables. Moreover, on a related note with Ahlers et al. (2015), it can be argued that variables for human capital (already adopted for the current research) also contain information about the social connections of the board members. In this case, accounting for business or industry related education serves not only as a proxy for human capital, but also indicates the

potential for network surrounding the project: university graduates are often part of the exclusive network.

While running the regressions and choosing the models with the best fit, I've included into the analysis following variables for operationalizing the funding experience: number of previous funding rounds and the amount of capital raised in the previous funding rounds. Furthermore, the list of control variables has been complemented with a proxy for intellectual capital. Following the approach of Piva/Rossi-Lamastra (2017), I used a dummy variable for holding a patent to operationalize intellectual capital. Previous research also operationalized intellectual capital by including a dummy variable for being granted a reward. However, the criteria for rewards differ from institution to institution. At the same time, the criteria for granting a patent are equal for all. For this reason, I did not account for having obtained a reward. Being obliged to limit the number of control variables for the regressions, I selected the industry dummy (for high_tech), year dummies and those of the control variables, which had significant results. As the number of previous funding rounds, amount of capital raised and dummy variable for holding a patent were insignificant in all of the regressions, they are not being included into the final regressions, reported in the current master thesis.

Table 3: Dependent and Independent Variables

Variable	Description
Dependent Variables (Success Measures)	
funding_amount	capital, raised during the crowdfunding campaign
target_capital_share	proportion of the raised capital to the target capital, as a percentage
no_investors	number of investors at the end of the crowdfunding campaign
Independent Variables (Success Drivers)	
Explanatory variables	
no_board	the number of project board members
no_team	the number of project board members
board_bus_educ_share	share of the project board members holding bachelor or master degree in economics or business administration, as a percentage
board_ind_educ_share	share of board members holding a bachelor or a master's degree in a field related to the project's industry, as a percentage
d_phd	dummy variable: =1 if the project has at least one board member with a PhD title =0 if the project has no board members with a PhD title
board_bus_work_share	share of the project board members, having obtained business work experience, as a percentage
board_ind_work_share	share of board members, having obtained work experience in the industry, related to the project's industry, as a percentage
Control Variables	
ln_funding_target	natural logarithm of the crowdfunding campaign target capital
d_b2c	dummy variable: =1 if the project offers B2C product or service =0 if the project offers product or service other than B2C
female_on_board_share	share of the female project's board members
years_in_business	years from the project's founding up to now
d_high_tech	dummy variable: =1 if the project belongs to the high-tech industry =0 if the project does not belong to the high tech industry
campaign_year2012 – campaign_year2017	dummy variable ranging from 2012 to 2017: = 1 if the crowdfunding campaign ended this year, = 0 if the crowdfunding campaign ended another year

4.3. Descriptive Statistics and Regression Models

This chapter aims to take an overview of the variables used in the research for the current master thesis. For this purpose, descriptive statistics on the variables are summarized in Table 4[204]. The correlation table as well as the table containing the variance inflation factors (further on - VIF) of the model variables is found in the appendix. Over the next paragraphs, I will give a brief description of the selected model variables' summary statistics.

Table 4: Summary Statistics

	Min	Max	Mean	Median	SD
target_capital_share	19.17	150.00	88.75	100.00	20.54
funding_amount	24000.0	3000000.0	319050.0	200000.0	372852.1
no_investors	25.0	1826.0	309.7	242.0	243.5
no_board	1.00	8.00	2.93	3.00	1.40
no_team	1.00	43.00	7.93	5.00	8.06
board_bus_educ_share	0.00	100.00	20.02	0.00	30.66
board_ind_educ_share	0.00	100.00	23.54	0.00	30.61
d_phd	0.00	1.00	0.29	0.00	0.45
board_bus_work_share	0.00	100.00	31.50	25.00	33.75
board_ind_work_share	0.00	100.00	43.10	40.00	39.31
funding_target	50000.0	3000000.0	357571.4	250000.0	385575.3
ln_funding_target	10.82	14.91	12.43	12.43	0.81
d_b2c	0.0	1.0	0.8	1.0	0.4
female_on_board_share	0.00	100.00	11.92	0.00	23.83
years_in_business	0.15	13.56	2.85	2.38	2.03
d_high_tech	0.00	1.00	0.31	0.00	0.47
campaign_year2011	0.00	1.00	0.04	0.00	0.19
campaign_year2012	0.00	1.00	0.23	0.00	0.42
campaign_year2013	0.00	1.00	0.2	0.00	0.40
campaign_year2014	0.00	1.00	0.19	0.00	0.39
campaign_year2015	0.00	1.00	0.15	0.00	0.36
campaign_year2016	0.00	1.00	0.13	0.00	0.34
campaign_year2017	0.00	1.00	0.06	0.00	0.23

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[204] Though the funding target is not used without logarithmic transformation, information about it is included in the table, for descriptive statistics to give an overall impression about the crowdfunding campaigns being run on Seedmatch

The average project in the sample raises about 319 000 € and gets 88.75 % of its target capital from 309.7 investors (see Table 4). The average funding target is 357 751 € with funding targets ranging from 50 000 € to 3 000 000 €. There is also a considerable variance across campaigns as to the total number of funding raised: the minimum is 24 000 €, the maximum - 3 000 000 €, while the mean equals 319 000 €. As for the share of successful projects, 58 % of the campaigns raised 100 % and more of the target capital. The number of investors is highly variable, ranging from a minimum of 25 to a maximum of 1826.

In terms of team characteristics, the average project has 4 employees and 2.93 board members (11.92 % of whom are female), with 20.02 % of the board members having obtained business education and 23.54 % - education in the field related to the startup industry, 31.5 % of the board members having worked in business and 43.1 % - in the industry related with their startup. 29 % of the projects have at least one board member holding a PhD. Figure 5 summarizes the average project team on the Seedmatch[205].

