Abstract

Corporate accelerators (CA) are a rapidly growing institutional phenomenon in start-up ecosystems. As agile innovation units they offer start-ups fixed-term coaching programs that are supposed to provide benefits for both start-ups and established companies. Although the proliferation of CAs is highly evident, little is known about the efficacy of these programs, and the drivers of performance. Analyzing a hand-collected and novel data set containing more than 200 start-ups across 15 CA programs located throughout Germany, our results suggest that while start-ups benefit from small, specialized and industry-specific programs through synergies and economies of scale and scope; increasing specialization generates also disadvantages for the accelerated start-ups. In particular, lock-in effects and hold-up problems may make it difficult to raise follow-up financing after leaving the accelerator program. This paper aims to fill into this gap in existing literature.
Corporate Accelerators and Start-up Performance

Abstract

Corporate accelerators (CA) are a rapidly growing institutional phenomenon in start-up ecosystems. As agile innovation units they offer start-ups fixed-term coaching programs that are supposed to provide benefits for both start-ups and established companies. Although the proliferation of CAs is highly evident, little is known about the efficacy of these programs, and the drivers of performance. Analyzing a hand-collected and novel data set containing more than 200 start-ups across 15 CA programs located throughout Germany, our results suggest that while start-ups benefit from small, specialized and industry-specific programs through synergies and economies of scale and scope; increasing specialization generates also disadvantages for the accelerated start-ups. In particular, lock-in effects and hold-up problems may make it difficult to raise follow-up financing after leaving the accelerator program. This paper aims to fill into this gap in existing literature.

Keywords: Corporate venturing, innovation, entrepreneurship, corporate accelerator (CA), autonomy, specialization
1. Introduction

Seed accelerators are cited as a key contributor to startup success (Pauwels et al. 2016) Accelerators select and invite small groups of start-ups to boot camps, providing mentoring, resources, and, most important, business connections during short-term fixed programs of only several months. Accelerators screen promising business ideas and start-ups to speed up. Successful start-ups may leave the program with the next stage of funding in hand (Cohen, 2013).

Starting with the Cambridge-based Y Combinator in 2005, the first programs of its kind, there has been a rapid growth in the number of accelerators over the past years. Today, the estimated number ranges about 3000 programs worldwide that invested more than 200bn$ in 12,000 start-ups. Yet, the landscape is vast and accelerators come in different forms and organizational types, including governmental-funded and public programs, for-profit and private accelerators, as well as those run by universities and research institutes and NGOs. Most recently, the corporate world has also discovered start-up acceleration as a part of their corporate strategy. Prominent examples are Allianz, Telefonica’s, Volkswagen and Walt Disney launching individual accelerator programs (Colombo, Rossi-Lamastra, & Wright, 2018; Shepherd & Shankar, 2018). The latest Global Accelerator Report (Gust, 2016) has illustrated that about 52 percentage of all accelerators worldwide are either today managed or at least partially funded by corporations. The main differences between seed accelerators, in general, and those run by corporations is their objective and different business model. Seed accelerators, like venture capitalists and angel investors, primary focus on getting a return on their financial investment. Corporates search for strategic opportunities and use their accelerator programs to market research and as a source of new business ideas and innovations, cultural rejuvenation and recruiting purposes (Cohen, 2013; Dempwolf, Auer, & D’Ippolito, 2014; Hochberg, 2016).
However, while corporate accelerators (CA) has become a major trend, little is known regarding the value of these programs. It is obvious that the work and design of these programs vary, and whether startup synergies can be effectively realized depends on several factors and conditions, where organization and issues of governance are as important as external resources and networks. Moreover, while items like speed to market, networks and the benefits from financing could be easily promised to founders, there might be also downside risks start-ups should be aware of.

Research is still in the first steps. Most CA have started their programs within the last years, and due to newness of the phenomenon, empirical studies, even descriptive, are scarce. This paper aims to contribute by studying the value of CA for start-ups after graduating from these programs. We collect data covering the performance of 223 start-ups graduated from 15 CA programs and investigate the impact of key organizational drivers on start-ups’ ability to raise follow-up funding and their speed to market.

Our results indicate that start-ups benefit from industry specificity and small and specialized CA programs via access to mentorship, complementary resources and economies of scale and scope. We find also downsides, and that the costs of corporate acceleration might trade-off several benefits. Hence, while accelerated start-ups gain speed to market, corporate acceleration seems to have a negative impact on start-ups’ market value and capacity to receive follow-up external venture funding. These findings suggest that specialization drives partner specificity, thus, resulting in lock-in effects and the well-known hold-problem, where venture capitalists may under-invest in financing start-ups after leaving the CA. Therefore, our study presents, as we know for the first time, data and empirical evidence on the design and organization of corporate accelerators and how it is affecting start-up success. The remainder of the paper is structured as follows: In
section 2, we review recent advances and controversies in the emerging literature on accelerators, particularly the performance of CA programs. Based on our discussion, we develop and identify several CA design indicators and test their impact on the acceleration of start-ups. Section 3 explains our data set and describes our methodological approach. Section 4 presents the results of our empirical analysis. In section 5 we discuss our findings and implications for future research. Finally, section 6 concludes and summarizes the main insights of our study.

2. Literature review and theoretical background

The literature on accelerators, respectively corporate acceleration, is quite recent with the first scholarly papers published in 2012. Yet, the entire research field is still developing and in a very early stage, missing clear research domains and theoretical concepts. Research intersects the broad literature on entrepreneurship, small business economics, corporate governance and venture capital and entrepreneurial finance.

Due to the newness of the topic, previous research is mainly conceptual and based on case studies. Empirical research, except from descriptive studies that outlines the practical relevance of accelerator, is scarce or yet has not been published. Current research can be divided into two major streams. The first discusses the nature and historical development of accelerators, while the second strand discusses current best practices in order to guide managers towards designing successful programs.

Defining the nature of accelerators is a challenging task. The concept remains fuzzy and what accelerators are, lacks a clear definition (Colombo et al., 2018; Richter, Jackson, & Schildhauer, 2018; Pauwels et al., 2016). Often scholars use concepts such as “Incubators”, “Technology Center”, “Innovation Park”, “Venture Builder” as synonyms for any kind of program that deals with innovative entrepreneurship and business creation (Bøllingtoft & Ulhøi, 2005).
However, even though there is no distinct typology of accelerators, scholars recently find at least consensus towards a basic working definition. Accordingly, accelerators are “a fixed-term, cohort-based program, including mentorship and educational components, that culminates in a public pitch event or demo-day” (Cohen & Hochberg, 2014, p. 14).

