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Does Distance Matter? Evidence from Swedish Venture Capital Backed Firms

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Abstract

The Venture Capital Industry has evolved from the purpose of bridging the funding gap of local businesses into an international alternative asset class. Cross-border investments have become common in today's globalized business environment. Yet, very little research has been done on the implications of increased distance between the parties involved in venture capital investments. While classical finance theory suggests a negative relationship between geographical distance and performance, we still see an increasing amount of distant investments occurring in the wake of the internationalization of the VC industry. Especially, the informational opaqueness of these investments is considered to reinforce the issues associated with distance. Using data from 1,157 Swedish VC-backed ventures between October 1989 and October 2019, this paper applies a binary response Probit model to examine the effect of distance on performance, measured as exits via trade sale or IPO. The results suggest that distance has no adverse effect on VC investments in the Swedish market. We instead find that distance is positively affecting exit rates, presumably due to the presence of international investors. Our results indicate that international investors can overcome problems associated with distance in later stages while we find that domestic investors add the most value in the first round. We further find that distance between VCs has no negative impact on exits, implying that collaboration is not affected by larger distances.

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Key words: Venture Capital, Cross-border, Sweden, Performance, Geographical Distance
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1. Introduction

The Venture Capital (VC) industry has evolved as a promising alternative investment class over the last decades moving from "bridging the funding gap for local businesses" to an international investment class that yields high returns. In particular, VC has become more and more prominent due to major shifts in the business industry over the last decade. The unprecedented low interest rates in the wake of the financial mortgage crisis, has led investors to search for new investment vehicles thus making funding for VC firms readily available.[1] Besides, recent years have shown a significant increase in entrepreneurial activity, facilitated by start-up hubs as well as the enormous improvements in technology which offers the unparalleled chance for new disruptive innovations (Hughes et al., 2019). These developments also caused "classical" financial players such as mutual funds, hedge funds or private equity firms to tap into the growing VC industry. According to the Center of American Entrepreneurship (2018) VC investments surged from 49bn USD in 2007 to 171bn USD in 2017 while the number of VC-backed ventures rose from 6,000 to 15,000 during the same period.[2]

Historically, VC has generally been considered a local business and scholarly proponents attribute this to three complementary levers. First and foremost, VC investments are characterized by large agency conflicts between the VC firm and the venture (Amit et al., 1998; Gupta and Sapienza, 1994; Lerner, 1995; Li and Zhao, 2008). Indeed, VC investments initially emerged due to the pronounced adverse selection and moral hazard issue that young businesses exhibit, resulting in a demand for specialized financiers that have the skills to bridge this asymmetric information gap. In fact, traditional financial investors do not have the capacity and ability to select and monitor young businesses, and it could hence be argued that they are less suitable to fund such investments. VC firms in contrast, are experienced investor in these businesses, heavily relying on their networks (Hochberg et al., 2007) and in-depth due diligence (Mathonet and Weidig, 2004) to mitigate uncertainties connected to adverse selection in the deal sourcing and selection process (Kräussl et al., 2011; Sorenson and Stuart, 2001). In addition, VC firms often take board seats to monitor the activities of the venture and stage their investments to reduce the risk of misalignment of management incentives and poor investment performance (Gompers, 1995).

[1] We use the terms investor, venture capitalist, VC firm and VC interchangeably in the course of this paper.
[2] We use the terms venture, portfolio company, start-up and investee interchangeably in the course of this paper.

The ability to use local networks and to conduct thorough due diligence as well as the power to monitor management decisions clearly decreases with distance thus making the investment cost highly sensitive to the distance between the VC and the venture (Gompers, 1995; Hochberg et al., 2010; Sorenson and Stuart, 2001).

A second factor brought forward by scholars is the view that VC firms add more than just capital after investing in the venture (Hsu, 2004). They further aid the venture by facilitating the development of their portfolio companies, particularly in the early phase of the investment by providing access to human capital (Hellman and Puri, 2002), advising and coaching the founders (Gorman and Sahlman, 1989), using their expertise to enter new markets (Hsu, 2006) and helping to form new strategic alliances (Balcarcel et al., 2008). Besides, VC firms add further value in the later stages of the investment phase, when guiding the venture through a potential sale or the initial public offering process (IPO) (Barry et al., 1990; Brav and Gompers, 1997). In our view there is a clear argument to be held for why these value-adding services get more difficult as well as costly to perform when distance increases.

The third lever is connected to the demographics of the VC industry itself. Previous research agrees that VC investments are characterized by geographic concentration, often taking place in certain clusters. When examining the equity markets within Germany and the United Kingdom, Martin et al. (2005) found that regions with few investments, a little number of local VC firms and a lack of experienced financial intermediaries result in a local funding gap. Cumming and Dai (2010) find that US VC-activity is mainly situated in three main metropolitan areas comprising more than 50% of all US activity. Chen et al. (2010) report that VCs in the US are five times more likely to invest in a firm that is located in the combined statistical area (CSA) than in other regions.

Yet, the last two decades have shown a trend of increased cross-border VC investments that even go beyond the spatial limitation of continents. For instance, Bradley et al. (2019) show that more than 50% of all VC investments in Europe come from foreign investors, of which approximately 20% come from the US. Are these recent developments contradicting theory? If so, why are VC firms invested in ventures hundreds and thousands of kilometers away from their home base? And what role does distance play in the success of the investments? If theory is correct, we would expect to see that such cross-border deals exhibit weaker performance. Contrary results would raise questions about to what degree agency conflicts and network theory impact VC investments.

Even though existing literature and theoretical frameworks provide convincing arguments for why the performance of VC-backed ventures should be negatively affected by distance, actual research that has been conducted on the matter has provided varied outcomes (Chemmanur et al., 2010; Chen et al., 2010).[3] As a direct result of this, our paper aims to shed further light on the relationship between *Distance*, *Nationality* and how they relate to *Performance* – in the context of venture capital investments made in the Swedish start-up sector.[4] The intention is to add to existing literature by providing further evidence as well as clarity to this important but overlooked area of research. We chose Sweden as our country to conduct our analysis on since the Swedish VC and start-up sector has experienced significant growth during recent years. With success stories as Spotify, Klarna, iZettle and Skype, Stockholm has established itself as an entrepreneurial epicenter. In fact, the Center of American Entrepreneurship (2018) shows that Stockholm has seen more VC-backed deals from 2015-2017 per 1m residents than New York, Los Angeles, London and Berlin – just to name a few. Yet, little research has been done on this subject in the region. Hence, we aim to add to this scarce amount of existing research by focusing on VC-backed ventures with Swedish origin.

Throughout the thesis we examine three hypotheses which study the relationship between *Distance, Nationality and Performance*. More specifically, we begin by investigating the relationship between distance and the likelihood of successful exits within venture capital investments. We then follow this up by looking at domestic investors and how their presence affects the venture's likelihood to succeed. The third and last hypothesis then concludes by investigating whether or not the distance between VCs themselves has any effect on their collaboration and ability to make a successful exit. To test our hypotheses, we use a Probit model, where the dependent variable captures whether or not the venture has made a successful exit (as defined by either being acquired or subject to an IPO). Our results first show that distance has a significant positive impact on the probability of successful exits. However, when controlling for the presence of international investors we do not find significance anymore, suggesting that the positive relationship is rather driven by the skills of the international investors, and their tendency to choose ventures of promising quality. We further show that the inclusion of a domestic investor increases the exit rates, while the distance between the members of the syndicate has no apparent effect.

[3] A more detailed overview of the relevant literature is given in the literature review (section 2).

[4] We use performance, likelihood/probability of exit, success rate and exit rate interchangeably in the course of this paper. These terms all refer to the final outcome of the investment, where only an IPO or trade sale is seen as success.

This thesis and its findings contribute to the existing literature on the VC industry by further examining the effect that distance has on investment performance. To our knowledge, it is also the first study to examine how the distance between syndication members effect the ultimate success of the venture. Finally, the results have practical implications for both venture capitalists as well as entrepreneurs – suggesting that the benefits of having a diverse set of international investors involved in the venture outweighs any potential issues associated with increased geographical distance between the involved parties.

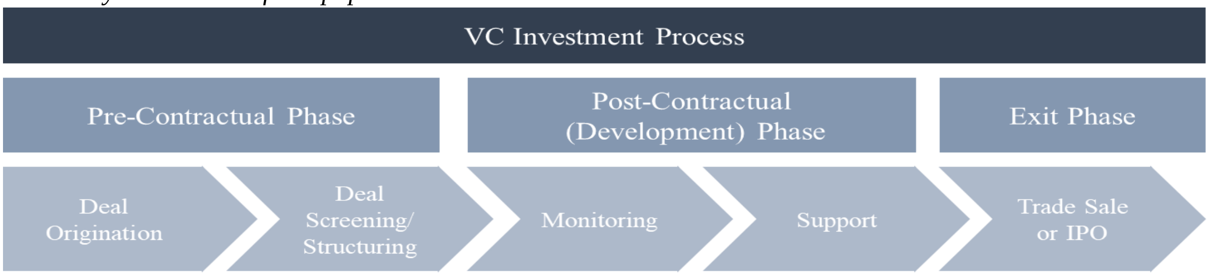
The remainder of the paper is organized as follows. Section 2 consists of the literature review related to the subject. Section 3 then develops and states our hypotheses. Section 4 first provides a guidance in how the data was gathered and the variables used. It then continues by providing a short sample description followed by the general research design. Section 5 presents the results as well as our discussion and the limitations of the thesis. Finally, in section 6 we summarize and conclude our findings – finishing with a recommendation for future research.

2. Literature Review

As established in the introduction, the relationship between VC firms and the ventures is moderated by classical financial theory such as the agency theory (Amit et al., 1998; Gupta and Sapienza, 1994; Lerner, 1995; Li and Zhao, 2008; Robbie and Wright, 1998; Ruhnka and Young, 1991). In general, VC investments are characterized by large informational asymmetries and conflicts of interest – both increasing the cost for the VC firm significantly (Gompers, 1995; Kaplan and Strömberg, 2001). Indeed, the information issues associated with distance are particularly important in the start-up industry, due to the informationally opaque nature of VC investments (Dai et al., 2012). Besides, existing research suggests that these problems are intensified by distance, thus further increasing the cost related to them and adversely impacting performance. To get a thorough understanding of how distance, VC firms investment activities and ultimately performance play together, we structure our literature review alongside the VC investment process (Figure 1).

Figure 1: The VC investment process

The figure below gives an overview of the different phases of the VC investment process. The figure has been created by the authors of this paper.



The investment process can be divided into three pillars, the pre-contractual phase, the post-contractual (development) phase and the exit phase. Each of these pillars in turn, are associated with various non-financial activities that the VC firms perform. Deal origination, screening and structuring refers to activities that helps the VC firm to identify and assess investment opportunities (Gorman and Sahlman, 1989; Sorenson and Stuart, 2001), as well as to structure the contracts to protect their investor rights (Baum and Silverman, 2004). The second phase consists of monitoring activities such as staging (Gompers, 1995), as well as supporting activities, that is acting as a sort of a consultant to the venture (Bygrave and Timmons, 1992; Fitza et al., 2009; Hellman and Puri, 2002; Hsu, 2004). The last phase constitutes the exit phase in which the VC firm either helps the venture to do an IPO or to be acquired by a strategic investor (Barry et al., 1990; Brav and Gompers, 1997).

2.1. Pre-Contractual phase

2.1.1. Deal Origination

Finding promising investment targets requires both the collection of information about the existence of the venture as well as information about the underlying quality of the prospective investment opportunity. Hence, the personal relationships that the VC builds over time is of utmost importance, not only to get access to potential investments but also to get information on the venture characteristics. According to the network theory there are huge benefits from the repetitive exchange of information such as the formation of strong alliances and partnerships over time (Alhajj and Rokne, 2014). Hochberg et al. (2007) state that better-quality relationships in turn could lead to better network positions within the VC community thus implying higher leverage and better access to investment opportunities.

Yet, geographical distance could constitute a limiting factor in building strong networks. Sorensson and Stuart (2001) argue that "The density of strong and redundant ties likely declines particularly sharply in distance.". They further pose that interpersonal relations which are considered to be the primary gateway to exchange information within the VC community, are hard to build up and maintain at a distance. This clearly evokes problems for investors in the VC industry, as a large part of deal origination stems from information collected from trusted parties. These trusted parties include, amongst others, groups such as family members or friends – but also entrepreneurs that the investor has previously financed as well as other venture capitalists (Fried and Hisrich, 1994).

Coval and Moskowitz (1999) find that investors have more and better access to information about portfolio firms that are located close to them. They argue that local investors have the advantage of being able to speak directly to employees, managers and suppliers of the portfolio company. Hence, they can gain important and valuable information connected to the investment opportunity. VCs may also obtain information from local media outlets, as well as local executives, which they may have prior relationships to. All of this may then ultimately provide the local investor with an information advantage when gathering knowledge about companies and selecting potential investments (Coval and Moskowitz, 1999). Even more so when the information is mainly tacit and hard to communicate by other means than through personal contact (Florida and Kenney, 1988).

Moreover, a German research paper examined 1,182 dyads of venture capitalists and German ventures between 2002 and 2007 and found that the probability of a financing relationship to evolve decreases by 8% if the journey time between the potential investor and investee increases by one standard deviation (Lutz et al., 2013). Supporting results were further found when Sorenson and Stuart (2001) conducted a similar investigation of the American market. This implies that VCs prefer investing in geographically close portfolio companies, as opposed to distant ones. And when VCs do invest in foreign ventures, they prefer to do it in countries that are geographically close to them (Aizenman and Kendall, 2012).

Furthermore, when examining the investment industry, Coval and Moskowitz (1999) manage to tie local bias to mutual fund performance – where fund managers have been found to earn an additional return of 1.84% per year from local investments when comparing the returns to passive portfolios, and 1.18% more than distant holdings after having adjusted for risk. Similar results to Coval and Moskowitz's are also found by Kang and Kim (2008). The view that it is less costly to identify ventures that are geographically close than those that are distant is further supported by empirical research conducted by Filatotchev et al. (2005).