Figure 5: Characteristics of the Average Startup Team on Seedmatch
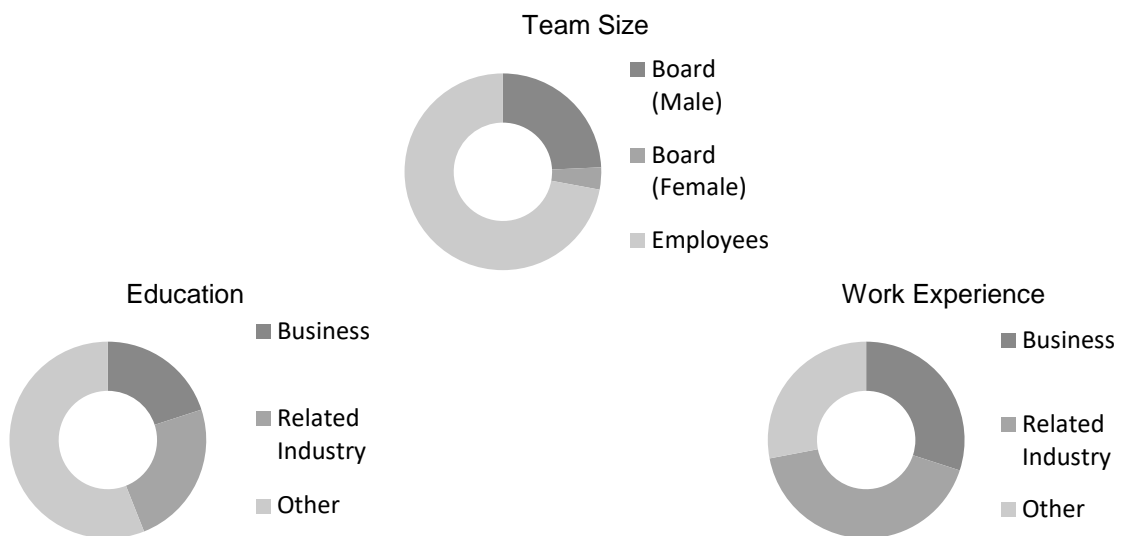
It is worth noting that the overall share of board members having business work experience and work experience in the related industry in all teams is higher than the share of board members having obtained business education and education in the field related to the startup industry. Thus, one can argue that business work experience and work experience in the related industry are more important for founding a startup than the respective education.

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[205] Some startup board members have both at the same time: a business education and an education in the related industry, as well as business work experience and related industry work experience. However, for demonstrative purposes this fact has been omitted when constructing the above diagrams.

The dispersion of campaigns in the data sample over the years is depicted in Figure 6. Having started operations in 2011, Seedmatch increased the number of the campaigns rapidly in 2012. In the period between 2012 and 2014 the number of the campaigns fell slowly. Beginning in 2015, the number of campaigns decreased until 2017. These trends are in accordance with the general development of the crowdfunding for startups market in Germany. After a huge growth in 2012, the market was relatively stable between 2013 and 2014, and from 2015 began to decrease[206].

Figure 6: Number of Crowdfunding Campaigns on Seedmatch, 2011-2017
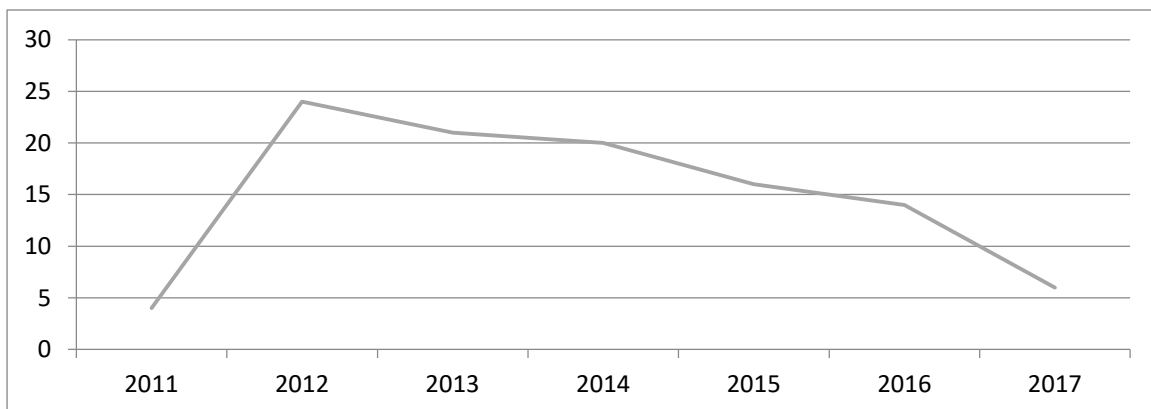
The projects in the data sample operate in 26 different industries (industry classification: two-digit industry codes from the ISIC Rev. 4). 33 of the 105 projects from the data sample operate in high-tech industries: they are either active in manufacturing of computers, electronic and optical products, or in computer programming or related services. The second most represented industry is retail, to which 24 projects belong. The remaining projects belong to different industries, the diversity of which is shown in Figure 6. Interestingly, a notable amount of projects, indeed 80%, offer B2C products or services. At the moment of their crowdfunding campaign, the average project has already been in business for almost three years, while half of the projects are younger than two and a half years.

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[206] Michels/Hoffmann (2017)

Figure 7: Industries of Projects Seeking Funding on Seedmatch

■ Manufacture of computer, electronic and optical products

■ Computer programming, consultancy and related activities

■ Retail trade, except of motor vehicles and motorcycles
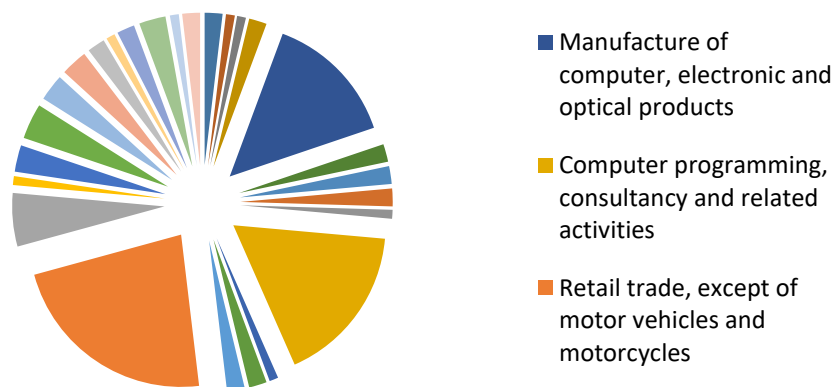
Correlations between the variables are presented in Table I in the appendix. While the coefficients for pairwise correlation between the independent variables are mostly low and insignificant, some higher correlations exist and should be explained here. Relatively high and significant correlation exists between the team's size and the natural logarithm of funding target (ρ=0.495). This can be explained by higher needs for financing projects with bigger teams: to sustain a big project, the startup should raise a large amount of money. One more interestingly high and significant correlation exists between the dummy variable for having at least one PhD on the board, and the share of board members with business experience (ρ=0.402). To find an explanation for this, I would like to come back to the argument used for developing the hypotheses for the current thesis. As mentioned in Chapter 3.4, JantjeFranck/Opitz (2004) show that holding a PhD title is used as a signal for being talent ed by the top managers in Germany[207]. On a related note, one can argue that the startup founders, who have already worked in business, tend to signal their talents by obtaining the PhD title before founding their new business. The negative and highly significant correlation between the dummy variable for the campaigns ended in 2012 and the natural logarithm of funding target (ρ=−0.583) can be explained by the lower funding targets set in campaigns in the first years of the Seedmatch's existence.