Historically, accelerators developed out of incubators (Ceaușu, Marquardt, Irmer, & Gotesman, 2017). Particularly, after the Dot.com burst in 2000, accelerators has been quickly evolving and ablösen. Today, accelerators are one of the most rapidly growing, new institutional phenomenon in entrepreneurial ecosystems (Drori & Wright, 2018). Accelerators and incubators differ regarding their use of equity investment, the timeframe of the start-up collaboration, level of standardization and objectives (among others Cohen, 2013; Drover et al., 2017; Hallen, Bingham, & Cohen, 2017; Kohler, 2016 provide synoptic tables). While incubators are often public and specialized on supporting high-tech, research-intensive start-ups faced with high technological uncertainty, and which need large funding for experiments and laboratories, accelerators invest in seed and early-stage start-ups, mainly of the ICT-oriented industries. However, while incubators follow a long-term interest aim to support key future technologies, accelerators provide support for only 2 to 3 months. Accelerators follow mainly a standardized selection and program structures, that starts several times a year. Therefore, start-ups are organized into classes, so called batches, and work side by side during the duration of the program. Every start-up in a batch receive the same amount of investment for the time of the program, including professional coaching and mentorship.

Accelerators come in different forms and types. The literature differentiates between three basic forms, public and governmental, non-governmental programs aim to support diversity and minority entrepreneurship (e.g. social and female entrepreneurship), and private accelerators, with
investment and corporate accelerators (CA) as most prominent examples (Kanbach & Stubner, 2016).

Recently, corporate acceleration has been a major trend across corporates worldwide. Starting in 2010 with the opening of CITRIX, the first corporate accelerators, yet well-known firms like AT&T, Telefonica, Microsoft, Ford, Target, SAP, Metro or Walt Disney all run individual accelerators. These programs are agile units and serve as an interface between start-ups and the corporate mother. Accelerated start-ups are supposed to benefit from specialized programs, including access to early-stage funding and industry-related business contacts. CA differ from traditional “seed” and investment accelerators due to their scope and business models. Generally, start-ups leave a small percentage of their company’s equity to the program, in turn, they get access to the accelerator. Seed accelerators, however, invest in start-ups to maximize the returns on their investments in start-ups equity trough buy-outs and selling their shares to follow-up investors, such as venture capitalists and corporates. Therefore, they act as intermediaries and get payed for screen and selecting promising business innovations. In contrast, corporates are more strategic-driven and use their accelerators programs not only primarily for financial ends, but also to source innovative business ideas, to recruit talents or new outside influences and cultural spillovers (Fantasia, 2016; Sauermann, 2018). Therefore, a “market” proof of concept of the business model might be more value to the parent company than scaling the market value and financial performance of accelerated start-ups.

In the literature a modest number of studies tackles the specifics of corporate acceleration as summarized in
Table 1:

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Nevertheless, while CA has become a global phenomenon, whether these programs have any impact on both, graduated start-ups and parent corporations, is far from known. Empirical research on corporate accelerators is scarce. Yet, previous studies have just focused on seed accelerator programs in general or analyzed the performance of corporate incubators. The only three existing studies that have yet been published in peer-reviewed scholarly journals are either case or descriptive studies and discuss definitional issues or best practices. Quantitative, empirical research exploring the differences of program types, their mutual benefit and the relevant factors that may play a role in the success of CAs yet not exist, but is actually needed (Colombo, Rossi-Lamastra and Wright, 2018).

In this study, we aim to contribute to gap in literature by exploring the effects and relevant factors that drive the success of corporate accelerator programs for start-ups. Due to limited research on corporate accelerators, we have taken up on studies within the broad field of corporate incubators, corporate venture capital and seed accelerator to develop a set of relevant factors and questions, and discuss their implications for start-ups considering the specific nature of corporate accelerator programs.

The Performance of Corporate Accelerators

Corporate accelerators come in different forms and types, and it is likely that their design effects their work and value. While it is supposed that both start-ups as well as the corporate mother benefit through cooperation, corporate acceleration might not always lead to success, and may
under certain conditions even disadvantageous, in particular for graduated start-ups. However, whether synergizes can be effectively realized by attending a corporate start-ups acceleration programs seem to depend on several factors and conditions, where internal factors, as well as the environment and industry context are supposed to matter (Kohler, 2016; Richter et al., 2018). Within this context, Colombo, Rossi-Lamastra and Wright (2018) stress the need for analyzing an accelerator’s set-up, especially “the choice between a generalist program and a specialist one which focuses on a given technology or industry” (Colombo et al., 2018, p. 195). Kanbach and Stubner (2016) identify three key strategies and their trade-offs that should been considered. First, the role of industry focus and specialization of the program (tight vs. broad and specific vs generalized). Second, the relationship of the CA to the parent corporation, i.e. highly integrated vs. independent. Third, the role of leadership and whether it is better to have managers with or without company and industry experience.

We hypothesis that trade-offs regarding the strategic and industry fit and the level of corporate integration, will leverage both the benefits costs for start-ups attaining a corporate accelerator program.

The Role of Strategy

Strategy matters. Of course, the strategic intent of the CA program is crucial for which type of start-ups are selected, how the program should been structured and which resources are necessary (Kohler, 2016; Richter et al., 2019). Specialization and industry-focus is a defining character of corporate accelerator programs. However, there is still an ongoing debate about how much specialization is beneficial and to which degree a certain diversity among start-ups in the portfolio is desirable to foster spillovers. Start-ups with a strong strategic and industrial fit to the corporate
parent allow exploiting economies of scale and scope. Start-ups will benefit through industry specific mentoring, and will grow fast to industry-related business networks and market access. However, this will may drive also over-specialization and partner-specificity, which will make start-ups dependent and may lead to risks, such as hold-up and lock-in effects. On the other hand, diversity and having a limited fit between corporation’s industry and start-ups may be also supportive for some degree, because it fosters complementarity and spillovers due to alternative experiences and skill sets.

Nevertheless, both a strong fit and less strong fit between involved parties comes with benefits but possible disadvantages for start-ups as well corporation.

**Organization and the Role of Governance**

Under organization and governance, we understand all relevant dimensions of setting up a CA, like its portfolio size and composition, its connection to and integration in the corporate parent, as well as the number and experience of CA employees. For all these dimensions, the guiding question is how much corporate should be in corporate accelerator, i.e. the degree of integration of the CA within the corporation versus proximity to start-ups or autonomy needs to be determined. Decisions on organization and governance will impact coordinating and motivating cost. Collaboration between the three parties start-up, CA and corporation has to be both efficient and effective.

CAs need to find the most suitable size of their portfolio. Whereas programs with too many start-ups under management reduce the extent of interactions between start-ups and corporations,
they increase to potential of including a later unicorn and have a positive network effect. The diversity among start-ups under management might differ. IBM for example runs several accelerator programs. IBM Alpha Zone has a broader scope, allowing start-ups with heterogeneous backgrounds and industry orientations into their program, whereas the IBM Blockchain Accelerator focuses on start-ups working on the blockchain technology only. Having a homogeneous start-up portfolio allows for mutual support and leveraging existing networks, whereas the competition among start-ups might also have detrimental effects. In heterogeneous portfolios, start-ups can learn from each other, although the possibility for mutual support is limited. Moreover, if the start-up portfolio is too dispersed the benefit for the corporation is questionable. Similar tradeoffs emerge for corporate partners. Whereas some accelerators have only a limited number of corporate partners, others developed into a network provider. For example, Daimler’s STARTUP AUTOBAHN partners with corporations like Porsche, BASF, HP or ZF Friedrichshafen, but also universities and seed accelerators globally. A larger number of corporate partners extends the network, however, it might result in a deterioration of focused guidance.