2.1.2. Deal Screening and Structuring

In the screening and structuring of the deal investors employ numerous mechanisms to mitigate and reduce uncertainty and manage the risk of the venture. The goal is to align the entrepreneur's interests with the VC's. The VC must be aware of the fact that once an investment has been made there is a risk that the entrepreneur might pursue their own interests, or simply reduce the efforts they put into the venture once cash has been paid out and received (Jensen, 1986). The pre-contractual mechanisms and steps taken by the VC to reduce this risk includes syndication with other VCs (Lerner, 1994), the performance of a thorough due diligence (Mathonet and Weidig, 2004) and general predetermined contractual agreements (Hellman, 1998). All this is done to reduce potential agency costs by mitigating information asymmetry as well as the impact of moral hazard. However, we acknowledge that eliminating the risk of moral hazard completely is virtually impossible, no matter the level of comprehensiveness of the due diligence process or the rigorousness of the predetermined contractual agreements.

Empirical research has suggested that it is less costly to screen investments done over small geographic distances, as compared to investments made further away (Cumming and Johan, 2006). When assessing a potential investment opportunity VCs usually perform a detailed analysis (due diligence) of the respective venture. This process often comprises of on-site visits and in-person reference checking (Mathonet and Weidig, 2004). These tasks clearly become harder and more ineffective at a distance. Consequently, either the quality of the conducted analysis will be adversely affected, or the cost will increase in order to overcome the distance-related problems (Kräussl et al., 2011; Sorenson and Stuart, 2001).

Bengtsson and Ravid (2009) has found that portfolio companies that are located further away from the home office of the VC firm receive less favourable terms, smaller rounds as well as lower amounts of total investment over the company's life period. They further find that "contractual harshness" increases in the US when the VC firm and the portfolio company are located in different states. This "contractual harshness" takes the form of contracts that include cash flow contingencies that favour investors (i.e. anti-dilution clauses) which Chen et al. (2010) in turn then argues would indicate that monitoring and soft information decreases with increased geographical distance. However, research by Lerner and Schoar (2004) points to conflicting results – showing that VCs actually have difficulties in implementing their own home countries' corporate governance mechanisms in foreign countries practicing different legal systems. One potential explanation is that when the legal system allows it, VCs tend to infer harsh contracts for distant portfolio companies, since the large distance requires stricter control. But when the foreign laws do not allow it, the VC is required to compromise, which then ultimately could result in decreased control of the venture – and consequently the performance of the investment.

Furthermore, distance has also been connected to larger syndication sizes (Sorenson and Stuart, 2001) which could be seen as way for investors to reduce the risk they associate with investing over longer distances. By syndicating with other VCs, the investor shares the risk of the venture and reduces their own exposure. One way for VCs to bridge the gap and mitigate international risk is by co-investing with local partners. By syndicating with domestic firms they could hope to overcome many of the disadvantages that comes with having a substantial geographic distance between themselves and the ventures they invest in – since the local partner is believed to mitigate the perceived distance (Fritsch and Schilder, 2008; Sorenson and Stuart, 2005).

2.2. Post-Contractual Phase

2.2.1. Monitoring

After the pre-contractual phase is over and terms have been agreed upon, the agency problems are still present and the VC’s need of preventing problems associated with moral hazard remains. To do this, the VC supervises and monitors the venture’s activities.

Gorman and Sahlman, (1989) have found that VCs on average spend 80 hours per year at each of their portfolio companies, and that they visit the ventures 19 times per year. It is reasonable to assume that the costs that is associated with that amount of supervision and monitoring will sharply increase as geographical distance between the investor and investee rises (Harrison and Mason, 2002; Sorenson and Stuart, 2001). Increased costs due to distance will then most likely reduce the willingness of the VC to impose the same level of monitoring that it would otherwise provide. In addition, previous studies, that analysed the differences between VCs that were located 5 minutes to 10 hours travel time from the ventures they were invested in, demonstrated that distance works as a barrier to effective information exchange – and that the distance lowers the intensity of monitoring (Korsgaard and Sapienza, 1996; Sapienza, 1992). Petersen and Rajan (2002) further state that face-to-face contact between the VC and the portfolio company should be higher if investments are located nearby – as compared to far away. And even though continuous innovations within telecommunications could be argued to be a reasonable modern substitute to meetings in person; differences in language spoken, which is often associated with geographical distance, would be harder to resolve (Fritsch and Schilder, 2008). The same also goes for institutional differences in tax systems, business habits and legal environment (Humphery-Jenner and Suchard, 2013).

Monitoring requires frequent interaction and continuous collection of information throughout the investment process. These tasks are likely to both increase in difficulty as well as become more costly when the VC and the portfolio company are operating across larger geographical distances (Filatotchev et al., 2005). In addition to risk and information costs, travel costs are naturally correlated with an increase in travel time, which can further be attributed to large distances between the members of the investor-investee relationship. Larger travel costs in turn makes coordination between the VC and the portfolio company harder, since spontaneous in-person interactions, however necessary they might be to effectively monitor the company, are discouraged by those costs (Ceci and Prencipe, 2013).

This view is further supported by Fritsch and Schilder (2008), who conducted 85 personal interviews with German investment professionals. All interviewees expressed the view that geographic proximity definitely is an advantage within the VC industry, mostly due reduced costs as well as fewer problems when performing tasks intended for either monitoring or general advising. However, the validity of these qualitative results should not be taken for a fact, since the responses provided by the VC professionals might not necessarily align with their actual actions and investment behavior.

A study by Tian (2011) examines the relationship between monitoring and staging as well as how staging is affected by the distance between the VC and the portfolio company. The results of the research indicate that geographic distance increases the likelihood that the portfolio company would be exposed to more intense staging, which in turn is seen as one of the most potent monitoring and risk reduction mechanisms that investors have at their disposal (Sahlman, 1990). This would indicate that firms see investments over large geographic distances as riskier, thus providing the need to spread said risk out through a higher number of rounds where the amount of investment in each individual round is given in smaller quantities.

Furthermore, board representation is thought to be one of the key ways in which VC's communicate with their portfolio companies. Being a part of the board allows the VC to directly engage with management, influencing the strategic direction of the firm. Lerner (1995) argues that monitoring firms over geographical distances are more costly than monitoring the same firms locally. He shows that firms that have offices within five miles of one the VC's office are twice as likely to have someone from the fund take a board seat as those with a distance exceeding five hundred miles. Being able to attend board meetings is believed to be a critical part of a VC's work to reduce the problems of moral hazard – and as distance increases so should also the issues connected to this.

2.2.2. Support

Besides from serving as a provider of financial resources and monitoring the firms they invest in, VCs also play a critical role in providing actual value-added services by supporting and advising the entrepreneurs while simultaneously facilitating the flow of information between the portfolio company and members of the investor's network (Baum and Silverman, 2004; Busenitz et al., 2004; Hellman and Puri, 2002; Hsu, 2004; Sapienza, 1992). Apart from providing financial expertise, VC firms also routinely act in ways that could be compared to management consultants, providing advice on both strategic as well as operational issues – with the ultimate aim of increasing the performance of portfolio companies (Bygrave and Timmons, 1992).

The advisory role becomes more difficult to perform, and may also be less valuable, when VCs work over large geographical distances with their portfolio companies (Kräussl et al., 2011). Geographical distance is believed to decrease the effectiveness of knowledge transfer between different kinds of organizations Gilbert (2008) and Korsgaard and Sapienza (1996) shows that frequency of interactions between VCs and portfolio companies also decrease with distance (both face-to-face contacts as well as general VC-CEO interactions). This would then reduce the distant VCs ability to support the portfolio company, since they would be able to offer more assistance to the targets when interactions occur more frequently. In fact, familiarity with the business and its issues is important if the VC wants to give good advice, both from a more short-term operational perspective, but also regarding long-term strategic support. Familiarity requires continual interaction, so the VCs role as an advisor is hurt two-fold: both in the quantity of advice given (due to fewer interactions) as well as the actual quality of the advice – due to the reduced effectiveness of knowledge transfer as well as general poorer familiarity with the venture and its threads and opportunities (Sorenson and Stuart, 2001). This problem of a lack of familiarity is further explained in more detail by Zaheer (1995) and defined by him as "liability of foreignness".[5] Liability of foreignness expediates the negative effect that distance has on the VC's ability to provide support to their portfolio companies, through increased costs (generated due to the lack of knowledge about the new foreign context) which then reduces their ability to focus on value-adding activities.

[5] The term "liability of foreignness" (LOF) describes the costs that firms operating outside their home countries experience above those incurred by local firms.

Furthermore, the social relationships between the VC and its portfolio companies is also something that needs to be taken into account when evaluating the effectiveness of the VC in performing its value-adding services. If the two parties manage to create mutual trust between each other it will increase cooperative behaviour between the two and reduce potential information asymmetries that might stand in the way of a successful exit (De Clercq and Sapienza, 2001; Korsgaard and Sapienza, 1996). For stable social relationships to develop, both parties need to interactively increase their commitment to the relationship (Larson and Starr, 1993). The likelihood of establishing such a stable, social, relationship declines as the distance in social space increases (Blau and Schwartz, 1984) as well as when the investee and investor are located close to each other, since it lowers the effort required to get in contact with each other. It could be argued that new communication technologies have bridged the gap, but face-to-face interactions is to this day still an important part in building relationships (Cook et al., 2001).

However, it should be said that distance, or at least factors correlated with distance, also has an effect which would potentially increase the success of ventures. Foreign VCs may have relative advantages in experience and resources, since it often requires both to take on international investments (Deloitte, 2006). Experience and resources then further aid the VC in providing qualitative advice to the management of the portfolio company. It should however be noted that it is not distance per se that, by this logic, would increase success rates of VC investments. Instead it is rather the characteristics (size, experience etc.) that often can be found within international VCs that would benefit the venture (Dai et al., 2012).

On a similar note, the presence of a foreign VC could actually be a good thing and increase the value that the VC adds to the venture. The distance between the VC and the portfolio company increases the internationality of the combined network. This might then help portfolio companies if they wish to become more internationalized (Blankenburg Holm and Chetty, 2000). Using a large sample of Chinese portfolio companies, a study found that the presence of foreign VCs significantly increased the likelihood that a portfolio firm would be listed on a foreign exchange, indicating that foreign VCs add an internationalising aspect to the venture (Humphery-Jenner and Suchard, 2013). A foreign VC could also be argued to be able to serve the role of legitimizing the unknown firm in the foreign VC's home market, raising awareness and introducing the management of the portfolio company to potential new business partners, acquirers or additional investors (Maula and Mäkelä, 2005).

2.3. Exit phase – Effect of distance on VC investment performance

The previous parts of the literature review have provided prior literature and theory that discuss the general relationship between distance and the VC-investment process suggesting that distance might be costly and increase problems in selecting, monitoring and supporting ventures thus potentially harming investment performance. This section now adopts a narrower scope – focusing on highlighting existing literature that has been conducted research on the direct correlation between distance and actual performance.

When examining local bias within the venture capital industry, Cumming and Dai (2010) found that geographic distance is negatively correlated with the likelihood of successful exits via IPO or trade sale. Chemmanur et al. (2010) further investigates the effect of syndication and whether having a local partner improves the probability of success for foreign investors or not. They find that distance is negatively correlated with the probability of having a successful exit, but that the presence of a local syndication partner mitigates the negative effect of distance between the investors and the investee. Furthermore, evidence has found that within early-stage investments, distance is an important condition for success (Carlson and Chakrabarti, 2007; Coval and Moskowitz, 1999; Cumming and Dai, 2010; Ivkovic and Weisbenner, 2005; Maula and Mäkelä, 2008).

However, not all research points towards the conclusion that distance reduces performance and likelihood of successful exits. Chen et al. (2010) shows with a sample of 2,039 VC firms from the US, that investments in the region where the VC has its main office tends to underperform, relative to other investments. Yet, they suggest that this might be due to the fact that VCs potentially use a higher hurdle rate for distant foreign investments, creating a sort of “cherry-picking”-situation where distant investors only invest in companies that are already of high quality. Similarly, Dai et al. (2012) conducted a study on venture capital investments in Asia, finding that geographical distance is positively correlated with exit performance. However, the authors argue that this could be due to the fact that observations exhibiting longer geographical distances in their sample mostly consists of US or European VC – which they then suggest outperforms Asian VCs, due to having broader experience, better developed skills and more extensive networks.

3. Hypotheses

This thesis aims to shed light on the relationship between three factors within the venture capital industry: *Distance*, *Nationality* and *Performance*. The literature review (section 2) has provided inconclusive or varying results regarding the effect that geographical distance actually has on venture capital investments and performance. Our contribution to existing literature is therefore not only limited to performing new research on VC investments in Sweden – but will hopefully also provide further clarity to the relationship between distance and performance. We aim to do this by testing three main hypotheses, which are further presented and argued for in the following segment.

As previously described in section 2.3. of the literature review, there is research pointing to the fact that both the VC and the portfolio company is favoured by local proximity and that shorter distance between the two leads to increased performance (Chemmanur et al., 2010; Cumming and Dai, 2010). Furthermore, from a theoretical perspective, a vast amount of literature supports the view that both the quality and quantity of pre- as well as post-contractual investment activities (see section 2.1 & 2.2) is disadvantaged by geographical distance (Ceci and Prencipe, 2013; Chen et al., 2010; Cook et al., 2001; Coval and Moskowitz, 1999; De Clercq and Sapienza, 2001; Gilbert, 2008; Korsgaard and Sapienza, 1996; Kostova and Zaheer, 1999; Sapienza, 1992; Sorenson and Stuart, 2001). The first hypothesis is therefore formulated in the following way:

H1: Larger geographical distances between Swedish portfolio companies and the invested VC firms decrease the likelihood of successful exits.

Furthermore, we also believe that by including a domestic (Swedish) investor in the investment syndicate, investors can overcome many of the disadvantages associated with distance and increase the likelihood of a successful exit (Fritsch and Schilder, 2008; Sorenson and Stuart, 2005). This positive correlation between the inclusion of a domestic VC and performance, has, as previously mentioned, already been presented in prior studies, conducted by Chemmanur et al. (see section 2.3.).

Our aim is to add to existing literature by confirming that the positive effect of including a domestic investor within syndications also holds for start-ups originating from Sweden and for Swedish VC firms – as compared to previous studies who have tended to focus on the more regionally dispersed US market. Our second hypothesis is therefore stated as follows:

H2: The presence of one or more domestic VC firms within the investment syndicate increases the likelihood of successful exits in Swedish VC investments.