VIFs are presented in Table II in the appendix. The VIFs are all under 4, with a mean VIF of 1.932. Researchers often use a rule of thumb of the VIF being not higher than 10[208] to exclude the multicollinearity. Based on this rule, the variance inflation factors (VIF) indicate no issues with the multicollinearity in the current research.

For the variable *target_capital_share*, I run a simple ordinary least square (OLS) regression and estimate the heteroskedasticity-robust-standard-errors by means of

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[207] Franck/Opitz (2004)
[208] O'brien (2007), p. 688

Eicker-Huber-White standard errors and Wald-test. The baseline OLS model has the following form:

$$target\_capital\_share_i = \alpha_i + \beta_{1i}X_{\ln\_funding\_target} + \beta_{2i}X_{\text{female\_on\_board\_share}} +$$
$$\beta_{3i}X_{d\_high\_tech} + \beta_{4i}X_{\text{campaign\_year\_2012}} + \beta_{5i}X_{\text{campaign\_year\_2013}} +$$
$$\beta_{6i}X_{campaign\_year\_2014} + \beta_{7i}X_{campaign\_year\_2015} +$$
$$\beta_{8i}X_{campaign\_year\_2016} + \beta_{9i}X_{campaign\_year\_2017} + \varepsilon_i \ ,$$

where *i* is the crowdfunding campaign.

The variables *funding_amount* and *no_investors* are measured as count variables and suffer from over-dispersion[209]. At the same time, the outcomes of these variables are non-zero. For the dependent variables with such characteristics, scholars estimate a negative binomial regression to be a proper econometric model[210]. Based on this argumentation, I use the negative binomial regression as an econometric model for regressions with dependent variables *funding_amount* and *no_investors*[211]. At the baseline, I estimate the following models:

$$\log(funding\_amount_i) = \alpha_i + \beta_{1i}X_{\ln\_funding\_target} + \beta_{2i}X_{\text{female\_on\_board\_share}} +$$
$$\beta_{3i}X_{d\_high\_tech} + \beta_{4i}X_{\text{campaign\_year\_2012}} + \beta_{5i}X_{\text{campaign\_year\_2013}} +$$
$$\beta_{6i}X_{campaign\_year\_2014} + \beta_{7i}X_{campaign\_year\_2015} +$$
$$\beta_{8i}X_{campaign\_year\_2016} + \beta_{9i}X_{campaign\_year\_2017} + \varepsilon_i \ ,$$

$$\log(no\_investors_i) = \alpha_i + \beta_{1i}X_{\ln\_funding\_target} + \beta_{2i}X_{\text{years\_in\_business}} + \beta_{3i}X_{\text{d\_b2c}} +$$
$$\beta_{4i}X_{d\_high\_tech} + \beta_{5i}X_{\text{campaign\_year\_2012}} + \beta_{6i}X_{\text{campaign\_year\_2013}} +$$
$$\beta_{7i}X_{campaign\_year\_2014} + \beta_{8i}X_{campaign\_year\_2015} +$$
$$\beta_{9i}X_{campaign\_year\_2016} + \beta_{10i}X_{campaign\_year\_2017} + \varepsilon_i \ .$$

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[209] To detect possible overdispersion problems, I have conducted tests to compare the conditional means and variances of all the dependent variables. The variances of *funding_amount* and *no_investors* are higher than their means. According to Hilbe (2011), such differences suggest the presence of over-dispersion, for which negative binomial regression is an appropriate econometric model.
[210] Shengping/Gilbert (2015), p. 50; for general description of negative binomial regression and its characteristics see Hilbe (2011).
[211] To prove the choice of negative binomial regression, I have conducted the likelihood ratio test to compare the fit of the negative binomial regression vs. Poisson regression. The results of the test shew the negative binomial regression to have a better fit for analyzed data than the Poisson regression.

5.   Results of the Analysis

5.1.   Regression Results: The Impact of Human Capital Signals on Equity-Based Crowdfunding Campaigns' Success

Chapters 5.1 and 5.2 will present the results of the quantitative analysis conducted on human capital signals affecting crowdfunding success, as well as the results of robustness tests. Table 5 presents the estimates of the econometric models with dependent variable *target_capital_share*. In Model 1 (1a and 1b), only the control variables are included, while Models 2 (2a and 2b), 3 (3a and 3b) and 4 (4a and 4b) contain explanatory variables to test the hypotheses. Thus, Models 2, 3 and 4 test the impact of team size, board members education and board members work experience on the success of equity-based crowdfunding campaigns. Models 1a, 2a, 3a and 4a contain unstandardized coefficients. To allow for evaluating and comparing the size of the effects of explanatory variables, Models 1b, 2b, 3b and 4b present standardized coefficients.

Though the estimates of Model 1 are not in accordance with prior research, they reflect some peculiarities of the Seedmatch platform. Unlike prior studies (Mollick (2014), Colombo/Franzoni/Rossi-Lamastra (2015), Liao/Zhu/Liao(2015), Vismara (2016) and Piva/Rossi-Lamastra (2017)), I find that target capital has a positive impact on the share of the raised target capital, as the positive and significant coefficient of *ln_funding_target* indicates. This obstacle can lead back to the procedure of the Seedmatch funding process. In case the funding target is reached within 60 days, Seedmatch extends the campaign, setting a new higher funding target. Being able to observe the funding trends of a particular campaign, the administration of Seedmatch should be able to assess the probability of a project reaching the new funding target. Thus, I assume that the campaigns are extended only for those projects for which the Seedmatch administration can act on the assumption of them being able to reach the new funding target. Consequently, the high funding target set by the Seedmatch could mean there is a perception of the project as being able to be successful in funding.