Wadhwa and Kotha (2006) measure integration through the number of alliances formed and the number of board seats taken and find that differences between high and low start-up integration exist. Therefore, CAs have to decide whether to assume official roles with long-term orientation, like board seats or merely act as informal advisor. Moreover, CAs have to take spatial distance between the involved parties into consideration. First, the distance between the CA and the corporation needs to be determined. On the one hand, CAs can be located at corporate headquarters. Thereby, informal interactions and more (knowledge) spillover between start-ups and corporate personnel evolves with positive impact on exchange of ideas, technologies, experiences. On the other hand, CAs can be located in start-up hubs, like the Silicon Valley,
London, Tel Aviv or Berlin. In this case, start-ups and CAs benefit from closer links to larger entrepreneurial ecosystems (Drori & Wright, 2018). Although Haslanger 2019 detects a tendency towards locating CAs in start-up hubs, no conclusive picture emerges.

Second, the distance between the CA and start-ups is of interest. Substantially all CAs offer co-working spaces, in which start-ups reside during the program (Haslanger 2019). As not all decisions of CAs can be taken in advance during set-up, the staffing of personnel gains importance. Literature in adjacent fields finds that prior experience of personnel working for a start-up support vehicle, e.g. an accelerator or a corporate venture capital unit, matters as the experience of an accelerator’s leader does not substitute, but complement, the experience of start-up founders (Hallen et al., 2017). As CAs act as intermediary between a corporation and start-ups, leaders are differentiated by whether they have previous experience in the start-up or corporate world (Wise & Valliere, 2014) Dokko and Gaba (2012). CA leads with corporate experience can more easily navigate corporate politics, for example negotiate larger CA budgets or more targetedly connect start-ups with suitable corporate personnel. In contrast, CA leads with previous founder experience better relate to the problems start-ups face and therefore can give more suitable and hands-on advice.

Decisions on a CAs strategy and organization have a long-term impact on corporations and start-ups and thereby heavily influence the overall success and ultimately survival of corporate accelerators. Therefore, performance implications from strategic decisions and organizational design of CAs are derived.

Performance implications
Many accelerators fail in the long-term (Ceaușu et al., 2017) and the short timeframe of such programs makes performance impacts questionable (Cohen, 2013; Dempwolf et al., 2014; Hochberg, 2016). Nonetheless, Hallen, Bingham and Cohen (2017) detect that accelerated start-ups in general outperform non-accelerated peers and Regmi, Ahmed and Quinn (2015) find a 23% higher survival rate of accelerated start-ups. Although CAs act “as shields to protect the start-up from corporate complexity” (Kohler, 2016, p. 353), a collaboration between corporations and start-ups proves challenging (Kohler, 2016; Kupp, Marval, & Borchers, 2017).

Corporations and start-ups will only engage in corporate acceleration if the benefits outweigh the costs and if ultimately their (financial and strategic) goals are achieved. Unfortunately, literature on the performance implications of CAs are limited and no empirical studies are available for multiple reasons. First, the newness of the CA phenomenon limits the availability of large datasets. Second, it is challenging to differentiate between an accelerator program’s actual impact on start-up performance and mere selection effects (Hallen, Bingham and Cohen 2017). Third, clearly defined measures of start-up and corporate performance are rare and difficult to define (Bauer, Obwegeser and Avdagic 2016). Especially the effect of few start-ups on the performance of a multi-billion dollar corporation is hard to justify theoretically and even more difficult to demonstrate empirically. Therefore, this paper focuses on the effect of CAs on the performance of start-ups.

Insights from adjacent literature, especially corporate venturing, outsourcing and mergers and acquisitions help to first gain a general understanding of potential performance drivers. Corporate venture capitals perform strategic long-term equity investments in well-established start-ups that are related to their core business. Thereby, corporations get a window on technology,
screen the market for upcoming innovations, get access to otherwise unreachable talent and can instill a more entrepreneurial mindset in their corporate culture. Start-ups gain some distinct benefits from collaborating with corporations, like access to business networks, financial funding and professional mentoring (Hallen et al., 2017). Start-ups benefit from funding and a proximity to business units. Wadhwa and Kotha (2006) find if CVC involvement in the start-ups under management is high, additional investment has a positive effect on start-up performance. In contrast, if CVC involvement is low, an inverted U-shape relationship between CVC investment and strategic start-up performance is observed. Dushnitsky and Shaver (2009) apply a distance measure and find a significant negative effect of distance on the likelihood of CVC investment.

Table 2 presents an overview of the four most common forms of corporate venturing vehicles:

– INSERT Table 2 ABOUT HERE –

Nonetheless, the importance of a good cultural fit and a mitigation of the downsides of integration, such as less entrepreneurial freedom (Tirole, 2005 page 403), remain crucial for both start-ups and the acquiring corporation (see e.g. Colombo & Murtinu, 2017; Dushnitsky & Shapira, 2010). For example, a close integration with a third party substantially requires management attention, which could instead be redirected to more pressing strategic issues (Ford & Farmer, 1986). Nonetheless, full autonomy is also not desirable due to missing guidance and direction and thereby all the advantages of a collaboration with a corporation. Assuming that each start-up will have more freedom from the corporation the more start-ups are under the management of one CA, the portfolio size is a measure to study in more detail. Belderbos, Jacob and Lokshin (2018) find a negative effect of portfolio size on technological performance. Lee, Kim and Jang (2015) detect
an inverted U-shape relationship between the portfolio size and level of knowledge transfer from start-ups to corporations. The findings indicate that, independently of detailed manifestations, a CA’s strategy and organization will have an impact on start-up performance. Keeping in mind the differentiation between financial and strategic objectives, we hypothesize that

\[ H1: \text{Industry fit and the organizational design of a corporate accelerator effects the (financial and strategic) performance of start-ups} \]

Although most strategic and organizational decisions will either support or detriment financial and strategic start-up performance concurrently, we argue that antagonistic effects will occur occasionally. Most prominently, the strategic fit between a corporation and a start-up is of interest. Wright 2019 p11 detects a large “heterogeneity in terms of whether a particular accelerator is focused on one industry sector or is generic covering various sectors”.

Although start-ups benefit from access to resources, they avoid investment from corporations of the same industry, due to misappropriation risks and advantages and disadvantages of complementary goods (Katila, Rosenberger, Eisenhardt 2015). This paradox of CVC investment is often referred to as “swimming with the sharks” (Katila, Rosenberger, Eisenhardt 2015). We hypothesize that the immediate (strategic) advantage of corporate investment is diminished by longer-term (financial) disadvantages from reduced follow-up investments. Having a strategic fit generates economies of scale through using corporate resources or pooling a specific demand at one party (Liebeskind, Oliver, Zucker, & Brewer, 1996). Besides Setting up own production facilities or research and testing laboratories, start-ups save time and cost through using existing
corporate infrastructure. Moreover, corporate technological experience and industry knowledge helps start-ups to develop and commercialize ideas faster and more successfully (Harrison Fitza 2014), especially supporting exploitative innovations. Through a higher relatedness, the absorptive capacity of both players increases (Zahra, Hayton 2008). In simple terms, corporations and start-ups with a strategic fit speak the same language. Additionally, performance is increased through spillover effects. Lastly, securing investment from a corporation active in the same industry as the start-up has a strong signaling effect to the market. Through their investment corporations endorse the technological viability and strategic importance of a start-ups idea (Harrison Fitza 2014).