Finally, we want to examine how the distance between the VCs themselves effect the success rates of the ventures they are invested in. The effect of distance between VC firms has not been investigated by existing literature and we thus aim to introduce new insights regarding this area of research. As previously argued (see section 2.2.), geographical distance reduces both quantity and quality of communication between parties, as well as the general likelihood that relationships develop between the participants (Blau and Schwartz, 1984; Cook et al., 2001; De Clercq and Sapienza, 2001; Gilbert, 2008; Korsgaard and Sapienza, 1996; Lerner, 1995; Petersen and Rajan, 2002; Sapienza, 1992; Sorenson and Stuart, 2001). We therefore argue that a higher distance between VCs would reduce collaboration and thus the ultimate quality of the support that is given to the portfolio companies. This would then further result in a lower likelihood of successful exits from the ventures. We consequently state the following hypothesis as our third and last:

H3: Larger geographical distances between the VC firms within the investment syndicate decrease the likelihood of successful exits for Swedish ventures.

4. Data & Methodology

This section provides an overview over the data sample used and the research design applied to test the hypotheses stated in the previous section. We start with explaining the data collection process in section 4.1. followed by the introduction of the variables being used in the scope of our paper (4.2.) and a sample description (4.3.). Thereafter, section 4.4. will establish the estimation models applied.

4.1. Data collection and Sources

The data used in our study is mainly based on the *VentureXpert* database, which is prevalently used by existing research in the VC field (Cumming and Dai, 2010; Dai et al., 2012; Hochberg et al., 2010, 2007; Li and Zhao, 2008; Shane and Stuart, 2002; Sorenson and Stuart, 2001). The database provides data on a deal-level between VCs and ventures, based on quarterly reports of investors, trade publications and interviews, amongst others. Gompers and Lerner (1999) and Kaplan and Strömberg (2009) both concluded that *VentureXpert* covers roughly 85% of all deals, thus constituting a comprehensive foundation for research within this research field. Yet, a well-known shortcoming of the *VentureXpert* database is that performance data is incomplete (Dai et al., 2012; Kräussl et al., 2011). The challenge for researching particularly acquisitions of VC-backed company is multifold and primarily driven by the relatively few data points publicly available (Da Rin et al., 2011). Hence, following common procedures in previous literature (Dai et al., 2012; Kräussl et al., 2011) we complemented our dataset with acquisition and IPO data through the *SDC Global New Issues* and *M&A Database* provided by *Thomson Financial.*

We retrieved investment data for all Swedish ventures receiving their initial funding during the period from 01/10/1989 to 01/10/2019 which resembles almost the total span that *VentureXpert* covers. Our initial sample consists of 1,983 deals, comprising a total of 5,994 funding rounds.[6] Since the sample also contains financing rounds allocated to buyout funds, real estate or mezzanine financing, we remove deals in which the share of VC firms comprises less than 50% of all investors, leaving a total of 1,284 observations with 4,446 financing rounds.

[6] By using the term deal we refer to the unique investment (company observation) which may include several rounds of funding. Within each of these funding rounds there are typically several firms (investors) involved.

As a next step, we excluded all deals where the venture received the initial financing round after the 01/10/2014, giving us a 5-year time horizon to observe an exit. We chose this threshold since our sample shows an average time-to-exit (successfully) of 5 years. Similar thresholds have been used in the works of Dai et al. (2012) and Hochberg et al. (2007). After disregarding the more recent data points, we end up with 1,158 deals covering 4,068 rounds of VC financing. As a last step, we removed one observation missing relevant information.[7]

Table 1: Sample derivation

The table below displays the sample construction process. Our initial sample of 1,983 Swedish VC backed ventures between Oct. 1989 and Oct. 2019 is obtained from the VentureXpert database by Thomson Reuters.

Initial Sample of Swedish VC backed ventures from 01/10/1989 to 01/10/2019	**1,983**
Excluding deals which were not mainly VC-backed (threshold of 50%)	-699
	1,284
Excluding all deals funded after 01/10/2014	-126
	1,158
Removing observations missing necessary information	-1
Final Sample of	**1,157**

4.2. Variable description

To test our hypotheses, we use variables introduced by existing VC literature but also construct a set of new variables adding to the accuracy of our models. A collective overview of all variables used, the detailed calculation method applied, and the source can be found in Table 15 in Appendix B.

As an introductory remark, the variables which aim to capture factors related to the VCs themselves are calculated on a firm-basis, and not the specific fund invested. Funds traditionally have a limited life (around ten years), whereas the VC firm has an indefinite lifespan. If a first-time fund is successful a VC firm can raise a follow-on fund (Kaplan and Schoar, 2005), leading to a sequence of raised and managed funds over the years. Hence, we view characteristics such as experience, network etc. to be more accurately captured when looking at a firm-level, as compared to if it instead would be calculated on a fund-level (Hochberg et al., 2007). Since some firms were only labelled as undisclosed firms in the *VentureXpert* database, we could sometimes not gather missing information on regionality and firm characteristics. In these cases, we applied averages of the respective rounds (first and all) on these observations.

[7] The only investor in this deal was undisclosed thus yielding no information about regionality and firm characteristics.

Applying an average value of the respective round yields the same result as omitting undisclosed firms from our sample, yet we can still use the firm to calculate variables depending on the number of investors itself. Besides, sometimes *VentureXpert* labelled the regionality characteristic so we could use it for the purpose of our analysis. In total, there are 787 undisclosed firm investments which constitutes roughly 25% of the sample.

4.2.1. Dependent variables

Since we study the effect of distance on VC performance, we construct a variable associated with the final success of the respective VC investment. Our study variable, *EXIT*, is a dummy that takes the value of 1 if the venture ultimately went public or was acquired. Due to the private nature of VC investments making it impractical to gather project-specific returns, we follow existing literature (Bottazi et al., 2008; Gompers et al., 2008; Gompers and Lerner, 2000; Hochberg et al., 2007) in using successful exits as a proxy of investment success. The measure is well established in existing VC research since it captures that VCs receive a capital gain only when exiting the investment. Indeed, former studies found that VCs primarily generate returns from successful exits via trade sale or IPO (Hughes et al., 2019; Mathur, 2019; Triantis, 2001).

Yet, we must acknowledge that the measure is somewhat flawed due to the disregard of costs and ownership stakes. In addition, critics might argue that IPO and venture sale differ significantly in profitability and one cannot identify the absolute performance of the investment.[8] However, the few studies looking at proprietary return data (Cochrane, 2005; Kaplan and Schoar, 2005) attest that most capital gain is generated from these events. Moreover, Hochberg et al. (2007) found that the likelihood of exit is a reasonable proxy for fund returns. They relate a sample of 188 fund's IRR to the respective exit rates to check the robustness of the model the built for fund performance. They find a significant correlation between both measures – yet stating that the proxy "is useful but noisy" (p.274).

[8] IPOs are often considered to be home-run exits (De Clercq and Dimov, 2006) and generate superior returns (Cochrane 2006; Hochberg et al., 2007). Yet previous literature suggests that trade sales also generate positive returns (Gompers and Lerner 2000; Guler and Mcgahan 2006) and sometimes even yield higher valuations due to possible synergies entailed in a strategic acquisition.

4.2.2. Independent variables

We use a total of three independent variables in our regressions, namely the average distance between the VC firms and the venture (*AVGDIST),* a Swedish Investor dummy *(DOMINV)*, and average distance between VC firms *(AVGDISTVC)*. All three variables are both calculated based on the first funding round as well as on all rounds. The first-round setting is calculated by only looking at investors present in the first round, while the all-round setting takes all firms invested into account. We hypothesise that first round measurements will prove themselves to be more significant. As discussed in the literature review, agency costs are much higher in the early stages of the venture thus intensifying the distance related problems we investigate. In particular, the selection of the venture is much more ambiguous in the early days of the venture which could reduce issues related to "cherry-picking". Furthermore, VCs make important strategic decisions early and the interaction with ventures in these initial rounds sets the tone for subsequent exchange through i.e., contractual terms and staging – thus being critical for the investment's ultimate success (De Clercq et al., 2006; Fitza et al., 2009; Sahlman, 1990).

The first measure used is *AVGDIST* which measures the geographical distance in kilometres between the invested VC firms and the respective portfolio company. It is calculated as one plus the natural logarithm of the average distance between each invested firm and the venture with regards to the capitals of the respective country.[9] Since *VentureXpert* does not have any such data included, we obtained bilateral country distance for all countries covered in our sample from CEPII (Mayer and Zignago, 2011).[10] A similar approach has been adopted by previous studies examining the implications of distance on VC performance (e.g., Sorenson and Stuart, 2001; Chemmanur et al., 2010). As stated in section 2 spatial distance is considered to be an important factor when it comes to the different stages of the VC investment process thus impacting the ultimate success of the investment.

The second independent variable *DOMINV* consists of a dummy that takes the value of one if there are more than one Swedish VC invested in the company and zero otherwise. The presence of a domestic investor should, based on agency and network theory, improve quality of the investment process thus ultimately increasing the success rate.

[9] We intentionally do not use the distance between funds and ventures since the network, experience and often also strategic decisions are connected to firm which is an indefinite entity as being discussed in the beginning of this chapter

[10] The database is accessed through: http://www.cepii.fr/CEPII/fr/bdd_modele/presentation.asp?id=6.

As a third independent variable we establish *AVGDISTVC* which is calculated as one plus the natural logarithm of the average distance between all firms involved. We use *AVGDISTVC* as a way to isolate the effect of distance between the invested firms themselves. By doing so we focus on issues associated with aligning the interests of the firms and cooperation along the investment process, rather than on issues regarding asymmetric information or moral hazard as previously discussed.

4.2.3. Control variables

Besides the previously mentioned dependent and independent variables, we also include a number of control variables. The chosen control variables can be broadly categorized into the following groups; VC firm-specific factors (*Success*, *Experience*, *Assets under Management (AuM)*, *Historical Network*, *Centrality*), Investment Process-specific factors (*Number of Rounds*, *Time between Rounds*, *Syndication Size*), Venture-specific factors (*Stage of Venture*), as well as Time- and Industry-specific fixed effects. We note that each of the VC firm-specific variables is calculated on both the first and all rounds following the explanation given before (section 4.2.2.). As previously mentioned, a more detailed explanation of the variables, the expected effect on performance, and their corresponding calculations can be found within Table 15 in Appendix B.

VC-specific variables

We use three different controls to account for the skill of the VC firms which is much likely to impact the success probability of the investment. First, we include previous *Success in the Swedish market (AVGSUCCESS)* as a variable since it functions as an indicator of the skill of the VC. The more skillful a VC is, the better value-added services it should be able to provide – ultimately resulting in an increased probability of success rates for future ventures in which the VC invests. Besides from the direct implication, prior success is also expected to provide the VCs with a good reputation. It could then further be argued that more reputable VC firms have access to better quality investments.

Next, *Assets under Management (AVGAUM)* is believed to have a positive relationship with the dependent variable due the fact that more successful (and hence skillful) VC firms should be able to raise larger funds (Gompers and Lerner, 2000).

As a third measure we use *General investment experience (AVGGENEXP)*, which is also believed to be correlated with the skill of the VC which, as previously discussed, directly relates to performance and thus probability of successful exits (Zarutskie, 2010). More experienced VCs are also expected to receive better deal-flow (Cumming and Dai, 2010) and support their portfolio companies better through a larger network of contacts, when compared to less experienced VCs (Powell, 2002). Specifically, broad international experience (which intuitively correlates with general experience) is considered to increase the VC's ability to bridge the gaps created by distance (Dokko and Gaba, 2012; Meuleman and Wright, 2011).

Next, we conclude the VC-specific section of the control variables by introducing two variables connected to the network of the VC in the Swedish market; *Degree Centrality (AVGDEGREE)* and *Historical Network (AVGHNETWORK)* both of which reflect the network that the respective VC firms have within the Swedish VC industry. The network is crucial for the VC, since it facilitates deal flow and information transfer (Bonacich, 1987) – as well as a wider range of expertise, contacts and capital. We follow Hochberg et al. (2007), Cumming and Dai (2010) in their method to calculate *Degree Centrality*. Degree reflects all ties that each firm has at the respective year (firms centrality in network) of the round dates. When further constructing the variable for *Historical Network* we use the same approach as described for centraility (for a more detailed explanation of both variables, see Table 15 in Appendix B) – but instead of only focusing on ties within a year, we count all years since the foundation of the firm.

Investment process-specific variables

Syndication Size (AVGSYNDSIZE) as a variable is defined as the average size of the group of investors that participate in a financing round. Syndication is believed to increase monitoring and reduce information assymetry between entrepreneurs and investors (Admati and Pfleiderer, 1994; Lerner, 1994; Sorenson and Stuart, 2001). Larger syndicates might benefit the venture by giving the portfolio company access to larger network of potential business partners and acquirers (provided by the VCs). A start-up should hence see more value from a large, syndicated round as compared to a sole investor.

We further introduce two variables connected to staging; *Number of Rounds (ROUNDS)* and *Time between Rounds (AVGSTAGINGTIME)*. *Number of Rounds* measures the total number of funding rounds that a venture receives, while *Time between Rounds* measures the average time between each of the ventures funding rounds (in years).

Increasing the number of rounds and spreading out financing through smaller, more frequent rounds is called staging, (Cumming and Dai, 2010; Gompers, 1995) – and as noted by Sahlman (1990), the staging of capital is one of the most effective mechanisms that VCs can employ to control their portfolio companies.

Venture-specific variables

Venture Stage (VENTURESTAGE) tries to capture which stage the venture is considered to be in at the time of the first VC-investment. It is designed as a dummy that takes the value of one if the initial investment is made while the venture is in early stage, and zero if it's labeled by *VentureXpert* as late stage or others. Since *VentureXpert* classifies ventures as Seed, Early Stage, Expansion and Late Stage we group Seed and Early Stage together as Early Stage, while Expansion and Late Stage is defined as Late Stage.[11] An investment in an early stage venture would, on average, be subject to a lower probability of successful exit since the age of the venture may affect its risk profile (Cumming and Dai, 2010; Dai et al., 2012; Gompers, 1995; Li et al., 2014).