Table 5: Regression Results. Dependent Variable: target_capital_share

	1a	1b	2a	2b	3a	3b	4a	4b
Constant	-3.06	0.00	-37.61	0.00	6.53	0.00	-4.45	0.00
	(36.68)	(36.68)	(39.88)	(39.88)	(34.61)	(34.61)	(37.83)	(37.83)
no_board			2.93**	0.20				
			(1.45)	(1.45)				
no_team			-0.57*	-0.22				
			(0.29)	(0.29)				
board_bus_educ_share					0.06	0.09		
					(0.07)	(0.07)		
board_ind_educ_share					0.08	0.11		
					(0.08)	(0.08)		
d_phd					0.93	0.02		
					(4.65)	(4.65)		
board_bus_work_share							-0.01	-0.02
							(0.10)	(0.10)
board_ind_work_share							0.04	0.07
							(0.06)	(0.06)
ln_funding_target	8.48***	0.33	11.30***	0.44	7.44**	0.29	8.54***	0.34
	(3.07)	(3.07)	(3.37)	(3.37)	(2.93)	(2.93)	(3.12)	(3.12)
female_on_board_share	-0.07	-0.08	-0.09	-0.10*	-0.06	-0.07	-0.09	-0.10
	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)
campaign_year2012	9.90	0.20	8.50	0.17	10.18	0.21	10.53	0.22
	(9.50)	(9.50)	(10.20)	(10.20)	(9.93)	(9.93)	(9.77)	(9.77)
campaign_year2013	-12.89	-0.25	-14.35	-0.28	-12.50	-0.24	-11.02	-0.22
	(11.18)	(11.18)	(11.65)	(11.65)	(11.66)	(11.66)	(12.44)	(12.44)
campaign_year2014	-9.12	-0.18	-16.09	-0.31	-8.33	-0.16	-7.86	-0.15
	(11.09)	(11.09)	(11.94)	(11.94)	(11.49)	(11.49)	(11.66)	(11.66)
campaign_year2015	-31.59***	-0.56	-36.43***	-0.64	-30.83**	-0.54	-30.71**	-0.54
	(12.12)	(12.12)	(11.99)	(11.99)	(12.47)	(12.47)	(12.13)	(12.13)
campaign_year2016	-21.08*	-0.35	-27.93**	-0.46	-21.27	-0.35	-20.54	-0.34
	(12.53)	(12.53)	(13.09)	(13.09)	(13.17)	(13.17)	(12.88)	(12.88)
campaign_year2017	-1.49	-0.02	-4.66	-0.05	-0.39	-0.004	-1.04	-0.01
	(14.96)	(14.96)	(16.03)	(16.03)	(16.16)	(16.16)	(15.82)	(15.82)
d_high_tech	-9.66**	-0.22	-11.75***	-0.27	-9.47**	-0.22	-10.04**	-0.23
	(4.24)	(4.24)	(3.80)	(3.80)	(4.72)	(4.72)	(4.59)	(4.59)
board_bus_educ_share: board_ind_educ_share					-0.001	-0.08***		
					(0.002)	(0.002)		
board_bus_work_share: board_ind_work_share							-0.001	-0.10***
							(0.001)	(0.001)
AIC	914.7	914.7	908.9	908.9	920.9	920.9	919.5	919.5
BIC	943.9	943.9	943.4	943.4	960.7	960.7	956.7	956.7
p-Value	3e-05	3.3e-05	4e-06	4e-06	0.000366	0.000366	0.000226	0.000226
Observations	105	105	105	105	105	105	105	105
R^2	0.31	0.31	0.37	0.37	0.32	0.32	0.32	0.32
Adjusted R^2	0.24	0.24	0.30	0.30	0.22	0.22	0.23	0.23

Note: *p<0.1; **p<0.05; ***p<0.01

The negative significant coefficients for dummy variables *campaign_year2015* and *campaign_year2016* are in line with general trends in the German crowdfunding market. After growth in 2012 and a relatively stable period between 2013 and 2014, the amount of capital raised and the overall number of crowdfunding campaigns for startups began to decrease in 2015 and continued to do so in 2016[212].

The estimated negative significant coefficient for control variable *d_high_tech* confirms the findings of Piva/Rossi-Lamastra (2017), who also include a dummy for high tech projects in their research on human capital drivers of crowdfunding success. Scholars argue that the negative impact of the belonging of the startups to the high-tech industry on crowdfunding success can be explained with uncertainty about the future prospects of these startups[213].

Model 2 tests the impact of the board's and team's size on the startup's crowdfunding success. The estimated coefficient for the independent variable *no_board* is positive and significant, and is thus in line with findings of Ahlers et al. (2015). This effect has a relatively large magnitude: the predicted value of *target_capital_share* increases by 2.93 (in percent) for a one member increase in the value of *no_board*. This change in the predicted value of *target_capital_share* is computed under the condition that all other variables remain unchanged. Therefore, the number of board members is being shown to have a positive impact on the crowdfunding success of a project. Ahlers et al. (2015) argue that board size is not only a good proxy for quantifying human capital but also serves as a measure for social capital: the more board members in the board, the more social connections the startup has to promote its funding campaign. These arguments could explain the fact that the share of the gathered target capital rises alongside increasing numbers of board members. Thus, hypothesis 1a is confirmed. Regression results of Model 2 indicate that 30 % of the variance in *capital_target_share* can be explained by the used set of variables and that the Model has significant explanatory power. As the adjusted R^2 of this Model is the highest of all the models and AIC and BIC are the lowest, Model 2 is considered to have the best fit of those presented in Table 5.

Surprisingly, findings on the impact of the team size on crowdfunding success contrast with those found in previous research. For instance, Vismara (2016) finds the positive impact of team size on crowdfunding success of startups. Though the coefficient, estimated in Model 2, is significant only at a level of significance of 10%, the negative coefficient of it clearly shows the direction of the possible change in the

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[212] Michels (2015); Michels/Hoffmann (2017)
[213] Piva/Rossi-Lamastra (2017), p. 9

predicted value of *target_capital_share,* with one-member increase in *no_team*. Such an estimated relation between funding success and team size may suggest that potential investors perceive higher risks to be connected to bigger startup teams. Hypothesis 1b is therefore not confirmed.

Models 3 and 4 test the impact of board members' education and board members' work experience on crowdfunding project success. The estimated coefficients for the corresponding variables *board_bus_educ_share, board_ind_educ_share, d_phd,* interaction term *board_bus_educ_share x board_ind_educ_share, board_bus_work_ share, board_ind_work_share* and interaction term *board_bus_work_share x board_ind_ work_share* are insignificant. Hence, I do not find support for Hypotheses 2a, 2b, 2c, 2d, 3a, 3b and 3c.

Overall, based on the results of the regression analysis, among all the involved measures for human capital signals, only *no_board* has a positive and significant impact on the share of target capital gathered in the crowdfunding campaign.

5.2.   Robustness Tests

For the purpose of ensuring the reliability of the results obtained, I perform a number of robustness tests. First, the regressions were run with a new dependent variable and the changed set of control variables. I replaced the dependent variable with alternative measures of the crowdfunding success. As mentioned in Chapters 4.2 and 4.3, I used the capital raised and number of investors as dependent variables in the negative binomial regressions. Moreover, the regression with dependent variable *no_investors* is run with the new set of control variables to ensure that my results are sustainable, regardless of the control variables of the regression. To this end, I replace the control variable for share of female board members with control variables for years in which the startup has been in business, and B2C product or service. The estimates of the models for robustness checks are reported in Tables 6 and 7. To evaluate the goodness of fit of the negative binomial regressions, I use McFadden's R^2[214]. Secondly, I rerun all the regressions after winsorizing the dependent variables and all the continuous independent variables at the 1st and the 99th percentile to test the robustness of the results to outliers.