Observing the CVC paradox that start-ups avoid investments from corporations with a close strategic fit, disadvantages of corporate and start-up proximity must exist. Being significantly smaller than corporations, start-ups run into the risk of drowning in the corporate world (Weiblen & Chesbrough, 2015). The relationship between a corporation and a start-up is characterized by a threat of double moral hazard. As start-ups are smaller and weaker than corporations, they will suffer more. Harrison & Fitza 2014 stress the risk of misappropriation, like a corporation’s inclination and ability to imitate a start-ups intellectual property. Dushnitsky Shaver 2009 find that start-ups avoid investments of corporations in the same industry especially if their intellectual property protection is low. Moreover, knowledge redundancy has a negative impact on performance and portfolio value (Belderbos et al. 2018, Dushnitsky, Lavie 2010). Collaborating with a corporation in the same industry might send adverse signals to potential customers, who are often competitors of the corporation. Additionally, it limits the access to complementary resources from other potential partners (Park Steensma 2012).
Harrison and Fitza 2014 find that start-ups are capable of balancing the benefits and risks of ‘shark investments’. Especially if defense mechanisms like patents are available or scarce resources are needed, start-ups accept investments of same-industry corporations (Katila, Rosenberger, Eisenhardt 2015). We argue that the advantages of a corporate investor active in the same industry as a start-up, especially access to resources and experience, a signaling and endorsement effect as well as economies of scale result in superior strategic start-up performance. In contrast, given the double moral hazard problem, information and power asymmetries and relationship specificity between corporations and start-ups of the same industry, follow-on investors are hesitant to invest in start-ups in which corporations with a strategic fit invested previously, thereby impeding the start-ups’ financial performance. Therefore, we hypothesize that

\[ H_2: A \text{ strong industry fit will enhance the strategic, yet impede financial performance of start-ups.} \]

3. Empirical analysis and methodology

3.1. Research setting and sample

Our empirical analysis follows a multi-level approach and combines firm-level data of (i) the CA, (ii) the start-ups under management of the accelerator\(^1\) and (iii) the parent corporation. We collect data manually by combining it from multiple sources. Data on corporate accelerators is collected from publicly available sources, like the unit’s own website, profiles on social media

\(^1\) The term ‘start-ups under management’ describes the start-ups that are part of a CA program, independently of how intense the managerial involvement of corporate personnel in the start-ups actually is
networks (Facebook and Twitter) as well as data from Crunchbase (a business information platform). Information on the key personnel, is sourced from self-reported data from the career network LinkedIn. Data on the start-ups under management is provided by Pitchbook, a Morningstar-owned venture capital, private equity and M&A database. The latter offers a broad range of start-up information like industry, ownership status, company location, employees, revenue and profit measures as well as start-up funding. For the parent corporation, key characteristics like financial, organizational, network and innovation variables are collected from multiple sources, e.g. publicly available data-bases like Barrons or Bundesanzeiger, company publications like annual reports and mass media like Fortune, Forbes and Trendence.

Focusing on CAs that are based in Germany, we obtain a unique data set, with CAs from 15 corporations, like Siemens and Innogy, covering a broad range of industries, like Industrial & Material, Consumer Discretionary, Financials, Health Care, Information and Communications Technology (ICT) or Energy. A list of CAs in Germany can be found in Appendix 1. Further insights on the dataset are available by Haslanger (2019). We focus on Germany only to eliminate country-specific effects, like risk-taking culture or the degree of market competition. Although the data set contains both smaller players and multinational corporations, the limitation on one country limits the generalizability of our findings

3.2. Variable description

We provide a description of all deployed variables and their corresponding sources in Table 3.

– INSERT Table 3 ABOUT HERE –
**Dependent variables**

In line with theory, corporate venturing pursues financial and strategic objectives (see e.g. Chesbrough, 2002). Therefore, we analyze performance based on two measures. Financially, the access to financing by a start-up is applied which is similar to start-up valuation as used by other scholars in the field of venturing performance, e.g. by Gompers and Lerner (1998) or Röhm, Köhn, Kuckertz and Dehnen (2018). Our variable is a suitable way of measuring financial start-up success as it incorporates the start-up’s assessment of experienced professionals in entrepreneurial finance. For the strategic dependent variable, we apply a web-measure based on referring website domains. Similarly, recent literature on corporate venturing uses web-based performance and traffic measures from Facebook, LinkedIn or company websites (Gonzalez-Uribe & Leatherbee, 2018; Hallen et al., 2017).

**Independent variables**

We operationalized the accelerator’s corporate partner network by counting the number of corporate partners. The firm’s popularity is approximated by summarizing the number of LinkedIn and Twitter followers as well as Facebook likes of the CA’s online presence, an approach also used by Gonzalez-Uribe and Leatherbee (2018). To construct our measure for portfolio size, we use the count of start-ups part of the accelerator program, whereas the portfolio diversification is computed as a Herfindahl-Hirschman Index for start-up industry concentration. We use a dummy variable to express whether the CA and the respective start-up are primarily active in the same industry. Thereby, we apply a measure of industry proximity and take into consideration the finding of Dushnitsky and Shaver (2009) that start-ups tend to refuse investments from corporations in the same industry due to concerns about property protection. Moreover, several studies find a negative effect of increasing distance between a corporate venturing unit and a start-up on investment likelihood, contract design, start-up valuations or exit success (e.g. Drover et al.,...
Therefore, we measure the spatial distance between the CA and the corporate headquarters. Our variable for CA employees per start-up is used as a monitoring key and proxy for regular informal interactions. The founding experience of the accelerator’s management lead is measured as the founding experience of the management team relative to industry experience. We thereby approximate whether leads are closer to start-up teams or corporations regarding culture, mind-set and way-of-working. Although we are aware of the short-coming that the information from our data source LinkedIn is self-reported and therefore might be subject to biases, we confidently use this information as done by other scholars (e.g. Garg & Furr, 2017; Hallen et al., 2017). We consider the age of the CA as a proxy for the accelerator’s experience in the corporate venturing and start-up environment.

**Control variables**

We use the annual revenue of the parent corporation to control for the financial backing of corporate venturing. Finally, we apply several control variables on the start-up level. We control for the number of employees as well as the start-up’s age. Moreover, we use a dummy variable to differentiate whether a start-up is active in the business-to-business (B2B) or business-to-consumer (B2C) space and control for the number of investors that are actively invested in the start-up.