Fixed Effects

To conclude the variable section, we introduce two fixed effects related to *Industry* and *Time Period*. *Industry* is given the shape of a dummy, which takes the value of 1 if *VentureXpert* labels the industry of the venture as Tech, and 0 if it is not. Entrepreneurial ventures carry different levels of idiosyncratic risk, dependent on the industry they belong to (Gompers and Lerner, 2000). This variable is meant to control for that inherent risk. We also account for fixed time effects by incorporating a set of time dummy variables covering the separate *time periods* in which the first investment was made in the venture, as measured by the date of the first round. Due to the size of our sample and the sometimes low number in observations in certain years, we split our sample in the subsequent 5 periods following Cumming and Dai (2010) and Kräussl et al. (2011): 1991-1996 (pre dot.com-bubble), 1997-2001 (dot.com-bubble), 2002-2007 (pre-financial crisis), 2008-2012 (financial crisis), 2013-2014 (post-financial crisis).

[11] Since VentureXpert sometimes classifies first rounds as Late Stage there might be a potential bias within this measure. A first financing round labeled as late stage potentially implies that it might not be the true first round, but the first round captured by VentureXpert. Yet, this measure is widely being used in VC research, none of which is reporting any concerns related to this labeling.

4.3. Sample Description

Total sample

Depicted in Table 2 below are the descriptive statistics of all variables used to test hypotheses **H1** to **H3**. The mean exit rate of 33.4% is in line with existing research in the VC field using exits as a measure of success (Cumming and Dai, 2010; Dai et al., 2012; Hochberg et al., 2007; Kräussl et al., 2011). A detailed overview of exits and funding rounds over the total sample period can be found in Figure 4 in Appendix A. Concerning prior investment experience, we find that few investors have a much higher experience and of a much larger size (AuM) than the average investor in our sample, thus driving the mean way above the median. The "big positive tail" suggests that there are some very experienced firms with a proven track record that are investing into the Swedish start-up market (see Table 14, Appendix A). The high value of average distance reflects an environment where, for example, many foreign VC firms (especially US) are present in the Swedish market. A detailed overview of the VC firms' nationalities and where they are located can be found in Figure 3 and Table 13 in Appendix A.

Table 2: Descriptive statistics

*The table provides descriptive statistics of the variables being used to test our hypotheses **H1 to H4** distinguishing between "first round" and "all rounds" characteristics.*

		First round		*All rounds*	
Variables	**N**	**Mean**	**Median**	**Mean**	**Median**
EXIT	1157	.334	0	.334	0
AVGDIST (LN)	1157	1.976	0	2.513	0
AVGDIST	1157	673,99	0	724.519	0
DOMINV	1157	.72	1	.861	1
AVGGENEXP	1157	39.743	12	45.796	15.4
AVGSUCCESS	1157	12.861	5.1	13.212	5.75
VENTURESTAGE	1157	.544	1	.544	1
ROUNDS	1157	2.102	1	2.102	1
AVGSTAGINGTIME	1157	.746	0	.746	0
AVGSYNDSIZE	1157	1.567	1	1.567	1
AVGHNETWORK	1157	4.496	1.41	4.482	2.081
AVGDEGREE	1157	.03	.009	.028	.011
AVGAUM (LN)	1157	5.371	5.955	5.525	5.897
AVGAUM	1157	1195.602	384.7	1271.537	363

Sample characteristics per investor group

Since the main area of research in this paper is related to distance in VC investments, we analysed our sample on an investor group level, differentiating between Domestic, US and foreign investors to investigate varying characteristics across these groups.

We intentionally separated US from foreign investors since the US represents a big share (25%) of the total investor base of our sample (Table 13, Appendix A) while also being one of the most-distant ones (6.632 km).

Venture specific attributes are depicted in Table 3 (next page). A detailed overview where the ventures in our sample are located can be found in Figure 2 and Table 12 in Appendix A. In general, we can see that in 72% of all first rounds a domestic investor is present while in 12% of the deals there is a US investor involved. In 26% of our deals there is also a foreign VC firm present, excluding US firms. The involvement of all investor groups increases over the time of the investment to 86%, 17% and 39%, respectively, shown in the higher N when considering all rounds. Especially, the increase by 5 percentage points of US investor and 13 percentage points of other foreign investor presence in later rounds is remarkable since this constitutes an increase of roughly 40% and 50% in total presence. Apparently, many non-domestic VC firms invest in the company at later stages. Corresponding to the findings of Dai et al. (2012) foreign VCs avoid investing in distant ventures very early since such companies constitute a highly informationally limited investment.

The first remarkable difference we find regarding the investor groups is the varying industry focus. Both foreign and US firms invest more in Tech ventures while the split for domestic firms is quite balanced. The even higher share of US investments in Tech compared to other foreign investors (~ +6%) might be explained by the enormous tech focus within areas such as San Francisco and Boston (Mathur, 2019) (see also Table 13 Appendix A). A second noteworthy finding refers to the exit rates and split across the different investor groups. First, US and foreign investors have significant higher exit rates compared to domestic investors. Yet, when looking at the respective type of exit, we see that US and foreign firms only outperform domestic when it comes to trade sale (M&A) transactions. As discussed in 4.2. there are conflicting scholarly views on whether such transactions really constitute a clear sign of good performance. Besides, we note that the exit rates are even higher for the subsamples where US and foreign investors have joined in later rounds, as compared to when they have directly invested in the first round. This suggests that there might be structural differences regarding the impact of these investor groups within these two settings.[12]

[12] See section 4.2. for the detailed discussion for the split between first and all rounds in our sample.

Table 3: Venture Characteristics per investor group

The figure depicts descriptive statistics of the ventures in our sample. Our sample consists of 1,157 Swedish VC-backed ventures receiving the first funding round between Oct. 1989 and Oct. 2014. We show characteristics for all deals (column 2) as well as for selected investor groups (Domestic, US, Foreign) differentiating between whether these groups invested in the first round (columns 3,5,7) or in any round (columns 4,6,8). We grouped the characteristics into STAGE, INDUSTRY, PERIODS (funding), PERIODS (exit) and EXIT SPLIT. Within each of these groups we show the N of the respective observations as well as the share within each group (%). VentureXpert classifies the venture stage as Seed, Early Stage, Expansion and Late Stage. We group Seed and Early Stage together as Early Stage, while Expansion and Late Stage is defined as Late Stage. Others consists of other related stages such as Buyout or Mezzanine financing. We used the periods 91-96 (pre dot.com), 97-01 (dot.com era), 02-07 (pre crisis), 08-12 (crisis) and 13-14 (post crisis) to split our sample. A detailed reasoning is provided in section 4.2. The data is based on VentureXpert, Thomson Reuters M&A and Global Issue Databases, accessed 01. Oct. 2019.

Characteristic	All Deals (N=1157)		Domestic investor involved in 1st round (N=833)		Domestic investor involved in any round (N=996)		US investor involved in 1st round (N=136)		US investor involved in any round (N=197)		Foreign investor involved in 1st round (N=296)		Foreign investor involved in any round (N=453)	
STAGE	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Early Stage	630	54%	468	56%	565	57%	68	50%	111	56%	159	54%	257	57%
Late Stage	414	36%	288	35%	345	35%	57	42%	73	37%	102	34%	150	33%
Other	114	10%	77	9%	86	9%	11	8%	13	7%	35	12%	46	10%
INDUSTRY														
High_tech	601	52%	404	48%	496	50%	86	63%	124	63%	174	59%	259	57%
Non High_tech	556	48%	429	52%	500	50%	50	37%	73	37%	122	41%	194	43%
PERIODS (funding)														
1991-1996	20	2%	12	1%	15	2%	7	5%	7	4%	1	0%	4	1%
1997-2001	322	28%	234	28%	259	26%	67	49%	100	51%	101	34%	163	36%
2002-2007	370	32%	285	34%	329	33%	25	18%	36	18%	71	24%	126	28%
2008-2012	372	32%	262	31%	333	33%	29	21%	41	21%	99	33%	128	28%
2012-2014	73	6%	40	5%	60	6%	8	6%	13	7%	24	8%	32	7%
PERIODS (exit)														
1991-1996	6	2%	4	1%	4	1%	1	2%	1	1%	1	1%	2	1%
1997-2001	46	12%	26	9%	32	10%	10	16%	14	14%	17	15%	26	14%
2002-2007	121	31%	98	33%	106	32%	16	26%	29	29%	30	27%	56	30%
2008-2012	131	34%	105	35%	115	35%	23	37%	38	38%	37	33%	63	33%
2012-2019	82	21%	68	23%	72	22%	12	19%	19	19%	28	25%	42	22%
EXIT SPLIT														
M&A	327	28%	258	31%	279	28%	55	40%	88	45%	91	31%	157	35%
IPO	59	5%	43	5%	50	5%	7	5%	13	7%	22	7%	32	7%
Not exited	771	67%	532	64%	667	67%	74	54%	96	49%	183	62%	264	58%

Table 4 (next page) shows VC firm characteristics per investor group. Examining the overall characteristics of all investors, we again see the higher mean to median figures across all investor groups suggesting that there are some much more experienced players within these groups than the average investor.[13] We see that US VC firms are much larger than both foreign and domestic firms (measured by AuM) and have participated in more deals. However, the total number of success is the lowest for US firms which is attributable to the fact that this measure only concern exits of Swedish ventures. Yet, syndicates with foreign VC firms which do not include US VCs show the largest amount of previous success – even when compared to domestic investors. When it comes to network, we see that domestic investors actually have a higher network which is not surprising given that these measures only capture ties to firms invested in Sweden which is their home market.

[13] We included an overview of the Top 10 VC firms invested in Swedish ventures of our sample in Table 14, Appendix A.

Table 4: VC Firm characteristics per investor group

The figure depicts descriptive statistics of the firms in our sample. Our sample consists of 513 VC investors taking part in the first funding round between Oct. 1989 and Oct. 2014. We show characteristics for all deals (column 2) as well as for the selected investor groups Domestic, US and Foreign (columns 3,4 and 5). We grouped the characteristics into REPUTATION, EXPERIENCE and NETWORK. Within each of these groups we show the mean and median of the respective observations. For further information of the respective characteristics (AuM, General, Successful Exits, Degree Centrality and Historical Network) refer to variable descriptions in section 4.2. as well as to Table 15 in Appendix B. The data is based on VentureXpert, Thomson Reuters M&A and Global Issue Databases, accessed 01. Oct. 2019.

	All Investors (N= 513)		Domestic investors (N=172)		US investors (N=129)		Foreign Investors (N=212)	
REPUTATION	Mean	Median	Mean	Median	Mean	Median	Mean	Median
AuM	1.802	245	318	95	6.167	1.000	3.140	601
EXPERIENCE								
General	63	15	21	10	159	44	127	40
Successfull Exits	80	9	68	11	48	3	115	8
NETWORK								
Degree centrality	0,03	0,01	0,04	0,01	0,02	0,01	0,02	0,00
Historical Network	4,99	1,00	6,65	1,88	2,54	0,47	2,62	0,47

Next, we look at the investment characteristics displayed in Table 5 (below). We see that having a US or foreign investor present in the syndicate significantly increases the average distance to the venture. We also see that the distance between the VCs behaves similar to the distance to the venture. Furthermore, the rounds where US investors are involved are larger – shown by the higher syndication size measure. Having a US investor present might attract other VC firms thus increasing the number of syndication members within a funding round. Furthermore, US and foreign investors seem to undertake more funding rounds (staging) with a somewhat longer time between the rounds when compared to domestic investors.

Table 5: Investment characteristics per investor group

The figure depicts descriptive statistics of the investment characteristics of our sample Our sample consists of 1,157 Swedish VC-backed ventures receiving the first funding round between Oct. 1989 and Oct. 2014. We show characteristics for all deals (columns 2 and 6) as well as for selected investor groups (Domestic, US, Foreign) differentiating between whether these groups invested in the first round (columns 3,4,5) or in any round (columns 7,8,9). We grouped the characteristics into DISTANCE, DEAL STRUCTURING and MONITORING/STAGING. Within each of these groups we show the mean and median of the respective observations. For further information of the respective characteristics (Distance to Venture, Distance between VCs, Syndication Size, Nr. of Rounds RCVD and Time between Rounds) refer to variable descriptions in section 4.2. as well as to Table 15 in Appendix B. The data is based on VentureXpert, Thomson Reuters M&A and Global Issue Databases, accessed 01. Oct. 2019. Distance is measured in kilometers while the time between rounds is measured in years.

	1st Round								All Rounds							
	All Deals (N=1157)		Domestic investor involved (N=833)		US Investor involved (N=136)		Foreign Investor involved (N=296)		All Deals (N=1157)		Domestic investor involved (N=993)		US Investor involved (N=197)		Foreign Investor involved (N=453)	
DISTANCE	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median
Distance to venture	674	0	229	0	4.225	4.430	1.126	479	725	0	382	0	3.270	3.322	1.122	418
Distance between VCs	408	0	401	0	2.780	0	920	0	796	0	758	0	3.595	4.434	1.579	418
DEAL STRUCTURING																
Syndication Size	1,57	1,00	1,56	1,00	2,18	2,00	1,93	2,00	1,57	1,00	1,61	1,00	2,23	2,00	1,96	2,00
MONITORING/STAGING																
Nr.of Rounds RCVD	2,10	1,00	2,11	1,00	2,36	1,00	2,22	1,00	2,10	1,00	2,17	1,00	3,21	2,00	2,95	2,00
Time between rounds	0,75	0,00	0,71	0,00	0,93	0,00	0,99	0,00	0,75	0,00	0,76	0,00	1,15	0,77	1,17	0,73

4.4. Research Design

4.4.1. Regression

To test our hypotheses, we follow Hoetker (2007) and apply a binary response Probit model. The Probit model is the predominant econometric model used when investigating exit rates within the VC field, being used by Botazzi et al. (2008), Cumming and Dai (2010), Hochberg et al. (2007), amongst others. The model estimates the relationship between our independent variables (see section 4.2.2.) and successful exits, which is defined as binary variable – equalling to 1 if the company was either acquired or went public, and 0 if neither of those outcomes occurred. We also control for various factors that is captured by a set of control variables which is previously described in section 4.2.3. By applying the Probit regressions we aim to investigate effects impacting the probability that a Swedish VC-backed venture exits successfully. In accordance to Wooldridge (2002), the following specification is used for the model:

$$P(EXIT_i = 1 \mid x_i) = \Phi \left(x_i^{\prime}ß\right), where\ i = 1,2, \dots, n$$

In the equation, *P* denotes the probability that *EXIT=1* and *Φ* represents the Cumulative Distribution Function (CDF) of the standard normal distribution. To test our hypotheses, we perform a set of three regressions – all based on the Probit method described above. For each hypothesis we provide two specifications, where we in both models include our previously introduced control variables as well as the fixed effects. Specification (1) will be calculated on a first-round basis, while specification (2) is calculated on an all-round basis.