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[214] For the concept of pseudo R^2, see McFadden (1973)

Table 6: Regression Results. Dependent Variable: funding_amount

	(1)	(2)	(3)	(4)
Constant	-1.31***	-1.97***	-1.18***	-1.33***
	(0.47)	(0.57)	(0.45)	(0.49)
no_board		0.04**		
		(0.02)		
no_team		-0.01*		
		(0.01)		
board_bus_educ_share			0.001	
			(0.001)	
board_ind_educ_share			0.001	
			(0.001)	
d_phd			0.01	
			(0.06)	
board_bus_work_share				-0.0003
				(0.001)
board_ind_work_share				0.001
				(0.001)
ln_funding_target	1.11***	1.17***	1.10***	1.11***
	(0.04)	(0.05)	(0.04)	(0.04)
female_on_board_share	-0.001	-0.001	-0.001	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)
campaign_year2012	0.10	0.08	0.11	0.11
	(0.11)	(0.13)	(0.12)	(0.12)
campaign_year2013	-0.17	-0.20	-0.17	-0.14
	(0.14)	(0.14)	(0.14)	(0.15)
campaign_year2014	-0.12	-0.25*	-0.12	-0.10
	(0.13)	(0.15)	(0.14)	(0.14)
campaign_year2015	-0.41***	-0.52***	-0.40**	-0.40**
	(0.16)	(0.16)	(0.16)	(0.16)
campaign_year2016	-0.27*	-0.40**	-0.28	-0.27
	(0.16)	(0.17)	(0.17)	(0.16)
campaign_year2017	-0.06	-0.12	-0.04	-0.05
	(0.17)	(0.18)	(0.18)	(0.18)
d_high_tech	-0.12**	-0.16***	-0.12*	-0.13**
	(0.06)	(0.05)	(0.06)	(0.06)
board_bus_educ_share: board_ind_educ_share			-0.00002 (0.00002)	
board_bus_work_share: board_ind_work_share				-0.00001 (0.00002)
AIC	2600.6	2593.8	2607	2605.3
BIC	2629.8	2628.3	2646.9	2642.5
Pseudo R2	0.1	0.104	0.1	0.1
Observations	105	105	105	105

Note: *p<0.1; **p<0.05; ***p<0.01

First, I replace the dependent variable with a new success measure *funding_amount*. Table 6 presents the results of the negative binomial regressions with the same set of independent variables as described in Chapter 5.1, and a dependent variable *funding_amount*. Model 1 tests only the control variables, while models 2 to 4 test the hypotheses of the research by including the respective sets of independent variables. The estimated coefficients of the control variables *ln_funding_target, campaign_year2015, campaign_year2016* and *d_high_tech* have the same sign and same significance level as those estimated in the regression with dependent variable *target_capital_share*. Estimated coefficient for the explanatory variables *no_board* is significant at a 5 % significance level and shows that the predicted value of *funding_amount* will increase alongside the increase in *no_board*. This implies a positive impact of board size on crowdfunding success.

Table 7: Regression Results. Dependent Variable: no_investors

	(1)	(2)	(3)	(4)
Constant	-5.42***	-6.01***	-5.30***	-5.40***
	(0.51)	(0.56)	(0.48)	(0.51)
no_board		0.02		
		(0.02)		
no_team		-0.01**		
		(0.005)		
board_bus_educ_share			0.001	
			(0.001)	
board_ind_educ_share			0.001	
			(0.001)	
d_phd			0.01	
			(0.06)	
board_bus_work_share				-0.002
				(0.001)
board_ind_work_share				-0.001
				(0.001)
ln_funding_target	0.92***	0.97***	0.91***	0.92***
	(0.05)	(0.05)	(0.04)	(0.04)
years_in_business	-0.04***	-0.03*	-0.05***	-0.05***
	(0.01)	(0.01)	(0.01)	(0.01)
d_b2c	-0.14**	-0.12**	-0.13**	-0.13**
	(0.06)	(0.06)	(0.06)	(0.06)
campaign_year2012	0.15	0.15	0.15	0.16
	(0.10)	(0.11)	(0.10)	(0.11)
campaign_year2013	-0.21*	-0.20	-0.21	-0.13
	(0.13)	(0.13)	(0.13)	(0.13)
campaign_year2014	-0.22*	-0.28**	-0.21*	-0.15
	(0.13)	(0.14)	(0.13)	(0.13)
campaign_year2015	-0.56***	-0.61***	-0.55***	-0.52***
	(0.14)	(0.14)	(0.14)	(0.14)
campaign_year2016	-0.42***	-0.52***	-0.43***	-0.38**
	(0.15)	(0.17)	(0.16)	(0.16)
campaign_year2017	-0.17	-0.26	-0.16	-0.13
	(0.16)	(0.16)	(0.17)	(0.16)
d_high_tech	-0.17***	-0.17***	-0.17***	-0.18***
	(0.06)	(0.06)	(0.06)	(0.06)
board_bus_educ_share: board_ind_educ_share			-0.00002	
			(0.00003)	
board_bus_work_share: board_ind_work_share				0.00001
				(0.00002)
AIC	1179.5	1174	1185.7	1181
BIC	1211.3	1211.2	1228.2	1220.8
Pseudo R2	0.161	0.168	0.163	0.165
Observations	105	105	105	105

Note: *p<0.1; **p<0.05; ***p<0.01

The estimated coefficient for the explanatory variable *no_team* remains significant at a level of 10 % and shows the negative impact of the team size on the funding outcome. All other variables testing the impact of human capital success drivers remain insignificant. Thus, the results of robustness check with dependent variable *funding_ amount* are in line with those obtained in regressions with dependent variable *target_ capital_share*.

Secondly, I replace the dependent variable and change the set of control variables. Table 7 presents the results of the negative binomial regressions with dependent variable *no_investors* and a changed set of control variables: *ln_funding_target, years_in_ business, d_b2c, d_high_tech* year dummies. Model 1 tests only the control variables, while models 2 to 4 test the hypotheses of the research by including the respective sets of independent variables.

The estimated coefficient of the control variable *ln_target_capital* remains positive and highly significant. In contrast to my expectations, while being significant at a significance level of 5 %, the estimated coefficients for control variables *years_in_business* and *d_b2c* are negative. This suggests that investors prefer investing into younger projects than the older projects, and that fewer investors are willing to invest into projects offering products and services for private customers than into projects offering products and services for businesses.