### 3.3. Descriptive statistics and correlations

In Table 4, we present descriptive statistics and the pairwise correlation matrix for our measures.

| INSERT Table 4 ABOUT HERE |

On average the start-ups included in our data set raised 3.7m$, describing the money they received from all investors so far. As expected this variable is strongly right-skewed. As many
early stage start-ups only raised several hundred thousand, this number is shaped by some larger
start-ups. The maximum of 70m$ total raised comes from the Israeli company Innoviz
Technologies. The average start-up website has 123 referring domains, which seems a high number
keeping in mind the newness of start-ups. Accelerators often have more corporate partners than
only their parent corporation. On average, CAs have 0.2 corporate partners for each start-up under
management. The maximum number of two corporate partners per start-ups seems high, meaning
that every start-up has - besides the corporate parent of the CA - two additional corporations to
cope with.

We measure popularity in terms of LinkedIn, Twitter and Facebook connections of the
accelerator and find an average of more than 1,000. However, some start-ups are not active in
social media at all. We presume that these start-ups are mainly active in a traditional business-to-
business setting. On average, accelerators have a portfolio size of more than 50 start-ups under
management. Although this number is surprisingly high, the range from only 3 to up to 75 start-
ups is also large and hints at different strategies and approaches towards portfolio composition.
The start-up industry diversity is reported as Herfindahl-Hirschman-Index. No accelerator has a
full industry concentration or a complete industry diversity. Moreover, on average only around
20% of the start-ups are active in the same industry as the corporation. Driven by digitization
trends, corporations heavily invest in start-ups from the ICT industry, independent of the industry
of their parent corporation. Moreover, start-ups active in different industries than the corporate
parent act as strategic complements and allow for economies of scope, whereas start-ups active in
the same industry as the corporate parent generate economies of scale through integration.

In order for knowledge spillovers to happen from informal information exchange, the spatial
distance between the different players matters. As almost all CAs offer co-working spaces, the
distance between CAs and start-ups is - at least for the duration of the acceleration program - reduced to zero. The distance between accelerators and corporate headquarters is on average 230 kilometers. Some accelerators are active in the same city as the corporate parent, whereas others are located further away, especially in start-up hubs like Berlin and Munich. The financial backing of the accelerators in terms of revenue of the parent corporation averages at almost 50bn€, ranging from only 3bn€ to up to more than 160bn€. As one can see, all leads have at maximum the same number of years of founder experience as they do in the industry. On average, leads have more than three times as much industry experience as they have as a founder. This clearly shows a stronger orientation of the CAs towards the corporation instead of towards the independent accelerator and start-up community. Accelerators have 0.9 employees per start-up under management, meaning that almost one CA employee supervises and manages one start-up. Keeping in mind that also non-CA corporate personnel assumes mentoring and coaching roles, this number seems surprisingly high.

CAs are - on average - almost five years, with the Siemens Technology Accelerator being the oldest. Keeping in mind that the first corporate accelerator globally was built in 2010, the German market seems to lag behind the leading US market. Both size and age are important indicators for start-ups as they demonstrate the start-up’s survival and ability to grow and prosper. Whereas the smallest only have two employees, the largest has 200. On average, start-ups employ 14 people. As expected the start-ups are on average between four and five years old, with some of them just being founded recently. EnOcean is the oldest start-up being founded in 2001. We include a dummy to control whether a start-up is active in the business-to-business (B2B) or business-to-

\[ \text{dummy} \]

\[ 2 \text{ The accelerator was initially founded in 2001 with the goal of detecting and commercializing external non-core innovative technologies and later switched its focus} \]
consumer (B2C) sphere, as this will influence their social media activity and – to some degree – might even influence their financing needs. 70% of the start-ups are active in the business-to-business area, which is in line with the overall German economy. Finally, the average start-up has four to five investors, although the range from only one to 24 investors is quite large.

As expected a strong positive correlation exists between a start-up’s age and number of employees and (financial and strategic) performance. Non-performing start-ups will not grow their employees a lot or even fail to survive at all. The positive correlation between start-up age and CA age gives a hint that both parties grow and age together. The high negative correlation between portfolio size and corporate partners is a mathematical one as the number of corporate partners is depicted per start-up. The negative correlation between the CA leads prior founding experience and spatial distance between a CA and its corporate parent seems surprising at first. It might describe a tradeoff regarding corporate control. Whereas CA leads with previous corporate experience get more freedom through being located further away from the corporate headquarters, CA leads with external previous experience face more corporate (spatial) proximity.

### 3.4. Methodology and robustness

In line with Colombo, Rossi-Lamastra and Wright (2018) we apply a multi-level data set including information on (i) the CA, (ii) the start-ups under management of the accelerator and (iii) the parent corporation. We approximate the efficacy of CAs by considering both the financial and the strategic performance of start-ups. Accordingly, our model has the following form:

\[
y_i = \beta_0 + \beta_1 CP_j + \beta_2 AP_j + \beta_3 PS_i + \beta_4 PD_j + \beta_5 IF_{i,j} + \beta_6 SD_j + \beta_7 LE_j + \beta_8 AE_j + \beta_9 AA_j \\
+ \beta_{10} SE_i + \beta_{11} SA_i + \beta_{12} BB_i + \beta_{13} AI_i + \beta_{14} FB_j + \epsilon
\]
where $y_{ij}^3$ is measured using either a financial or a strategic start-up performance indicator and where $i$ describes the $i$-th start-up, whereas $j$ refers to the $j$-th CA. ‘Access to financing’ is a continuous variable, with all observations larger than zero and a high probability for small numbers. In contrast, the dependent variable ‘access to market’ constitutes a right-skewed count variable. Based on both distribution shapes Poisson regressions are applied. Unfortunately, data on start-ups is spare and incomplete. Although our data set contains more than 200 start-ups, a complete set of variables is available in only 132 cases, which descriptive statistics and key regressions are based on.

The independent variables differentiate accelerators along their network (CP, AP), their portfolio (PS, PD), the distance between the accelerator and the corporation and start-up respectively (IF, SD) and the supervision start-ups experience from the accelerator (LE, AE). Although all variables characterize how CAs are set up and work, our focus lies on the indicators describing a CA along the trade-offs of specialization versus complementarity. Moreover, we control for accelerator age, (AA), corporate backing (FB) and selected start-up indicators (SE, SA, BB, AI).

On the complete case analyses\textsuperscript{4}, we perform multiple robustness checks and find that our results are robust and inconspicuous for our hypotheses. First, we perform regular ordinary-least-square (OLS), Tobit and negative binomial regressions instead of Poisson regressions. As expected based on the distribution of our two dependent variables, Poisson regressions show the best fit for our data\textsuperscript{5}. Nonetheless, using other regression models broadly support our findings. Additionally,

\textsuperscript{3} See Table 2 for a description of abbreviations

\textsuperscript{4} For further robustness tests, individual samples for each of the two dependent variables are applied

\textsuperscript{5} We conduct specific least square robustness checks, using M-, MM- and S-Estimators, where applicable
we use the variance inflation factor (VIF) to test our OLS models for multicollinearity and find values within generally accepted ranges\footnote{We find a mean VIF of 2.5 and a maximum of 4.4 for the financial backing variable using the both the financial and strategic performance model}. Moreover, we control for outliers. Using both statistical and graphical identification methods, we exclude outliers of start-up employees and age, as well as number of active investors. As the sample size reduction from the exclusion of outliers might impact the viability of the outlier-reduced models, we argue that excluding outliers has a limited benefit in our specific case. Therefore, we check for robustness using multiple imputations as proposed by Rubin (1978). We conduct chained congenial multiple imputations for the independent and control variables popularity, financial backing, lead founding experience, CA employees per start-up, start-up employees and start-up age, with robust results. In summary, we are confident with the robustness of our results.