Hypothesis 1 (**H1**) is tested by examining the results from the first set of regressions. More specifically, we are interested in the coefficient of our main dependent variable (*AVGDIST*) which, as mentioned in section 4.2, captures the relationship between geographical distance and the probability of the venture having a successful exit. The specification of the regressions used to test **HI** looks as follow:

$$P\left(EXIT_i = 1 \middle| AVGDIST_i, Control^{14}{}_i, FE^{15}{}_i\right) = \Phi\left(\beta 1 AVGDIST_i, +\beta 2 Control_i + \beta 3 FE_i + \varepsilon_i{}^{16}\right)$$

[14] "Control" includes all previously mentioned control variables.
[15] "FE" is short for "Fixed Effects" and includes both industry and time period.
[16] "ε_i" equals the error term.

Hypothesis 2 (**H2)** is tested by conducting a similar set of regressions – but also adding a dummy variable (DOMINV), which captures the presence of one or more domestic VC firms in the syndicate. The specification of the regression used to test **H2** looks as follow:

$$P(EXIT_i = 1|AVGDIST_i, DOMINV_i\ Control_i, FE_i)$$
$$= \Phi(\beta 1 AVGDIST_i, + \beta 2 DOMINV_i + \beta 3 Control_i + \beta 4 FE_i + \varepsilon_i)$$

Hypothesis 3 **(H3)** is tested with a third set of regressions. This last set of regressions are identical to the ones tested **H1**, except for the fact that we swap the independent variable (AVGDIST) with the independent variable (AVGDISTVC). As mentioned in section 4.2., this variable aims to capture the geographical distance between the VCs that are involved in the syndicate. The specification of the regression used to test **H3** looks as follow:

$$P(EXIT_i = 1|AVGDISTVC_i, Control_i, FE_i) = \Phi(\beta 1 AVGDISTVC_i, + \beta 2 Control_i + \beta 3 FE_i + \varepsilon_i)$$

4.4.2. Robustness check

To check our results for robustness we run all regressions presented in section 5 once again, but now using a different distance measure called *AVGDISTROBUST*. We constructed this variable by assigning each VC firm´s home country a value from 0 to 5 depending on how close they are to Sweden. We then averaged the values for the first round and all-round investors which corresponds to the derivation of our initial distance measure. The scale and allocation of values to the different regions is shown in Table 6 (below). The robustness checks are excluded from the main body and can be found in Appendix D.

Table 6: Regional Scale

The table below shows the regional scale we applied to construct our robustness distance variable. Northern Europe is considered to be all contingent countries to Sweden plus Iceland. The other regions are taken as labeled in the VentureXpert database.

Geographical Region	Scale factor
Sweden	0
Norther Europe	1
Western Europe	2
Eastern Europe	3
Southern Europe	3
North America	4
Caribbean	4
Middle East	4
South America	5
East Asia	5
Southeast Asia	5

4.4.3. Econometric tests

To check the explanatory power of our results we conduct selected econometric tests to investigate the validity of our Probit regressions. We tested all regressions presented in the following section for multicollinearity and misspecification. The detailed results and explanatory comments can be found in Table 19 and 20 in Appendix C. Summarizing, our regressions show no indication for multicollinearity or misspecification. All other econometric measures are included in the regression tables themselves (beneath the constant). A detailed overview and explanation of all econometric tests conducted is provided in Table 18 in Appendix C.

5. Results & Discussion

In this section we describe the results obtained from conducting the empirical tests described in section 4.4.1. The order of our hypotheses is equivalent to the one presented in section 3.

5.1. Hypothesis 1: The effect of geographical distance on exit rates

The first hypothesis, **H1**, is tested by examining the regressions depicted within Table 7 (next page). To recap, the hypothesis itself aims to determine whether or not larger geographical distances between Swedish portfolio companies and the invested VC firms decrease the probability of successful exits.

Specifications (1-2) are our baseline models and show the effect of distance on the likelihood of exits including all controls previously presented (see section 4.2.). As expected, the introduced control variables are mostly significant and in line with what previous papers have found. However inconsistent with our expectation, general investment experience (*AVGGENEXP*), syndication size (*AVGSYNDSIZE*) and the firm's centrality in the network (*AVGDEGREE*) have no effect on success at all, showing no significance in our regressions.[17] Yet of higher interest is the coefficient of distance on exit rates which shows a positive effect at a 10% and 1%- level, respectively. This finding is somewhat puzzling and contrary to our intuition. Theoretical frameworks such as the network and agency theory present formal arguments for a negative rather than a positive correlation. Besides, Chemmanur et al. (2010) who conduct similar research for the US market find a negative impact of geographical distance on exit rates. In our view, there is a risk that the positive effect of distance could be driven by something not captured in our model. In accordance with this concern, Dai et al. (2012), who find the same positive effect of distance on performance in the Asian market, argue that "U.S. or European VCs, in our study, are associated with longer geographical distances […] than Asian VCs , while these VCs are likely to be associated with better exit performance due to their broader experience, skills, and networking" (p.680). In fact, we would expect foreign investors only to invest if they are 1) confident to have the skill to overcome the difficulties associated with distance, or 2) if they are very good at "cherry-picking" promising companies.

[17] We also examined the effect of each particular set of controls on exit rates and how this affect the impact on distance. Yet, since this is not the focus of our paper, we moved the respective regression to the Appendix E.

Table 7: The effect of geographical distance on exit rates

*The sample consists of 1,157 Swedish VC-backed deals receiving their first funding during the period from 1989 - 2014. We analyze the relationship between distance and the likelihood of exits (M&A or IPO) as of 01. October 2019. The table reports the outcomes of Probit regression models of the logarithm of average distance between the venture and the VC firms (AVGDIST) on the likelihood of exits (study variable) and several control variables. Specifications (1) and (2) are the baseline models including all control variables introduced in Section 4.3. In specifications (3) and (4) we add a US dummy (USINV) to control for the presence of an American investor. While the variables in specifications (1) and (3) are calculated based on first round characteristics, specifications (2) and (4) show the results using variables calculated on all rounds. Venture industry dummies and time dummies are included in all regressions (1-4) but are not reported. We used the periods 91-96 (pre dot.com), 97-01 (dot.com era), 02-07 (pre crisis), 08-12 (crisis) and 13-14 (post crisis) to control for time related effects corresponding to the reasoning provided in section 4.2. We also control for industry-specific effects by including an industry dummy taking the value of 1 for tech and 0 for non-tech related deals. For a detailed discussion of the variables used, please refer to Section 4.3 above. A complete overview of all variables and correlation matrices are provided in Tables in Appendix B. All Statistical tests conducted as well as results for the linktest and multicollinearity test can be found in the Tables in Appendix C. Robustness tests are presented in the Tables in Appendix D. The robust standard errors for each variable are reported in parentheses. The significance level is denoted by asterisks at the ***(1%), **(5%), and *(10%) level.*

VARIABLES	(1) Base 1st	(2) Base all	(3) Base + US 1st	(4) Base + US all
AVGDIST	0.027*	0.039***	0.024	0.024
	(0.014)	(0.015)	(0.018)	(0.018)
USINV			0.044	0.241*
			(0.160)	(0.142)
VENTURESTAGE	-0.385***	-0.386***	-0.384***	-0.387***
	(0.082)	(0.082)	(0.082)	(0.082)
AVGGENEXP	-0.000	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)
AVGSUCCESS	0.001	-0.000	0.001	-0.000
	(0.004)	(0.004)	(0.004)	(0.004)
ROUNDS	0.077***	0.061***	0.077***	0.060***
	(0.021)	(0.022)	(0.021)	(0.022)
AVGSTAGINGTIME	0.087***	0.078***	0.087***	0.080***
	(0.030)	(0.029)	(0.030)	(0.029)
AVGSYNDSIZE	-0.024	-0.043	-0.026	-0.062
	(0.047)	(0.048)	(0.048)	(0.050)
AVGHNETWORK	0.049***	0.061***	0.048***	0.058***
	(0.010)	(0.012)	(0.010)	(0.012)
AVGDEGREE	-0.595	-0.549	-0.578	-0.466
	(0.746)	(0.946)	(0.749)	(0.950)
AVGAUM	0.023	0.019	0.023	0.019
	(0.022)	(0.024)	(0.022)	(0.024)
Constant	-1.034***	-1.034***	-1.028***	-0.983***
	(0.239)	(0.241)	(0.240)	(0.243)
Observations	1,157	1,157	1,157	1,157
Fixed Time Effect	YES	YES	YES	YES
Industry Fixed Effect	YES	YES	YES	YES
Pseudo R-squared	0.098	0.107	0.098	0.109
Wald chi2	131.165	140.932	131.985	145.207
Prob > chi2	0.000	0.000	0.000	0.000
Correctly predicted test	70,53%	72,43%	70,61%	73,03%
Hosmer-Lemeshow GOF	0.1060	0.1730	0.1011	0.1770
Area under ROC curve	0.7047	0.7094	0.7044	0.7087

Those ventures might be of the best quality from the beginning – thus increasing the likelihood to exit successfully in the future. Consequently, if these two “skill-sets” differ across regions the effect of distance might not be related to distance itself but rather that distant investors are just more successful due to their skills and ability to locate promising investments.

To further study this line of argumentation, we want to separately examine how particularly US VC investors differ from the rest of the world in regard to how they affect success rates. Our reasoning is that US VC firms are older and more experienced, as well as generally displaying a higher level of internationalization, due to the fact that the VC industry in the US is more developed than in other nations (Hughes et al., 2019; Mathur, 2019). This experience in international investments should further present itself with larger, more useful networks that the VCs can use to mitigate the issue that geographical distance may cause. In addition, the global reach of the combined network might then help portfolio companies if they wish to become more internationalized (Blankenburg Holm and Chetty, 2000) – ultimately effecting the success rates of the geographically distant portfolio companies that they invest in. In short, US VCs are believed to be more skilled at overcoming the burden of large geographical distances, when compared to investors of other nationalities.

To shed some light on whether or not US VCs are better at overcoming and mitigating any potential issues associated with geographical distance, we introduce new specifications (3-4) (one each for first- and all-round setting) of our baseline model where we add a US investor dummy (USINV). The dummy takes the value of 1 if there is a US investor present and 0 otherwise. The most noteworthy finding of the new specifications (3-4) is the disappearing significance on distance. Since adding the US investor erased all explanatory power of distance, we infer that the positive effect of distance shown in specifications (1-2) is mainly attributable to the fact that a US VC is present in the syndicate, rather than distance itself. While US investors might increase the likelihood of success by using their expertise and network, the presence of a US investor, who coincides to be far away, also increases the value of our distance variable.[18]

Another particularly interesting finding is connected to the effect of the US dummy on exit rates. Against our expectation, the coefficient on the US dummy in the first-round setting is not statistically significant while in the all-round setting it shows significance ($p<0.10$). This suggests that US investors increase the success when being present in later rounds rather than at the very beginning. We argued in section 4.2.2. that first round investors should have more impact on the development and therefore success of the venture than compared to investors that enter in later rounds. We offer three potential explanations, why this may not hold.

[18] The distance between the US and Sweden is approx. 6.632km. The distance is measured between the capitals of Sweden (Stockholm) and US (Washington D.C.) which corresponds with the calculation method use to get our average distance measure as being described in our variables part (Section 4.2.2.).

First, US investor add value throughout the entire development process (not only in the beginning) as stated by Balcarcel et al. (2008) and Hsu (2004, 2006) provide the venture with expertise facilitating the exit process (Barry et al., 1990; Brav and Gompers, 1997). Indeed, the greater network and previous success rate that the US investors exhibits on average could help them to find suitable buyers and guide the venture through the selling process. Second, US investors could be very good at "cherry-picking" the right investments, as suggested by Chen et al. (2010). They will only invest when the venture has already proven itself to be successful, but still might be in the need of more funding to expand operations. In this case the, the presence of a US firms would positively correlate with the probability of successful exits since the ventures they partake in, on average, are of higher quality. Third and connected to the previous one, the problems associated with distance is remarkably pronounced in earlier investments (due to increased information asymmetry) making it harder for very distant investors to select promising companies (somewhat reducing the ability of "cherry-picking"), and thus lowering the exit rates in these deals. Corroborating evidence for this is provided by Humphery-Jenner and Suchard (2013) who analyzed the Chinese market, finding that foreign VCs perform better when investing in late-stage ventures.

To further check these results, we constructed a sub-sample excluding US investors. Referring to our previous argumentation, we suspect that distance would show less significance after taking away the US observations for the reasons discussed. Table 8 (next page) depicts the outcome of re-running the regressions using the sub-sample. We find that there is no substantial difference regarding the initial impact of average distance. Distance still shows a positively significant effect when excluding the US observations which casts some doubt on the findings of the previous discussion. Yet, the sample description has revealed that there are also other foreign players highly involved (Tables 3-5) thus potentially affecting distance in a similar way which we have not accounted for in specifications (1-2). In fact, Maula and Mäkelä (2005) argues that foreign investors in general serve the role of legitimizing the unknown firm in the foreign VC's home market, raising awareness and introducing the management of the portfolio company to potential new business partners, acquirers or additional investors – thus facilitating a potential exit.

We test this proposed effect of foreign investors by constructing an additional dummy (*FOREIGN*) capturing all foreign investors excluding US ones. The dummy takes the value of 1 if there is a foreign investor present in the respective round-setting and 0 otherwise. Next, we include the foreign dummy in our analysis of the Non-US sample which give us the specifications (3-4).