Preferring younger projects could be explained with the possible perceived low quality of old projects seeking funding through crowdfunding: one could argue that an older project should have already been successful enough to obtain funding from traditional sources like banks or venture capital. To explain the second effect, I would like to go back to the aim of including the dummy variable for B2C products or services. Lukkarinen et al. (2016) used this dummy as a proxy for the products' or services' understandability, and found a positive relation between B2C products or services and crowdfunding success[215]. Based on my findings, I find *d_b2c* to be an unsuitable proxy for the understandability of projects on Seedmatch. I suggest that investors find B2B business to be more sustainable and its client base more reliable, and therefore prefer it over B2C business. The estimated coefficients of the control variables *ln_funding_target*, *campaign_year2015, campaign_ year2016* and *d_high_tech* remain with the same sign as those estimated in the regression with dependent variables *target_capital_share* and *funding_amount* and at high significance levels. Contrary to the results obtained in previous models, the estimated coefficient of *no_board* is insignificant. At the same time, the estimated coefficient of *no_team* remains negative and is significant on the 5 % level of significance. Though results of these models do not confirm the results on the board size, they present a new set of control variables[216] with significant estimated coefficients, and confirm the findings on the team size, as presented in the previous chapter.

As it can be seen on the example of Figures I and II in the appendix, the available data has outliers. To test the robustness of the results to outliers, I rerun all the regressions after winsorizing the dependent variables and all the continuous independent variables at the 1st and the 99th percentile. The results of the regressions after winsorization, as reported in Table III in the appendix, do not change in terms of

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[215] Lukkarinen et al. (2016), p. 35
[216] The regressions with dependent variables *target_capital_share* and *funding_amount* were also run with this set of control variables. Interestingly, the estimated coefficients for *years_in_business* and *d_b2c* are significant only in the regression with dependent variable *no_investors*. This suggests that the age of the startup and its B2C specific has a significant impact on the number of investors, but not on the capital raised.

significance and direction of the relations between the dependent and independent variables. Thus I hold the results of the conducted research to be robust to outliers.

6. Conclusion

6.1. Discussion of the Results Obtained and Practical Implications of the Analysis

The objective of this master thesis was to research the impact of human capital characteristics on companies' crowdfunding success. Scholars indicate information asymmetries as one of the biggest hurdles for entrepreneurs on their way to getting funds for their projects. Finance theory offers a solution for this problem, within the framework of signaling theory. According to signaling theory, applied to a crowdfunding context, entrepreneurs can use different signals to show the quality of their project. The group of signals investigated in the current master thesis comprises information on different human capital characteristics of the project, being funded in crowdfunding.

To analyze the impact of human capital signals on crowdfunding success, three main tasks of this master thesis have been set as follows. First of all, the research should be based on data which was not used in previous studies. For this purpose, I analyzed data from 105 crowdfunding campaigns, run on the one of the biggest German crowdfunding platforms, Seedmatch. Second, the results of the thesis should be comparable with the results of existing studies on human capital crowdfunding success drivers. To this end, I derived the hypotheses and the econometric methods from previous research on related subjects. The hypotheses for the current research have been developed to test the impact of the size of the project's human capital, as well as the education and the work experience of the project's board members on crowdfunding success. Third, the research should be conducted within the chosen framework of finance theory, which in this case was signaling theory. Econometric models used were the ordinary least square regression and the negative binomial regression.

The contribution of this master thesis is twofold. First, in order to get a literature overview, I summarized all previously conducted research on human capital crowdfunding success drivers. As a result, I conducted the analysis of all the before researched human capital crowdfunding success drivers in one research. Second, the analysis of all the previously researched human capital crowdfunding success drivers has been conducted based on data from the German crowdfunding platform Seedmatch, which has not been made before.

The results of this analysis show that for the available data sample, the board size has a positive significant impact on crowdfunding success, measured as the raised share of target capital. Team size, board members' business education, education in the related industry, business work experience, work experience in the related industry, having PhD members, as well as heterogeneity of the board in terms of education and work experience are not found to have a significant impact on crowdfunding success. The results on the positive significant impact of the board size on crowdfunding success are in line with those of Ahlers et al. (2015). This effect can be explained using the argument that board size is not only a good proxy for quantifying human capital, but also serves as a measure for social capital. Consequently, each board member brings their social connections to the project and promotes the funding campaign. Thus, the share of target capital rises with increasing numbers of board members. Thus, board size is an effective signal by which entrepreneurs can signal the quality of their project to potential investors.

Current research has not shown any significant results for hypotheses testing the board members' education and work experience. On one hand, it seems intuitive that these factors should impact the investment decisions of the investors. Missing significant results would then point to the possible weaknesses in the methods chosen for the research. For instance, factors influencing results could be omitted variable bias caused by not including important explanatory variables, the chosen industries classification, the process of identifying project members as board members, as well as the construction of variables. On the other hand, missing significant results on the board members' education and work experience could mean that investors pay much more attention to the purpose of the project and its content than to the track record and academic credentials of the board members.

The results of the current thesis are relevant for small and emerging companies seeking funding. First, each entrepreneurial team should thoroughly consider involving more people in the project's board: each board member would bring social connections and thus influence the positive outcomes of the funding campaign. Second, as education and work experience are not found to influence the investment decisions of potential investors, this could encourage entrepreneurs to seek funding for their projects, regardless of their education and work experience. Third, entrepreneurs considering obtaining a PhD, not because of the passion for science but as an instrument to increase their status, could instead consider investing this time into building a solid board team and improving their business. Moreover, these results can be interesting for crowdfunding platforms, which consult the potential crowdfunding projects and assist them in preparations for the start of the funding campaign. Investors

with negative investment experience could rethink their investing behavior, and consider whether they pay enough attention to the human capital of the projects which they invest in.

6.2. Limitations of the Study and Questions for Future Research

The current research has limitations which offer avenues for further investigation. First of all, the analysis for this master thesis has been made based on the data from one German crowdfunding platform. This can bring problems in terms of possible platform- and country-specific factors. Moreover, due to the specificity of the data available on Seedmatch, the research has been conducted relying on imperfect data, on the target capital of the crowdfunding campaigns and incomplete data regarding unsuccessful projects. Second, current research has focused on three human capital characteristics: size, education and work experience. Though these human capital signals are intuitively important for signaling the project's quality to the potential investors, other human capital signals could have a greater degree of importance in this context. For example, considering education, I did not account for apprenticeships ("Ausbildung") or educational courses, as well as a prominent university, which could attract potential investors. When considering work experience, I did not pay attention to the level of autonomy of the board members on their previous positions, did not explicitly account for having worked for a big corporation or for having already started a successful startup. Third, due to possible over-fitting problems, I did not include into research all of the previously identified crowdfunding success drivers, such as quality and amount of information available on the crowdfunding project's page, previous funding experience, social capital and intellectual capital, and I did not take into account the project's content. Finally, I did not account for financing instruments in the analysis. From the 105 crowdfunding campaigns included in my data sample, 3 were not startups but growing companies, with venture debt as a financing instrument. From the limitations observed in this master thesis, I would propose the following directions for future research. First, the data sample could be extended by involving data from other German crowdfunding platforms. If crowdfunding platforms are not willing to cooperate and offer data, following the activity of crowdfunding platforms "live" and gathering data would be time consuming, but the only possible way to get reliable data. Second, future research could include other facets of education and work experience by accounting for specific universities and employers. Third, the researchers who have bigger data samples at their disposal should account for the campaign's and project's characteristics, previously found to have a significant impact on the crowdfunding success: quality and amount of information available on the crowdfunding project's

page, previous funding experience, social capital and intellectual capital. Fourth, future research should account for the financing instrument offered in the crowdfunding campaign.