4. Results

The results of our empirical approach are presented in Table 5.

– INSERT Table 5 ABOUT HERE –

We assess CA programs through measuring their impact on the performance of accelerated start-ups. Thereby, we draw on two measures of start-up performance. Model 1 presents our financial model estimating a start-up’s capacity to raise external funding. Model 2 provides a strategic perspective and studies the impact of CA programs to speed up start-ups’ market access. The results support our hypothesis that both financial and strategic performance of start-ups are influenced by the strategic orientation and organizational design of corporate accelerators. Especially for the strategic fit between a corporation and a start-up, a tradeoff between pursuing
either financial or strategic performance goals emerges. We test for the role of industry-fit and the accelerator’s investment strategy, more precisely, whether a strong industry-fit between selected start-ups and the core business of the parent company is beneficial or not. As hypothesized, our results draw a mixed picture regarding the two main models. When it comes to start-ups’ ability to raise follow-up venture funding, we find a negative impact of a strong industry-fit and a start-up’s access to financing. These findings suggest that we are dealing with problems associated with partner specific investments, such as lock-in and hold-up problems. Thus, partner specificity promotes dependency and over-specialization which may threaten future venture investors. In contrast, a strong industry-fit is positively linked with start-ups’ speed to market; thus, indicating that industry-expertise, specialized trainings and access to relevant and established industry networks are key for start-up performance. These results indicate that the double moral hazard problem known from venture capital investments (Tirole 2005 p. 364) is also evident in the CA context. Additionally, we measure the portfolio diversity of start-ups under management by creating a Herfindahl-Hirschman Index on start-ups’ industry affiliation. Although we cannot report significances for Model 1, Model 2 reports that a higher portfolio diversity reduces a start-up’s ability to grow and gain speed to markets. In other words, the more focused portfolios are, i.e. the less start-ups from different industries are part of accelerator batches, the higher the start-up’s strategic performance. Thus, start-ups benefit from co-working with similar start-ups due to spillover effects, for example via sharing experience, expertise and knowledge.

The corporate partner network of accelerators especially matters for strategic start-up performance, whereas no significant impact on the ability to raise capital is found. The negative sign indicates that an increasing high number of corporate partners reduces a start-ups market access. Having many partners on their side, corporations might feel less responsible for coaching the start-up, a phenomenon known from moral hazard in teams. Moreover, if a high number of
corporate partners is not aligned on the roadmap they foresee for the start-up, founders might get opposing advice leading to unbefavourable outcomes. The number of CA employees per start-up supports this finding, as it indicates that an increasing number of CA employees per start-up reduces strategic start-up performance. The popularity of a CA on social networks like LinkedIn, Twitter and Facebook appears to have negligible impact on start-up performance due to missing significances or small effect sizes. Therefore, no support can be found that start-ups specifically chose well-known and popular CAs. Although start-ups benefit from networks with other participants of accelerator batches (Smith, Hannigan, & Gasiorowski, 2015), the quality and type of networks are essential. Having many Twitter followers is not comparable to gaining access to a global network of industry experts. Portfolio size is negatively associated with start-up performance indicating that start-ups benefit from small and more focused programs due to more intense mentoring and supervision. Distance and spatial proximity seem to matter for exploiting synergies and spillover effects. We find that a small distance between the parent company and the accelerator positively effects start-ups’ market value and speed to market. With regards to the accelerator’s management, we find that leadership is important and both industry and entrepreneurial experience, e.g. working as a founder or at a start-up, are crucial for the performance of CA programs. However, our regressions reveal some interesting evidence. While the managing directors’ prior entrepreneurial experience seem to be a plus for start-ups to speed up and grow fast; it seems to have no effect on start-ups’ market evaluation and their probability to gain further venture funding. Finally, we include the age and experience of the accelerator. Older more established and experienced accelerators have a longer track-record and feature large networks and partnerships towards the start-up community, which may be not only a quality signal to potential investors and venture capitalists, but also opens access to experts and specialists that push start-up growth and market performance. Our results show a positive impact of age on
external funding and capital raised. However, there seem to be also downsides of age. For start-ups’ speed to market, our regression results report a negative and significant relationship.

We include start-up size (employees) and age. As expected, these two are the most important performance indicators on the start-up level as they describe experiences and past success. Their positive signs indicate that larger and more established start-ups prove more successful in raising capital and gaining access to market. The dummy variable of whether the start-up is active in the business-to-business (B2B) area is specifically used due to its impact on our strategic performance variable. We find that being in the B2B business impedes a start-up’s ability to gain market access. Moreover, the number of active investors reports a positive correlation with the access to financing. Having multiple active investors balances the risk for each investor and reduces the power each investor has individually over the start-up. However, negative effects of moral hazard in teams might reduce the benefits of a large number of active investors. Through having a network effect, the number of active investors in the start-up also increases a start-up’s market access. Finally, we apply a broad control variable on financial backing through the parent corporation without finding a sizable impact.

5. Discussion and limitations

5.1. Contribution and implications

It is the main goal of this study to investigate the effects of CAs on start-ups and their performance after graduating from those programs. The literature about accelerators in general, and CAs in particular, is very recent and suffers from theoretical and empirical rigor. Research on the outcomes of seed and corporate accelerators intersects several strands of management literature, including Corporate Governance, Corporate and Entrepreneurial Finance, Innovation and Entrepreneurship literature. Our empirical analyses, however, reveals several interesting
insights into the mechanisms and design of CA programs. For instance, we find support that attending a CA program may, in fact, not only be beneficial, but there might be also disadvantages for start-ups, for instance, when it comes to raising venture capital and finding follow-up investors.

In line with previous studies, we measure the success of start-up acceleration in two distinct dimensions. The first is the amount of total raised capital and measures whether start-up’s market value has been promoted by attending the CA. Investors decide on basis of future growth prospects and aim to maximize their returns. Therefore, especially in early seed stages, the amount of venture capital funding that start-ups receive is a quality signal and evaluation of expected future success. The second dimension is more strategic and measures whether start-ups’ increased awareness could accelerate their speed to the market by attending these programs. We find evidence that strategic orientation and organizational design of corporate accelerators play an essential role in determining a start-ups performance, financially and strategically. Although both financial and strategic performance are similarly supported by strategic and organizational decisions, a tradeoff between the two becomes obvious in the case of strategic fit. Whereas a close industry fit between the start-up and the corporation is beneficial strategically, it detriments financial start-up performance. A close fit between the parent company and the start-ups’ industry triggers spillovers. Start-ups gain access to complementary resources and relevant business contacts and benefit from industry expertise and well-established business and partner networks. Industry experts and specialized trainings prepare start-ups for a fast market access and growth. Start-ups under accelerator management benefit from mentorship and co-working. Accelerators select start-ups into batches, where start-ups work closely side-by-side during the entire program. Entrepreneurs often name potential synergies and the exploitation of spillovers due to collaboration with other start-ups, and the share of experiences and knowledge, as one of the primary reasons for applying to an accelerator program (Cohen & Hochberg, 2014). Thereby, our
results find support that specialization and industry fit is one of the main advantages of CAs (Colombo et al., 2018).