Table 8: The effect of geographical distance on exit rates – a non-US sample

*The sample consists of 1,157 Swedish VC-backed deals receiving their first funding during the period from 1989 - 2014. The sub-sample excluding US investors consists of 1,021 (first round) and 960 (all rounds) Swedish VC-backed deals, respectively. We analyze the relationship between distance and the likelihood of exits (M&A or IPO) as of 01. October 2019. The table reports the outcomes of Probit regression models of the logarithm of average distance between the venture and the VC firms (AVGDIST) on the likelihood of exits (study variable) and several control variables. We compare the effect of distance on exit rates between a sample including US investors and a sample excluding these deals to check for robustness of the results presented in regression Table 7. Specifications (1) and (2) are the baseline model without US observations including all control variables introduced in Section 4.3. In specifications (3) and (4) we add a foreign dummy (FOREIGN) to control for the presence of a foreign investor (excluding US). While the variables in specifications (1) and (3) are calculated based on first round characteristics, specifications (2) and (4) show the results using variables calculated on all rounds. Venture industry dummies and time dummies are included in all regressions (1-4) but are not reported. We used the periods 91-96 (pre dot.com), 97-01 (dot.com era), 02-07 (pre crisis), 08-12 (crisis) and 13-14 (post crisis) to control for time related effects corresponding to the reasoning provided in section 4.2. We also control for industry-specific effects by including an industry dummy taking the value of 1 for tech and 0 for non-tech related deals. For a detailed discussion of the variables used, please refer to Section 4.3 above. A complete overview of all variables and correlation matrices are provided in the Tables in Appendix B. All Statistical tests conducted as well as results for the linktest and multicollinearity test can be found in the Tables in Appendix C. Robustness tests are presented in the Tables in Appendix D. The robust standard errors for each variable are reported in parentheses. The significance level is denoted by asterisks at the ***(1%), **(5%), and *(10%) level.*

VARIABLES	(1) Non-US Base 1st	(2) Non-US Base all	(3) Non-US Base + Foreign 1st	(4) Non-US Base + Foreign all
AVGDIST	0.038**	0.041**	0.055	0.015
	(0.018)	(0.018)	(0.035)	(0.028)
FOREIGN			-0.118	0.205
			(0.208)	(0.165)
VENTURESTAGE	-0.417***	-0.443***	-0.418***	-0.443***
	(0.088)	(0.091)	(0.088)	(0.091)
AVGGENEXP	-0.001	-0.001	-0.001	-0.001
	(0.000)	(0.000)	(0.000)	(0.000)
AVGSUCCESS	-0.001	0.001	-0.001	-0.000
	(0.004)	(0.005)	(0.004)	(0.005)
ROUNDS	0.081***	0.058**	0.081***	0.053*
	(0.023)	(0.027)	(0.023)	(0.027)
AVGSTAGINGTIME	0.083**	0.081**	0.083**	0.080**
	(0.033)	(0.034)	(0.033)	(0.034)
AVGSYNDSIZE	0.016	-0.045	0.023	-0.075
	(0.059)	(0.068)	(0.060)	(0.072)
AVGHNETWORK	0.040***	0.035**	0.039***	0.038**
	(0.011)	(0.014)	(0.011)	(0.015)
AVGDEGREE	-0.352	-0.353	-0.358	-0.322
	(0.734)	(0.971)	(0.735)	(0.972)
AVGAUM	0.036	0.035	0.036	0.034
	(0.023)	(0.025)	(0.023)	(0.025)
Constant	-1.122***	-1.051***	-1.130***	-1.001***
	(0.259)	(0.276)	(0.259)	(0.280)
Observations	1,021	960	1,021	960
Fixed Time Effect	YES	YES	YES	YES
Industry Fixed Effect	YES	YES	YES	YES
Pseudo R-squared	0.085	0.074	0.085	0.075
Wald chi2	97.582	77.599	97.466	80.827
Prob > chi2	0.000	0.000	0.000	0.000
Correctly predicted test	70,52%	73,44%	70,81%	72,81%
Hosmer-Lemeshow GOF	0.1309	0.1020	0.1030	0.1336
Area under ROC curve	0.6985	0.6834	0.6993	0.6840

We see that in both models the average distance shows no significance anymore suggesting that other foreign investors indeed created a similar sort of distance bias as the one caused by US investors.

To further analyze any potential impact of the foreign involvement in the syndicate, we re-run regressions (3-4) using the total sample while including the foreign dummy. The outcome is shown in Table 9 (next page). The specifications of regression models (1-2) show similar results to previous regressions. Yet, one difference to be noted is the magnitude in significance of the US investor dummy which increased from the 10% to the 1%-level. Additionally, we further checked for robustness of these effects by recalculating the distance measure excluding the US distance. The result is shown in specifications (3-4) which do not significantly differ from what we found in (1-2). Distance is not significant anymore while both the US and foreign investor dummy appear to have a significant impact on exit rates. This supports our argumentation that the initial positive effect of distance is rather caused by generally higher success rates attributable to foreign investors, than distance itself.

Finally, since we do not find significant results of a negative relationship between distance (*AVGDIST*) and the probability of a successful exit (*EXIT*), we are consequently not able to confirm **H1**. Rather we find indications that proximity has no effect on venture capital investment performance. When trying to explain these results, we would hypothesize that communication technology has become advanced enough to bridge the gap of geographical distance, and that the internationalization of the venture capital industry has reduced the importance of local networks and partnerships.

Table 9: The effect of geographical distance on exit rates – further analysis

*The sample consists of 1,157 Swedish VC-backed deals receiving their first funding during the period from 1989 - 2014. We analyze the relationship between distance and the likelihood of exits (M&A or IPO) as of 01. October 2019. The table reports the outcomes of Probit regression models of the logarithm of average distance between the venture and the VC firms (AVGDIST) on the likelihood of exits (study variable) and several control variables. Specifications (1) and (2) are the baseline models including all control variables introduced in Section 4.3 as well as a US (USINV) and foreign (FOREIGN) dummy to control for their respective presence. In specifications (3) and (4) we recalculated the distance measure by removing the distance associated with US presence. We did so to account for the potential bias associated with US investors affecting both exit rates and distance. While the variables in specifications (1) and (3) are calculated based on first round characteristics, specifications (2) and (4) show the results using variables calculated on all rounds. Venture industry dummies and time dummies are included in all regressions (1-4) but are not reported. We used the periods 91-96 (pre dot.com), 97-01 (dot.com era), 02-07 (pre crisis), 08-12 (crisis) and 13-14 (post crisis) to control for time related effects corresponding to the reasoning provided in section 4.2. We also control for industry-specific effects by including an industry dummy taking the value of 1 for tech and 0 for non-tech related deals. For a detailed discussion of the variables used, please refer to Section 4.3 above. A complete overview of all variables and correlation matrices are provided in the Tables in Appendix B. All Statistical tests conducted as well as results for the linktest and multicollinearity test can be found in the Tables in Appendix C. Robustness tests are presented in the Tables in Appendix D. The robust standard errors for each variable are reported in parentheses. The significance level is denoted by asterisks at the ***(1%), **(5%), and *(10%) level.*

VARIABLES	(1) Base + US + Foreign 1st	(2) Base + US + Foreign all	(3) Adjusted Distance 1st	(4) Adjusted Distance all
AVGDIST	-0.003	-0.024	0.042	0.007
	(0.024)	(0.022)	(0.033)	(0.025)
USINV	0.212	0.486***	0.197	0.369***
	(0.191)	(0.159)	(0.132)	(0.119)
FOREIGN	0.215	0.425***	-0.010	0.306**
	(0.137)	(0.122)	(0.190)	(0.146)
VENTURESTAGE	-0.388***	-0.395***	-0.390***	-0.393***
	(0.082)	(0.083)	(0.082)	(0.083)
AVGGENEXP	-0.000	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)
AVGSUCCESS	0.000	-0.002	0.001	-0.001
	(0.004)	(0.004)	(0.004)	(0.004)
ROUNDS	0.079***	0.042*	0.078***	0.044**
	(0.021)	(0.022)	(0.021)	(0.022)
AVGSTAGINGTIME	0.086***	0.069**	0.083***	0.069**
	(0.030)	(0.029)	(0.030)	(0.029)
AVGSYNDSIZE	-0.044	-0.122**	-0.038	-0.112**
	(0.050)	(0.056)	(0.050)	(0.055)
AVGHNETWORK	0.048***	0.061***	0.047***	0.061***
	(0.010)	(0.013)	(0.010)	(0.013)
AVGDEGREE	-0.579	-0.455	-0.606	-0.465
	(0.745)	(0.940)	(0.742)	(0.936)
AVGAUM	0.024	0.019	0.021	0.014
	(0.022)	(0.024)	(0.022)	(0.024)
Constant	-1.014***	-0.895***	-1.028***	-0.922***
	(0.240)	(0.247)	(0.241)	(0.248)
Observations	1,157	1,157	1,157	1,157
Fixed Time Effect	YES	YES	YES	YES
Industry Fixed Effect	YES	YES	YES	YES
Pseudo R-squared	0.099	0.117	0.101	0.116
Wald chi2	137.072	158.938	135.578	157.012
Prob > chi2	0.000	0.000	0.000	0.000
Correctly predicted test	70,79%	73,21%	70,96%	73,12%
Hosmer-Lemeshow GOF	0.1402	0.1370	0.1108	0.1140
Area under ROC curve	0.7044	0.7138	0.7075	0.7138

5.2. Hypothesis 2: The effect of domestic investors on exit rates

H2 is tested by the running the regressions depicted within Table 10 (next page). The hypothesis itself aims to determine whether or not having a domestic (Swedish) VC firm in the investment syndicate increases the probability of successful exits.

By examining specifications (1-2) we find that the results for distance's effect on success rates remains similar to the results found in specifications (1-2) in Table 7 – although slightly more significant. The control variables are mostly in line with the results found in Table 7. The only difference is that syndication size (*AVGSYNDSIZE*) and previous success (*AVGSUCCESS*) is significant in specification (1).

When studying the independent variable of interest to **H2,** (*DOMINV*), we find significance of the highest level ($p<0.01$) in specification (1), while we find no significance in (2). Judging by the significance in combination with the positive sign of the coefficients, we can determine that including a domestic investor in the syndicate in the first round increases the probability of a successful exit. These results are in line with **H2** – as well as previous research done on the subject of local-foreign co-investment within VC syndicates (Chemmanur et al., 2010; Fritsch and Schilder, 2008; Sorenson and Stuart, 2005).

When it comes to explaining the results, we would argue that syndicates that include domestic investors, have several advantages over syndicates that solely consist of foreign players. As described in the literature review (section 2), the increased probability of success could be attributed to both the pre- and post-contractual investment phase. In the pre-investment phase, a domestic VC mitigates potential information asymmetry and is able to gain better information connected to the investment opportunities (Coval and Moskowitz, 1999). Furthermore, additional advantages of domestic VCs can be derived from the post-investment phase. The literature review mentions various research which claims that monitoring and general support is deemed to increase as distance is reduced (Fritsch and Schilder, 2008; Gilbert, 2008; Korsgaard and Sapienza, 1996; Petersen and Rajan, 2002; Sapienza, 1992; Zaheer, 1995). This would then imply that including a domestic VC in the syndicate would result in an increase in the average quality and quantity of the value-added services provided by the VCs – ultimately resulting in a higher probability of successful exits. However, our main argumentation for the positive effect of including a domestic VC is based on the intuition that a domestic player understands and is familiar with the start-up's market. This familiarity is not solely a result of close geographical distance, but also of the fact that they share the same nationality.

Table 10: The effect of domestic investors on exit rates

*The sample consists of 1,157 Swedish VC-backed deals receiving their first funding during the period from 1989 - 2014. We analyze the relationship between distance and the likelihood of exits (M&A or IPO) as of 01. October 2019. The table reports the outcomes of Probit regression models of the logarithm of average distance between the venture and the VC firms (AVGDIST) on the likelihood of exits (study variable) and several control variables. Specifications (1) and (2) are the baseline models including all control variables introduced in Section 4.3 as well as a domestic dummy (DOMINV) to account for a local investor being present. In specifications (3) and (4) we add a US dummy (USINV) to control for the presence of an American investor. While the variables in specifications (1) and (3) are calculated based on first round characteristics, specifications (2) and (4) show the results using variables calculated on all rounds. Venture industry dummies and time dummies are included in all regressions (1-4) but are not reported. We used the periods 91-96 (pre dot.com), 97-01 (dot.com era), 02-07 (pre crisis), 08-12 (crisis) and 13-14 (post crisis) to control for time related effects corresponding to the reasoning provided in section 4.2. We also control for industry-specific effects by including an industry dummy taking the value of 1 for tech and 0 for non-tech related deals. For a detailed discussion of the variables used, please refer to Section 4.3 above. A complete overview of all variables and correlation matrices are provided in the Tables in Appendix B. All Statistical tests conducted as well as results for the linktest and multicollinearity test can be found in the Tables in Appendix C. Robustness tests are presented in the Tables in Appendix D. The robust standard errors for each variable are reported in parentheses. The significance level is denoted by asterisks at the ***(1%), **(5%), and *(10%) level.*

VARIABLES	**(1) Base + Domestic 1st**	**(2) Base + Domestic all**	**(3) Base + Domestic + US + Foreign 1st**	**(4) Base + Domestic + US + Foreign all**
AVGDIST	0.121***	0.048***	0.114***	-0.013
	(0.019)	(0.018)	(0.030)	(0.025)
DOMINV	1.047***	0.128	1.116***	0.163
	(0.124)	(0.159)	(0.130)	(0.162)
USINV			-0.117	0.487***
			(0.223)	(0.159)
FOREIGN			0.257*	0.436***
			(0.150)	(0.124)
VENTURESTAGE	-0.399***	-0.392***	-0.411***	-0.403***
	(0.084)	(0.082)	(0.084)	(0.083)
AVGGENEXP	-0.000	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)
AVGSUCCESS	0.008**	0.000	0.008**	-0.002
	(0.004)	(0.004)	(0.004)	(0.004)
ROUNDS	0.083***	0.056**	0.083***	0.037
	(0.023)	(0.022)	(0.022)	(0.023)
AVGSTAGINGTIME	0.091***	0.074**	0.085***	0.065**
	(0.030)	(0.029)	(0.030)	(0.029)
AVGSYNDSIZE	-0.141***	-0.058	-0.153***	-0.142**
	(0.054)	(0.053)	(0.058)	(0.061)
AVGHNETWORK	0.052***	0.060***	0.055***	0.060***
	(0.010)	(0.012)	(0.010)	(0.013)
AVGDEGREE	-0.767	-0.590	-0.903	-0.508
	(0.717)	(0.950)	(0.719)	(0.945)
AVGAUM	0.038*	0.019	0.039*	0.019
	(0.023)	(0.024)	(0.023)	(0.024)
Constant	-1.978***	-1.136***	-2.077***	-1.025***
	(0.269)	(0.267)	(0.279)	(0.270)
Observations	1,157	1,157	1,157	1,157
Fixed Time Effect	YES	YES	YES	YES
Industry Fixed Effect	YES	YES	YES	YES
Pseudo R-squared	0.144	0.108	0.149	0.117
Wald chi2	194.025	142.330	201.451	161.292
Prob > chi2	0.000	0.000	0.000	0.000
Correctly predicted test	72.86%	72,52%	72,60%	73.12%
Hosmer-Lemeshow GOF	0.1322	0.1703	0.1465	0.1149
Area under ROC curve	0.7400	0.7096	0.7446	0.7146

We would argue that by bringing cultural context to the table, as well as knowing the market's key actors, the domestic VC brings great value to the syndicate – value which is separate from the effect of geographical proximity.