Further, I would propose including a possible subjective investor perception of the project's content in the research. Generally, subjectivity decreases the reliability of the results of scientific research. However, the scientific strand researching the drivers of the investment decisions aims to build a model to quantify the subjective view of potential investors. Therefore, to capture the subjective opinion of the investor on the project's content, I would propose classifying projects into thematic groups, for instance: 1) projects dealing with products and services for children or families with children, 2) projects dealing with drugs, medical services, medical software, medical education, products and software for doctors, 3) projects dealing with digitalization and software for businesses, 4) projects dealing with devices and software for home. One could argue that industry classification should capture the proposed thematic classification of the projects. However, the projects mentioned in the previous sentences within one proposed group would belong to completely different industry groups, even under a high-level industry classification. To conduct a reliable classification of projects into groups in terms of their content, as well as increasing the quality of assigning a board member status to the project members, I would propose the quantitative analysis combining data gathered from crowdfunding platforms with data obtained from relevant laboratory experiments and/or interviews.

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Appendix

Table of Contents

Table I: Correlation Table

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1	target_capital_share	1																			
2	funding_amount	0.188	1																		
3	no_investors	0.248*	0.963***	1																	
4	ln_funding_target	-0.012	0.803***	0.822***	1																
5	female_on_board_share	-0.046	-0.056	-0.054	-0.073	1															
6	d_high_tech	-0.044	0.059	0.040	0.008	-0.275**	1														
7	no_board	0.071	0.192*	0.185	0.256**	0.008	0.195*	1													
8	no_team	-0.106	0.485***	0.409***	0.495***	-0.044	0.070	0.120	1												
9	board_bus_educ_share	0.113	0.055	0.067	0.011	0.020	-0.299**	-0.150	-0.024	1											
10	board_ind_educ_share	0.061	0.201*	0.218*	0.258**	-0.093	0.169	0.146	0.114	-0.055	1										
11	d_phd	0.010	0.114	0.132	0.281**	-0.034	0.026	0.167	0.273**	-0.128	0.262*	1									
12	board_bus_work_share	-0.089	0.058	0.059	0.161	-0.113	-0.158	0.040	0.230*	0.025	0.009	0.402**	1								
13	board_ind_work_share	0.013	0.155	0.151	0.215*	0.158	-0.013	0.075	-0.001	-0.179	0.112	0.308*	0.128	1							
14	campaign_year2011	-0.014	-0.124	-0.149	-0.229*	-0.100	0.187	-0.134	-0.098	0.032	-0.099	-0.126	-0.187	-0.092	1						
15	campaign_year2012	0.300**	-0.308**	-0.309**	-0.583***	0.045	0.120	-0.186	-0.205*	0.042	-0.097	-0.194	-0.270*	-0.121	-0.108	1					
16	campaign_year2013	-0.048	0.013	0.068	0.082	0.067	-0.031	-0.182	0.132	0.036	-0.006	0.053	0.294**	-0.081	-0.100	-0.272**	1				
17	campaign_year2014	0.077	0.182	0.212*	0.199*	-0.047	0.037	0.268**	-0.005	0.019	-0.007	0.015	0.191	0.140	-0.097	-0.264**	-0.243*	1			
18	campaign_year2015	-0.341***	0.080	0.062	0.238*	0.064	-0.173	0.078	0.119	0.026	-0.012	0.025	-0.023	-0.009	-0.084	-0.231*	-0.212*	-0.206*	1		
19	campaign_year2016	-0.155	0.009	-0.022	0.108	-0.096	-0.084	0.100	-0.095	-0.066	0.172	0.124	-0.059	0.085	-0.078	-0.214*	-0.196*	-0.190	-0.166	1	
20	campaign_year2017	0.177	0.192*	0.142	0.239*	0.006	0.010	0.041	0.186	-0.139	0.045	0.117	-0.068	0.087	-0.049	-0.134	-0.123	-0.119	-0.104	-0.097	1

Note: *p<0.1; **p<0.05; ***p<0.01

Table II: VIFs

	VIF	√VIF
no_board	1.310	1.145
no_team	1.560	1.250
board_bus_educ_share	1.243	1.115
board_ind_educ_share	1.201	1.096
d_phd	1.530	1.237
board_bus_work_share	1.663	1.290
board_ind_work_share	1.293	1.137
ln_funding_target	2.745	1.657
female_on_board_share	1.245	1.116
d_high_tech	1.553	1.246
campaign_year[217]	3.848	1.119
Mean VIF:	1.534	

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[217] campaign_year is a factor variable with 7 levels, with each level corresponding to one of the years from 2011 to 2017

Figure I: Regression Line for the OLS Model 2 as Described in Chapter 5.1. Predictor Variable: no_board
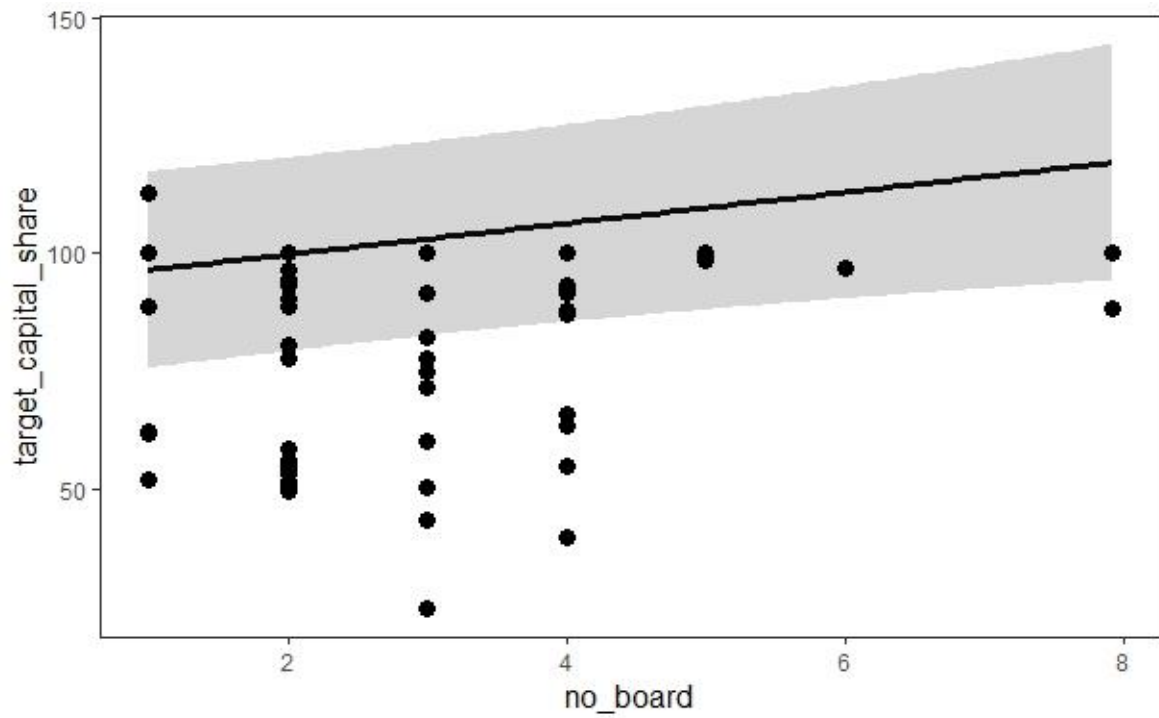