Nevertheless, although start-ups benefit from gaining speed to market and immense expertise, there is a dark side. Our findings indicate that corporate acceleration has a negative effect on start-ups and their ability to get additional funding and venture capital. We believe that this effect might be best explained and referred to as the well-known hold-up problem (e.g. Gompers, 1995; Williamson, 1975). Partner specificity and being increasingly dependent on the resources and expertise of the parent company, might scare off potential investors and may lead to under-investments. Support here comes from previous studies within the context of corporate venture capital which reported that CVC-backed start-ups experience significantly lower valuations than start-ups financed by private and independent venture capital funds (e.g. Colombo & Murtinu, 2017; Guo, Lou, & Pérez-Castrillo, 2015).

Moreover, our findings indicate that start-ups benefit from small batches and exclusive programs that select only start-ups from a given industry. Our findings support that start-ups benefit from small batches indicating that internal competition among start-ups about valuable resources, such as coaching and attention, is low and spillovers among the start-ups are best realized when the portfolio of selected start-ups is homogenous.

We also find that leadership matters. An extensive body of research has emphasized the particular role management is playing in the success of venture capital funds and seed accelerator programs. Accelerated start-ups benefit when managers have experience as an entrepreneur or have previously worked in start-ups, for instance, in more general “start-up issues”, like preparing business plans and giving convincing pitch presentations, but also from the manager’s contacts within the start-up community (Hallen et al., 2017). However, our findings support that having
management with founding experience helps start-ups to accelerate and grow and boost external funding.

In contrast, firm age seems to be also a hindrance for accelerated start-up. Our results suggest that the older the CA is, the less performing are the start-ups after leaving from the programs. At the first sight, this may be surprising but seems reasonable: With age accelerators become incrusted and start coping with start-ups ‘as always before’. Thus, instead of approaching every start-up with an individual support, much older accelerators tend to develop formalistic, bureaucratic and static structures that may stifle entrepreneurial freedom and openness to new and innovative ideas and business concepts. Moreover, with increasing age and formalism, the accelerator becomes more and more integrated in the regular routines and structures; which offsets the idea and benefits of CA programs creating a lab for innovations.

This study has implications on corporations and start-ups. Corporations aiming at setting up a CA that effectively supports start-up performance get insights how the strategic orientation and organizational design of CAs matters. Start-ups can, during a selection process, use the findings presented to identify the most suitable CA for their needs.

5.2. Limitations and further research

Although several studies were published recently, more research needs to be done specifically on CAs, especially focusing on the relationship of an accelerator to its parent corporation and on the differentiation between generalist and specialist programs (Colombo et al., 2018; Kohler, 2016). Drover, Busenitz, Matusik, Townsend, Anglin and Dushnitsky (2017) urge to study organizational forms of accelerators and find structures and approaches that prove most impactful on start-up performance. In line with the request of these scholars, we offer new and intriguing insights on CAs. Nonetheless, this study is not without limitations and need for future research.
Critical to the generalizability of such studies is the availability of a rich data set. Although our data set is statistically sufficient, a larger N would be favorable. The amount of data in our study is limited for multiple reasons. First, we focus on Germany only. On the one hand, this mitigates cross-country effects. On the other hand, however, it limits both the generalizability of findings to other countries and the availability of observations. Secondly, the phenomenon of corporate acceleration is rather new. Therefore, the availability of historical data is limited. Thirdly, obtaining start-up data is hard in general. Due to their newness and small size, start-ups underlie hardly any disclosure requirements. Therefore, few – especially financial – publications are available. As public interest of a specific start-up is limited, no analyst coverage exists, further limiting data availability. As almost all papers on similar topics, we cannot satisfactorily control for selection effects.

Additionally, we cannot report full robustness for all our variables. Especially the variables for spatial distance, accelerator age and network are not robust to different estimator tests and robustness checks like excluding outliers. Further research might therefore enhance quantitative data sets through surveys. Scholars should interview leads of CAs regarding organizational ties to the parent, like reporting lines and duties, financial budget information, incentive systems of key personnel and an approximation for the CAs standing and priority among further corporate venturing, innovation and research activities. Moreover, scholars are recommended to take a start-up lifecycle perspective and investigate the interplay of CAs with other corporate venturing units. For example, one could hypothesize that CAs act as assessment center or particularly detailed due-diligence for corporate venture capital investments.

Corporate venturing in general constitutes a trichotomy between (i) a start-up, (ii) a corporation and (iii) a corporate venturing unit between the former two. For CAs to successfully fill their
position as middle-man, there needs to be a positive impact on the performance of both start-ups and corporations. So far, our paper is limited to the impact of CAs on start-up performance. We, however, recommend analyzing the impact of CAs on corporate performance as well. Due to the difficulty of isolating the effect of accelerators on corporate performance this side of the coin is heavily underdeveloped in literature.

6. Conclusion

CA programs have become a major trend in start-up ecosystems. Whether these programs are also effective, which are more effective and what are the key drivers, has only been poorly developed. This paper aimed at investigating the impact of CA programs on start-ups and their performance after leaving the program. We deployed a novel and unique, multi-level data set studying the performance of more than 200 start-ups, which has been under management in 15 CA programs across Germany.

Our results show that corporate acceleration affects start-ups’ performance. Start-ups benefit from highly specialized programs that coach just an exclusive portfolio of start-ups operating in industries closely related to core business of the parent corporation. Therefore, start-ups benefit from industry expertise and established business networks that help speed up market access and growth. Nevertheless, there seem to be also costs and downsides of corporate acceleration that should been carefully considered. This, while start-ups may strategically benefit from a close and supportive exchange with the parent company, increasing specialization and the costs and disadvantages of relationship specific investments may trade off the benefits of corporate acceleration for start-ups’ future performance to find potential investors and capital. Partner specificity and hold-up problem make start-ups unattractive for other investors and venture capitalist, thus may make it difficult for founders in the future to raise follow-up financing to grow.
References


Dokko, G., & Gaba, V. (2012). Venturing into new Territory: Career Experiences of Corporate