Furthermore, it is interesting to note that the significance of the dummy variable is lost in specification (2), where we look at all rounds instead of just the first. This would indicate that, while the presence of a Swedish investor early in the venture is in fact increasing the probability of successful exits – no such relationship can be derived when we change the scope of the included variables to include all rounds. This is in line with the arguments brought forward in the deal origination section in our literature review (section 2.1.1.). Local knowledge and networks are crucial to overcome the information asymmetry ventures usually inherit when it comes to the deal sourcing. Since the deal sourcing happens even before the first round, we see significant impact of the domestic presence in the first rather than in later rounds.

As an additional remark, it is worth mentioning that in specification (1), when we add our domestic investor dummy (*DOMINV*), we gain significance ($p<0.01$) on distance (*AVGDIST*). These results differ from the corresponding specification in Table 7, where distance's significance level is limited to the 10%-level

We hypothesize that the drivers of the positive relationship between distance and the dependent variable could, as previously discussed in **H1**, potentially be US and foreign investors and their tendency to exhibit particularly high success rates. Before including the dummy related to domestic investors (*DOMINV*), the regression model was subject to conflicting relationships and correlations of distance and exit rates. Potentially, domestic investors (showing a distance of 0) was providing a negative relationship between *AVGDIST* and *EXIT* – while the international investors (showing large distances on average) were providing a positive relation between the two variables (as discussed in 5.1.). Presumably, these two effects worked against each other when not isolating the influence of the domestic investors. We would argue that the significance on *AVGDIST*, gained in specification (1), could potentially be explained by the model no longer being conflicted by these opposing correlations – since the negative influence (provided by the benefit of having geographically proximate, domestic members of the syndicate) is now isolated.

To test for this, we also included the US and foreign dummy introduced in **H1**. The results are displayed in specifications (3) and (4) in Table 10. While distance is still significant in the first-round setting, we see that the significance has vanished in the all-round model, partially confirming the argumentation posed in the previous paragraph.

5.3. Hypothesis 3: The effect of distance between VC firms on exit rates

Our last hypothesis, **H3**, is tested by the set of regressions found within Table 11 (next page). The hypothesis tries to answer whether or not an increase in average distance between the syndicate members increases the probability of successful exits.

By examining regression Table 11 we can start of by determining that nearly all control variables behave identical to our previous set of regressions. Proceeding with our variable of interest, namely the distance between VC firms (*AVGDISTVC*), we can see a significant difference between specifications (1) and (2). While in the first-round setting, we see that average distance between VC firms is not affecting the probability of successful exits, we find a highly significant and positive relationship for all rounds. The results from specification (1) points to the conclusion that collaboration between members of the investment syndicate either is not that important, or that it is simply not affected by geographical distance. On the contrary, specification (2) suggests that distance between VC firms increase the success rate of the venture which is in fact in direct opposition to our initial hypothesis.

However, if we undertake the task of trying to explain the results, we would argue that distance between VCs itself is actually not that important (hence the lack of significance in specification (1)) – and that there is other characteristics of the syndicates that drive the significant positive correlation in specification (2). Similar to the previous introduced theory that international investors could potentially be selecting the ventures with the highest probability of successful exits (Chen et al., 2010), the same could be argued for diverse syndicates. A potential explanation could simply be that qualitative start-ups begin to standout as the investments process move from first rounds into later investment stages. As startups get known within the investment community due to their success, a diverse set of international VCs from all over the world would consequently become interested in investing. This would then ultimately increase the average distance between the VCs in these ventures – creating a false impression of causality between distance between VCs and probability of successful exits. Another explanation could be that a diverse set of investors contribute with complementary skill sets and a broader more international network (Blankenburg Holm and Chetty, 2000). Consequently, this increases the VC-syndicates ability to support the venture with a more qualitative and wider range of value-added services.

To account for the potential interrelation of distance between VC firms, exit rates and foreign as well as US investors, we introduce specifications (3-4) – which includes the US and foreign dummy.

Table 11: The effect of average distance between VCs on exit rates

*The sample consists of 1,157 Swedish VC-backed deals receiving their first funding during the period from 1989 - 2014. We analyze the relationship between distance and the likelihood of exits (M&A or IPO) as of 01. October 2019. The table reports the outcomes of Probit regression models of the logarithm of average distance between VC firms (AVGDISTVC) on the likelihood of exits (study variable) and several control variables. Specifications (1) and (2) are the baseline models including all control variables introduced in Section 4.3. In specifications (3) and (4) we add a US (USINV) and foreign (FOREIGN) dummy to control for the presence of a foreign investor. While the variables in specifications (1) and (3) are calculated based on first round characteristics, specifications (2) and (4) show the results using variables calculated on all rounds. Venture industry dummies and time dummies are included in all regressions (1-4) but are not reported. We used the periods 91-96 (pre dot.com), 97-01 (dot.com era), 02-07 (pre crisis), 08-12 (crisis) and 13-14 (post crisis) to control for time related effects corresponding to the reasoning provided in section 4.2. We also control for industry-specific effects by including an industry dummy taking the value of 1 for tech and 0 for non-tech related deals. For a detailed discussion of the variables used, please refer to Section 4.3 above. A complete overview of all variables and correlation matrices are provided in the Tables in Appendix B. All Statistical tests conducted as well as results for the linktest and multicollinearity test can be found in the Tables in Appendix C. Robustness tests are presented in the Tables in Appendix D. The robust standard errors for each variable are reported in parentheses. The significance level is denoted by asterisks at the ***(1%), **(5%), and *(10%) level.*

VARIABLES	(1) Base 1st	(2) Base all	(3) Base + US + Foreign 1st	(4) Base + US + Foreign all
AVGDISTVC	0.005	0.042***	-0.026	0.004
	(0.019)	(0.016)	(0.022)	(0.019)
USINV			0.278*	0.356***
			(0.147)	(0.132)
FOREIGN			0.246**	0.328***
			(0.103)	(0.104)
VENTURESTAGE	-0.391***	-0.406***	-0.381***	-0.394***
	(0.082)	(0.082)	(0.082)	(0.083)
AVGGENEXP	-0.000	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)
AVGSUCCESS	-0.000	-0.000	-0.001	-0.001
	(0.004)	(0.004)	(0.004)	(0.004)
ROUNDS	0.077***	0.053**	0.079***	0.043*
	(0.021)	(0.023)	(0.021)	(0.023)
AVGSTAGINGTIME	0.089***	0.066**	0.086***	0.068**
	(0.030)	(0.029)	(0.030)	(0.030)
AVGSYNDSIZE	-0.009	-0.070	-0.023	-0.116**
	(0.052)	(0.053)	(0.052)	(0.057)
AVGHNETWORK	0.048***	0.059***	0.049***	0.061***
	(0.010)	(0.012)	(0.010)	(0.013)
AVGDEGREE	-0.664	-0.668	-0.475	-0.469
	(0.754)	(0.951)	(0.752)	(0.938)
AVGAUM	0.033	0.025	0.024	0.015
	(0.021)	(0.023)	(0.022)	(0.024)
Constant	-1.054***	-0.994***	-1.033***	-0.914***
	(0.241)	(0.243)	(0.242)	(0.248)
Observations	1,157	1,157	1,157	1,157
Fixed Time Effect	YES	YES	YES	YES
Industry Fixed Effect	YES	YES	YES	YES
Pseudo R-squared	0.095	0.107	0.100	0.116
Wald chi2	128.948	141.349	136.792	157.043
Prob > chi2	0.000	0.000	0.000	0.000
Correctly predicted test	70,53%	71,91%	71,31%	73,29%
Hosmer-Lemeshow GOF	0.1130	0.1092	0.1300	0.1165
Area under ROC curve	0.7024	0.7106	0.7051	0.7137

We find consistent results when comparing these findings to the ones produced by the regressions conducted in order to test **H1**. After including the dummies, *AVGDISTVC* is not significant anymore, and we can therefore not confirm **H3**.

As previously explained in the discussion of **H1** (section 5.1.), this could potentially be due to advancements within communication technologies and a generally more internationalized business climate –which in turn could mitigate the effect that distance has on performance. In addition, the US and foreign dummies both show to have a positive impact on exit rates, showing similar result as discussed in **H1.**

As a concluding remark to section 5, we note that all regressions shown are being tested on robustness in accordance with the procedure explained in section 4.4.2. For all specifications, we find similar results to the ones presented in this section thus strengthening the validity of our findings. A detailed overview of all robustness regressions are shown in Appendix D.

5.4. Limitations

To conclude the discussion of our results we introduce the following section, where we aim to highlight any perceived limitations related to our thesis:

To begin, one limitation that is always present when working with data concerning the venture capital industry is the lack of completeness and reliability of the dataset used in the study. VentureXpert is acknowledged to be rather comprehensive in regard to its coverage of US VC investments – but less so in Europe and other regions. US investors might therefore be over-represented in the sample and there is moreover a general risk that not all ventures in Sweden which received financing from a VC firm was capture by the database. One way to address the issue with potential over-representation of US VCs is (as done in section 5.1.) to introduce a subsample – excluding the observations with US investors. The general issue regarding VentureXpert and the incompleteness of the dataset is however trickier to solve without access to more sophisticated databases.

Furthermore, as mentioned during the introduction to our dependent variable (EXIT), the use of successful exits as a proxy for the VCs' investment performance is flawed – but still, we believe this to be justified by the limitations in available data. As suggestion for improvement, it would be preferable to measure the returns on investment for the VCs, but unfortunately this data is not available – which is often the case when researching the venture capital industry. An exit does not necessarily need to imply that the VCs involved in the venture makes a profit. And even though previous studies have used the same measurement of performance as this paper (see section 4.2.1.), we still want to highlight the fact that this measurement is far from perfect.

In a situation where better and more transparent access to data would exist, a suggestion for future researcher would be to gather financial and accounting data, both from the VC firms themselves but also from the portfolio companies they invest in, and then derive their measurement of success from that.

Finally, the lack of data regarding the performance and characteristics of the ventures themselves is something that also needs to be addressed. In regression analysis there is always the risk of excluding one or more important variables when constructing the regression model. In this case, the lack of a variable capturing any sort of early indicator of the current as well as future quality of the venture leads to a potential bias within our statistical model – in the form of endogeneity. To refer back to our "cherry-picking"-argument presented in section 5.1., it could be argued that international investors only tend to invest when they perceive the quality of the venture to be high. By this line of argumentation, "performance indicators" (a potential variable we omit) could possibly function as a confounding variable in our regression models. In this case, the confounding variable could possibly be correlated and affect both *EXIT* and *AVGDIST*. If that is the case, this could give the false impression that AVGDIST positively drives *EXIT*, when in reality it the "performance indicators" that drives both of them. Unfortunately, as a result of difficulties in obtaining reliable data to construct such variables, we chose to exclude these factors from the regression model. We do this while still being aware of the possible biases it may cause. Suggestions for further researchers in solving this issue could be to look at the previous experience of management and the founders of the ventures, as well as make efforts in trying to access privately held data from the early stages of the companies.

6. Conclusion

We analyse the effect of distance on the ultimate investment success of Swedish VC investments to contribute to the sparse research conducted on the VC industry in the European region. Particularly, the field of distance has become more and more frequently discussed as internationalization facilitates global investment activities in the VC market. Cross-border investments have become more and more common – contradicting scholarly views of a detrimental impact of distance on investment performance. Classical theories such as the agency theory pose that distance limits informational exchange thus accelerating problems associated with asymmetric information. Particularly, the informational opaqueness of ventures creates immense problems related to adverse selection, which should intensify distance-related issues even further. In addition, existing literature theorize that distance-related risk hampers the pre- and post-contractual activities VC firms perform, thus impacting performance adversely. Using a sample of 1,157 Swedish VC-backed companies we analyse the effect of distance on VC performance to add further insights to this debatable topic.

Controlling for known determinants of VC investment performance, we find that distance has no negative impact on the success of Swedish VC-backed ventures, measured as the likelihood of an IPO or trade sale (M&A) transaction. In contrast, we show that geographical distance between the venture and investor nation actually has a positive effect. Yet, we attribute this finding to the fact that international investors, who are shown to have a significant impact on success rates in the Swedish market both increase the distance measure applied as well as the likelihood of successful exits. After controlling for the presence of such investors we find that distance itself has no implications for the ultimate success of the investment anymore, thus raising questions regarding the accuracy of classical theories. We hypothesize that these actors are more skilled, have better networks and are more capable of identifying promising investments, thus overcoming problems associated with distance. To further explain the lack of significance we suggest that advancements in communications technology in combination with an increasingly internationalized business climate decreases the importance of being local. Furthermore, we analyse the effect of domestic investors on investment performance in the Swedish VC market. Existing literature indicate that domestic player can reduce problems associated with the agency theory when being present in the syndication due to their local network and their proximity to the venture. Indeed, our results suggest that domestic investors increase the likelihood of exits of Swedish VC-backed ventures.

In particular, we find that this effect is merely observable when the domestic investor is present in the first round indicating that the local network and knowledge is very important to overcome agency problems in the earlier stages of the investment process. Additionally, we introduce a new measure to the VC literature, which aims to capture the distance between the VC firms themselves. By using this measure, we want to shed some light on the question how distance might affect collaboration among the syndication members and therefore the final success of the investment. We find that distance between VC firms has no apparent impact on the performance.

Our findings have clear implications for investors and entrepreneurs in the Swedish start-up market. First and foremost, our results imply that VC firms investing in Sweden can increase their ultimate investment success by forming syndications comprised of international investors as well as local players. While international investors potentially bring a broad skillset and experience, the local investors add value by having local networks and regional knowledge. Furthermore, evidence suggests that entrepreneurs can increase their own chance of success by attracting a diverse set of investors. Distance between the investors themselves should not be seen as a problem by neither the investors nor the investee – as the benefits of an international set of investors seems to outweigh any potential issues it may bring.