Figure II: Regression Line for the OLS Model 2 as Described in Chapter 5.1. Predictor Variable: no_team
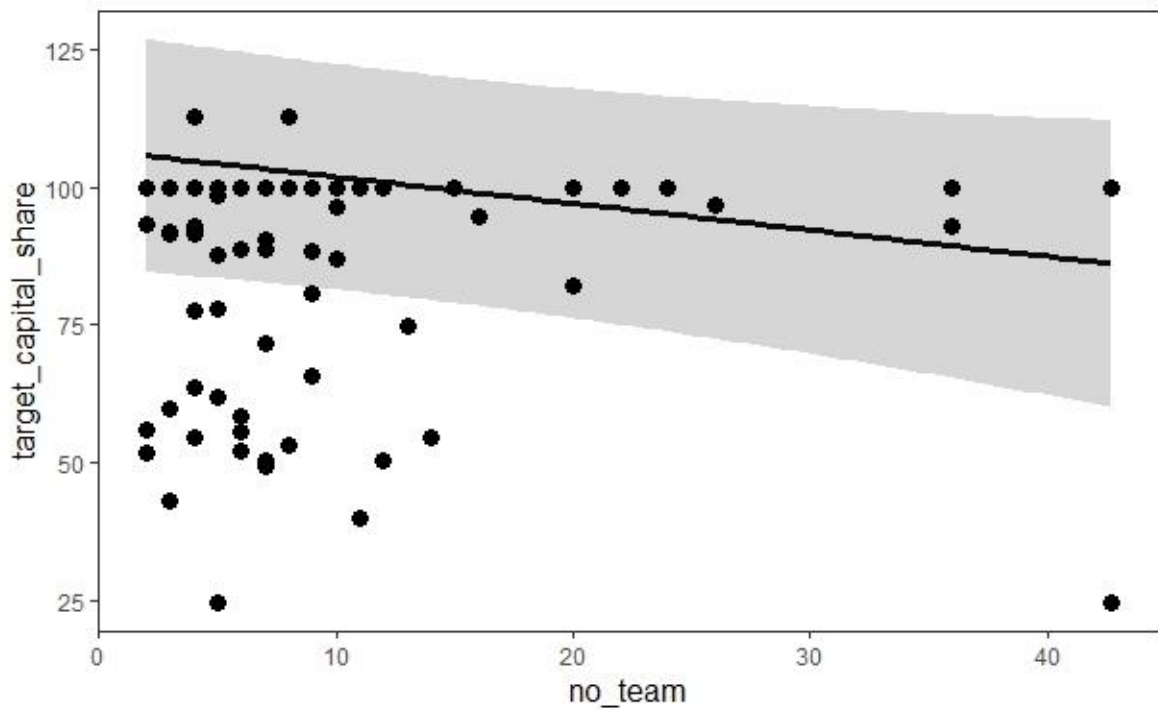
Table III: Regression Results of the OLS Model after Winsorization

	(1)	(2)	(3)	(4)
Constant	-9.926	-39.034	1.838	-0.149
	(35.110)	(38.818)	(33.106)	(33.816)
no_board		3.293**		
		(1.314)		
no_team		-0.480*		
		(0.267)		
board_bus_educ_share			0.072	
			(0.063)	
board_ind_educ_share			0.084	
			(0.079)	
d_phd			1.823	
			(4.462)	
board_bus_work_share				0.071
				(0.064)
board_ind_work_share				0.091
				(0.074)
ln_funding_target	9.020***	11.301***	7.767***	7.938***
	(2.940)	(3.293)	(2.814)	(2.885)
female_on_board_share	-0.057	-0.080	-0.047	-0.047
	(0.058)	(0.053)	(0.056)	(0.057)
campaign_year2012	9.981	8.279	10.232	10.448
	(9.473)	(10.100)	(9.894)	(9.797)
campaign_year2013	-13.249	-14.947	-12.955	-12.597
	(11.121)	(11.515)	(11.565)	(11.356)
campaign_year2014	-9.573	-16.914	-8.778	-8.507
	(11.016)	(11.682)	(11.395)	(11.314)
campaign_year2015	-31.649***	-36.892***	-30.898**	-30.640**
	(11.912)	(11.735)	(12.274)	(12.146)
campaign_year2016	-21.308*	-28.297**	-21.714*	-21.305*
	(12.388)	(12.856)	(12.982)	(12.852)
campaign_year2017	-8.389	-12.037	-7.357	-6.903
	(11.597)	(12.139)	(12.715)	(12.445)
d_high_tech	-8.805**	-11.242***	-8.591*	-8.624*
	(4.022)	(3.659)	(4.499)	(4.447)
board_bus_educ_share:board_ind_educ_share			-0.002	
			(0.001)	
board_bus_work_share:board_ind_work_share				-0.002
				(0.001)
AIC	903.8	897.1	908.9	907.2
BIC	933	931.6	948.7	944.3
p-Value	2.39e-05	2.4e-06	0.0001954	0.0001029
Observations	105	105	105	105
R^2	0.315	0.382	0.334	0.332
Adjusted R^2	0.250	0.308	0.238	0.245

Note: *$p<0.1$; **$p<0.05$; ***$p<0.01$

Eidesstattliche Erklärung

Hiermit versichere ich, dass ich diese Arbeit selbstständig verfasst und keine anderen als die angegebenen Quellen und Hilfsmittel benutzt habe. Außerdem versichere ich, dass ich die allgemeinen Prinzipien wissenschaftlicher Arbeit und Veröffentlichung, wie sie in den Leitlinien guter wissenschaftlicher Praxis der Carl von Ossietzky Universität Oldenburg festgelegt sind, befolgt habe.