### Table 1: Overview on corporate accelerator literature

<table>
<thead>
<tr>
<th>References</th>
<th>Research focus</th>
<th>Methodology</th>
<th>Perspective</th>
<th>Key findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>(S. Bauer et al., 2016)</td>
<td>Literature review; definition; future research</td>
<td>Qualitative</td>
<td>Corporate</td>
<td>Existing research is mainly exploratory and qualitative</td>
</tr>
<tr>
<td>(Colombo et al., 2018)</td>
<td>Definition; future research</td>
<td>Qualitative</td>
<td>Corporate, start-up</td>
<td>Additional research specifically on organization and set-up of CAs is needed</td>
</tr>
<tr>
<td>(Hochberg, 2016)</td>
<td>Definition; performance impact on regional entrepreneurial environment</td>
<td>Mainly qualitatively</td>
<td>Region</td>
<td>Proliferation of accelerators in general is evident; research is challenging due to newness and limited data availability; effect on ecosystem are positive; trend is towards vertically-specialized accelerators</td>
</tr>
<tr>
<td>(Kanbach &amp; Stubner, 2016)</td>
<td>Literature review; definition; objectives</td>
<td>13 case studies</td>
<td>Corporate</td>
<td>CAs are classified in four distinct types; organizational design, governance and access to external resources matter</td>
</tr>
<tr>
<td>(Kohler, 2016)</td>
<td>Definition; objectives; collaboration of start-up and corporation</td>
<td>Survey with 40 CAs</td>
<td>Corporate</td>
<td>Four design dimensions are identified; additional research specifically on organization and set-up of CAs is needed</td>
</tr>
<tr>
<td>(Kupp et al., 2017)</td>
<td>Collaboration of start-up and corporation</td>
<td>Qualitative, with selected case study</td>
<td>Start-up</td>
<td>Transparent and long-term goals are needed; independent team, large network and top-mgmt. backing do matter</td>
</tr>
<tr>
<td>(Richter et al., 2018)</td>
<td>Definition; objectives; acceleration process; CAs as open innovation vehicle</td>
<td>Interviews with 11 CAs</td>
<td>Corporate</td>
<td>CAs work as performance filter and guide for start-up innovativeness</td>
</tr>
<tr>
<td>(Shepherd &amp; Shankar, 2018)</td>
<td>Objectives; organization and set-up; performance impact</td>
<td>31 interviews with corporate personnel, CA managers and start-up employees</td>
<td>Corporate</td>
<td>Organizational design, governance and access to external resources do matter; two objectives for CAs, namely adapting corporation to emerging innovations and offering option on future innovations</td>
</tr>
<tr>
<td>(Weiblen &amp; Chesbrough, 2015)</td>
<td>Definition; distinction from other forms of corporate innovation</td>
<td>Qualitative</td>
<td>Corporate</td>
<td>Differentiation in corporate venture capital, corporate incubators, outside-in and platform start-up programs is recommended</td>
</tr>
</tbody>
</table>
Table 2: Comparison of selected corporate venturing vehicles

<table>
<thead>
<tr>
<th>Vehicle</th>
<th>Objective Description</th>
<th>Examples</th>
</tr>
</thead>
</table>
| Corporate Venture Capital | Financial return, strategic advantage (e.g. technology)  
  • Equity investment (up to 20%) over several years (5-7) and often multiple funding rounds  
  • Investment in established, fast-growing, existing small companies with high potential  
  • Often close collaboration with business units, assumptions of board seats, sharing of patents and complementary assets | BMW iVentures  
 Renault, Nissan, Mitsubishi  
 Alliance Venture  
 Alphabet GV |
| Corporate Accelerator | Rapid screening of a large number of start-ups and search for highly qualified personnel and innovative ideas  
  • Structured 3-4 months accelerating program for larger batches of early stage start-ups or ideas  
  • Small founding of around 25k$ for small (<10%) or no equity stake  
  • Often mentoring, network access, office space, public relations  
  • Limited/ no interaction with business units  
  • Support of ideas unrelated to core business of the corporation | Microsoft Ventures Accelerator  
 Telekom hub:raum  
 Axel Springers Plug’n’Play |
| Corporate Incubator  | Development and support of (internal) innovative ideas  
  • Ownership up to 25%, timeframe 1-3 years  
  • Provision of mentoring, coaching, network access, office space, hardware and infrastructure  
  • Often, yet not always external “experts”/ team used to execute on internal ideas  
  • Support of ideas related to core business | Merck Innovation Center  
 ATT Foundry  
 LinkedIn [in]cubator |
| Other less structured forms | Access to early stage start-ups, bringing together innovative entrepreneurs, creation of positive image for corporation in start-up sphere  
  • Pure sharing of resources, e.g. co-working spaces  
  • Internal/ external hackathons  
  • Challenges/ contests for specific problem-statements  
  • Scouting missions, innovation platforms or venture clients, digital labs | Facebook Hackathon  
 AT&T Developer Summit Hackathon  
 Unilever Foundry |
<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Financial performance (capital raised)</td>
<td>Total dollar amount raised by a start-up, all the money injected from different investors</td>
<td>Pitchbook</td>
</tr>
<tr>
<td>Strategic performance (market access)</td>
<td>Number of unique referring domains, i.e. redirections to another site, a start-up website hosts</td>
<td>Pitchbook</td>
</tr>
<tr>
<td>Corporate partner network (CP)</td>
<td>Number of corporate partners per start-up currently part of accelerator program</td>
<td>Accelerator website</td>
</tr>
<tr>
<td>Popularity (AP)</td>
<td>Number of LinkedIn and Twitter followers as well as Facebook likes of respective CA profile</td>
<td>LinkedIn, Twitter, Facebook</td>
</tr>
<tr>
<td>Portfolio size (PS)</td>
<td>Number of start-ups currently part of corporate accelerator program</td>
<td>Pitchbook</td>
</tr>
<tr>
<td>Portfolio diversity (PD)</td>
<td>Herfindahl-Hirschman Index for start-up industry diversity, industry based on two-digit SIC code</td>
<td>Pitchbook</td>
</tr>
<tr>
<td>Industry fit (corp. and start-up) (IF)</td>
<td>Dummy variable for corporation and start-up being active in same industry, industry based on two-digit SIC code</td>
<td>Corporate annual report, Pitchbook</td>
</tr>
<tr>
<td>Spatial distance (CA and corp.) (SD)</td>
<td>Distance between CA location and corporate headquarters in kilometers to account for spillovers</td>
<td>Accelerator website, corporate annual report, Google data</td>
</tr>
<tr>
<td>Financial backing (FB)</td>
<td>Annual revenue of corporate mother</td>
<td>Corporate annual report</td>
</tr>
<tr>
<td>Lead founding experience (LE)</td>
<td>Founding experience of CA management team in years relative to industry experience</td>
<td>LinkedIn</td>
</tr>
<tr>
<td>Employees per start-up (AE)</td>
<td>Number of CA employees per start-up currently part of accelerator program</td>
<td>Accelerator website, Pitchbook</td>
</tr>
<tr>
<td>Age (AA)</td>
<td>Age of the corporate accelerator in 2018 in years</td>
<td>Pitchbook</td>
</tr>
<tr>
<td>Employees (SE)</td>
<td>Number of employees working for start-up</td>
<td>Pitchbook</td>
</tr>
<tr>
<td>Age (SA)</td>
<td>Age of the start-up in 2018 in years</td>
<td>Pitchbook</td>
</tr>
<tr>
<td>B2B orientation (BB)</td>
<td>Differentiation of whether start-up is active in the business-to-business (B2B) or business-to-consumer (B2C) space</td>
<td>Pitchbook</td>
</tr>
<tr>
<td>Number of active investors (AI)</td>
<td>Number of investors that injected money in start-up and still actively hold a stake in the start-up, does not include investors that invested earlier but already withdrew capital</td>
<td>Pitchbook</td>
</tr>
</tbody>
</table>
Table 4: Descriptive statistics and correlations