Finally, we acknowledge that our results contribute to the previous work and research done by Chen et al. (2010) and Chemmaneur et al. (2010), which also examines the effect of distance on performance within the venture capital industry. Their findings, together with ours, indicates that the research question in general merits further scrutiny. We propose that additional research is needed, using larger samples, more fine-grained data and a more complete set of measurements of success – all in order to more effectively explain the mechanisms of the VC investment phenomena.

As mentioned in the limitations of our thesis (section 5.4.), we suggest that future research could use venture specific performance data to cross-check the validity of the commonly used binary success measure. Besides, by incorporating venture-specific performance data, future research can mitigate potential issues related to endogeneity. The initial quality of the portfolio companies is indisputably affecting the final performance of the investment thus causing a sort of positive performance bias for investor groups that are better at selecting high-quality ventures than others. Hence, using a more complete set of venture performance data could strengthen the explanatory power of future analyses, thus enabling research to shed further light on the debatable effect of distance on VC investment performance.

In addition, future research should also try to include factors that could be deemed to be correlated with geographical distance – such as culture, institutional environment and potential language barriers.

Finally, we believe the existing research conducted on the effect of collaboration between syndicate members on performance is lacking, and that further weight should be put into this subject. This thesis has tried to spearhead this area of research by introducing a measurement that aims to capture collaboration by measuring the distance between the investors within the syndicate. Future researchers could build upon our argumentation and try to investigate other measurements of collaboration, to eventually find more concluding evidence regarding the effect of VC collaboration on the performance of venture capital investments.

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Appendices

Appendix A: Sample description

Figure 2: Regional distribution of ventures

The figure below shows the regional distribution of the ventures in our sample. The sample consists of 1,157 Swedish VC-backed ventures receiving the first funding round between Oct. 1989 and Oct. 2014. The data is based on VentureXpert, Thomson Reuters M&A and SDC Global Issue Databases, accessed 01/10/2019.

Table 12: Regional venture distribution – Top 10 cities

The figure shows the regional distribution of the ventures in our sample consisting of 1,157 Swedish VC-backed ventures receiving the first funding round between Oct. 1989 and Oct. 2014. Only top 10 cities are displayed. We also included the share of Exits within each of the cities compared to all Exits (N=386). The data is based on VentureXpert, Thomson Reuters M&A and SDC Global Issue Databases, accessed 01/10/2019.

City	Share of Investments	Share of Exits
Stockholm	37,54%	40,43%
Gothenburg	11,84%	7,66%
Lund	4,98%	5,26%
Malmö	4,36%	5,02%
Uppsala	3,35%	3,59%
Solna	2,88%	2,87%
Linköping	2,57%	2,87%
Umeå	2,02%	1,20%
Luleå	1,87%	0,48%
Karlstad	1,17%	1,44%

Figure 3: Regional distribution of VC firms

The figure below shows the regional distribution of the VC firms in our sample. The sample consists of 517 VC firms that invested in Swedish ventures who received their first financing round between Oct. 1989 and Oct. 2014.

Table 13: Regional VC firm distribution – Top 10 countries invested

The figure shows the regional distribution of the VC firms invested in the Swedish ventures of our sample. The sample consists of 517 VC firms that invested in Swedish ventures who received their first financing round between Oct. 1989 and Oct. 2014. Only top 10 nations are displayed. The data is based on VentureXpert, accessed 01/10/2019.

City	Share of all VC firms
Sweden	33,66%
United States*	25,10%
United Kingdom**	10,12%
Germany	4,67%
Norway	4,09%
France	3,31%
Finland	3,11%
Denmark	2,72%
Netherlands	2,14%
Japan	1,56%

* 4 cities account for 48% of all firms; Boston (8%), Menlo Park (9%), San Francisco (12%) and New York (19%)
**London accounts for 94% of all firms

Table 14: Top 10 firms invested in Sweden

The figure shows the Top-10 VC firms based on their investment experience who are invested in the Swedish ventures of our sample. The sample consists of 517 VC firms that invested in Swedish ventures who received their first financing round between Oct. 1989 and Oct. 2014. Only top 10 firms are displayed. The data is based on VentureXpert, accessed 01/10/2019. The measures are averages taking into account that the investment experience has grown over the course of our time period captured. The displayed values are the average characteristics based on all funding rounds in which the firms participated in Sweden.

Firm Name	Nation	City	Average Age	Average Sweden Inv.	Average Inv.
New Enterprise Associates Inc	United States	Menlo Park	33	1	1.547
Sequoia Capital Operations LLC	United States	Menlo Park	39	4	1.209
3i Group PLC	United Kingdom	London	58	37	1.189
Kleiner Perkins	United States	Menlo Park	41	2	1.105
Apax Partners LLP	United Kingdom	London	33	2	964
Bessemer Venture Partners	United States	San Francisco	96	2	930
Accel Partners & Co Inc	United States	Palo Alto	28	6	827
Goldman Sachs & Co LLC	United States	New York	12	4	677
Greylock Partners LLC	United States	Menlo Park	5	1	656
Summit Partners LP	United States	Boston	35	1	627

Figure 4: Distribution of exits and funded ventures over the sample period

The figure shows the distribution of Exits clustered by IPO and Trade Sale (M&A) and funded ventures over the sample period. Our sample consists of 1,157 Swedish VC-backed ventures receiving the first funding round between Oct. 1989 and Oct. 2014. The first round funding data stops at 2014 due to the exclusion of deals being funded after the 01. Oct. 2014 thus offering the possibility for a 5-year time to exit period. For detailed discussion of this exclusion see section 4.1. The data is based on VentureXpert, Thomson Reuters M&A and Global Issue Databases, accessed 01/10/2019.

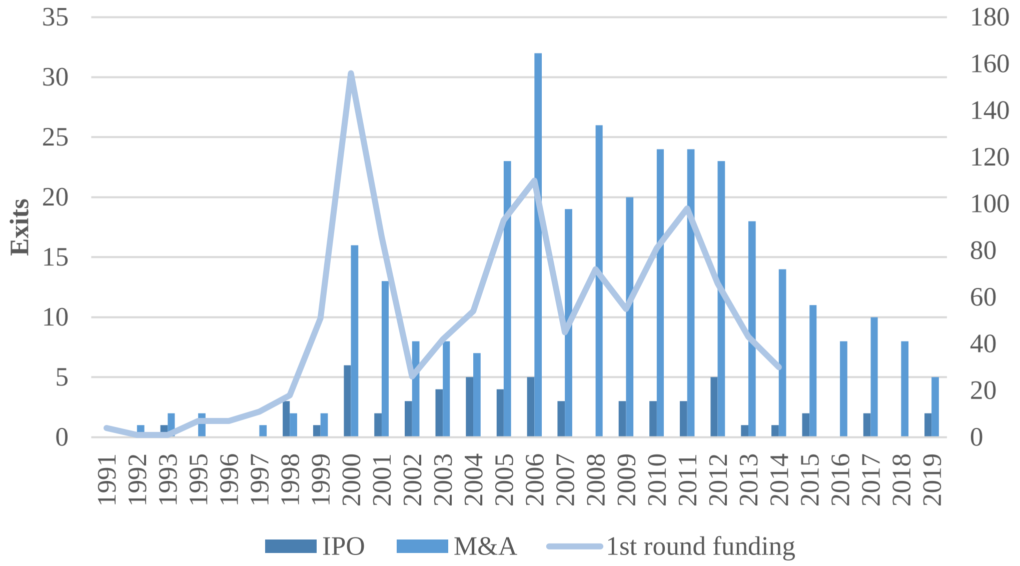
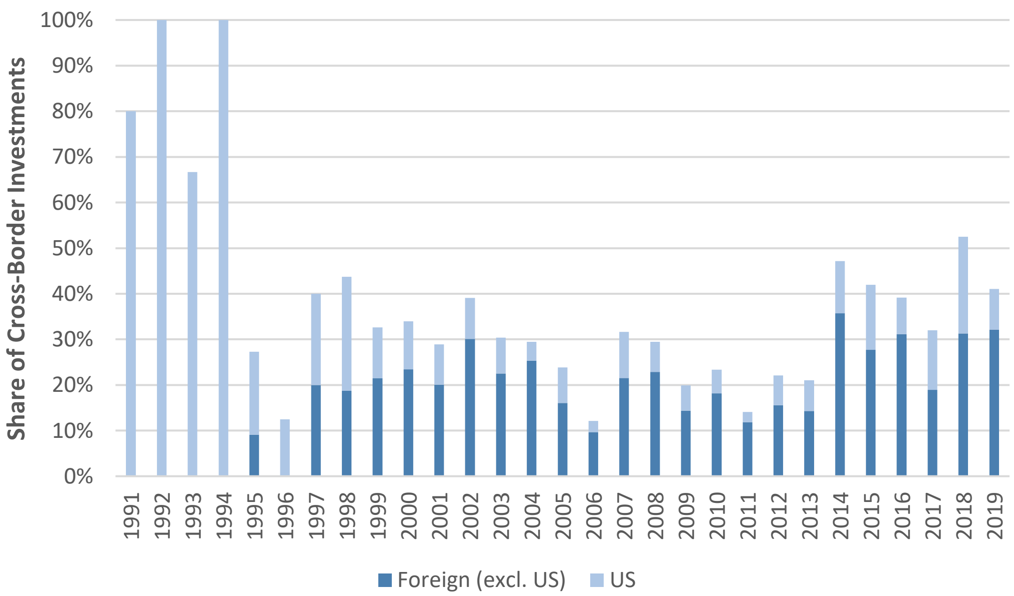


Figure 5: Cross-Border investments over the sample period

The figure shows the development of cross-border activity in Sweden over time with regards to our sample. Our sample consists of 1,157 Swedish VC-backed ventures receiving the first funding round between Oct. 1989 and Oct. 2014. We display the total share of both US and foreign investors (excl. US ones) participating in any Swedish venture funding round at the respective year of investment. For the purpose of transparency, we excluded the Swedish investor share constituting the residual after accounting for US and foreign investors. The data is based on VentureXpert, accessed 01/10/2019.



Appendix B: Correlation matrices and variable overview

Table 15: Variable overview

*The table below depicts all variables introduced in section 4.2. A short description is also included, as well as the calculation logic, source and expected effect on performance. All Variables marked with an asterisk * are both calculated on first round and all rounds.*

Variable Name	Description & Effect	Calculation	Source
Dependent Variables			
EXIT	Dummy to account for if the investors made a *Successful Exit* from the venture. An exit is defined as successful if the portfolio company was either acquired or subject to an IPO.	1 = The venture was either acquired or subject to an IPO 0 = The venture was not acquired or subject to an IPO	Thomson Financial's M&A Database & SDC Global New Issues
Independent Variables			
AVGDIST*	Measures the average *Distance* between the members of the syndicate (VCs) and the venture. We use a dataset provided by www.ceepi.fr to define the distance. The dataset provides pair-wise distances based on country. We then use VentureXpert's classification to determine which country the VCs and ventures originate from.	$Average\ Distance = \frac{(Tot.sum\ of\ distance\ between\ the\ syndicate\ members\ and\ the\ venture)}{(Tot.nr.of\ syndication\ members)}$	VentureXpert & (CEPII, 2011)
DOMINV*	Dummy to account for if there is one or more *Domestic (Swedish) VCs* present in the syndicate.	1 = Swedish investor present 0 = No Swedish investor present	VentureXpert
AVGDISTVC*	Measures the average *Distance* between the members of the syndicate (VCs). We use a dataset provided by www.ceepi.fr to define the distance. The dataset provides pair-wise distances based on country. We then use VentureXpert's classification to determine which country the VCs originate from.	$Average\ Distance\ between\ VCs = \frac{(Tot.sum\ of\ distance\ between\ the\ syndicate\ members) *}{(Tot.nr.of\ syndication\ members)}$ *Each pair of nationalities is only accounted for once	VentureXpert & (CEPII, 2011)
Control Variables			
USINV* (Introduced in 5.1)	Dummy to account for if there is one or more *US VCs* present in the syndicate.	1 = US investor present 0 = No US investor present	VentureXpert
FOREIGN* (Introduced in 5.1)	Dummy to account for if there is one or more *Foreign VCs* present in the syndicate.	1 = Foreign investor present 0 = No Foreign investor present	VentureXpert
VENTURE-STAGE	Dummy to account for the *Stage of the Venture.* <u>Effect: Negative effect</u>	1 = Early Stage 0 = non-Early Stage	VentureXpert
AVGGENEXP*	Measures the average *Experience* of the syndication members. <u>Effect: Positive effect</u>	$Average\ Experience = \frac{(Tot.nr.of\ combined\ previous\ investments\ made\ by\ the\ syndication\ members)}{(Tot.nr.of\ syndication\ members)}$	VentureXpert
AVGSUCCESS*	Measures the average level of previous *Success* of the syndication members. Success is defined as nr. of successful Swedish venture exits made by the VC. <u>Effect: Positive effect</u>	$Average\ Success = \frac{(Tot.nr.of\ combined\ previous\ succesful\ exits\ made\ by\ the\ syndication\ members) *}{(Tot.nr.of\ syndication\ members)}$ *Only Swedish ventures exits	

ROUNDS	Measures the total *Number of Rounds* (funding rounds) received by the venture. Effect: Positive effect	$Total\ Number\ of\ Rounds\ = Tot.nr.of\ rounds$	VentureXpert
AVG-STAGINGTIME	Measures the average *Time between Rounds.* Time is calculated on a year basis. Effect: Positive effect	$Average\ Time\ between\ Rounds = \frac{(Tot.nr.of\ years\ from\ first\ round\ to\ last)}{((Tot.nr.of\ rounds) - 1)}$	VentureXpert
AVG-SYNDSIZE	Measures the average *Size of the Syndication*. Size is defined as number of members of the syndicate. Effect: Positive effect	$Average\ Syndication\ Size = \frac{(Total\ nr.of\ firms\ invested\ in\ the\ venture)}{(Tot.nr.of\ rounds)}$	VentureXpert
AVGDEGREE*	Measures average *Degree Centrality*. Degree reflects all the ties that syndication members has in Sweden at the respective year of the round dates. We define a tie as two VCs co-investing together in a financing round (syndication members). We divide Degree by all total possible ties within the year to ensure comparability over time. We define the total possible ties are the number of all firms being active within the respective year excluding the firm being observed. Effect: Positive effect	$VC\ i's\ Degree = \frac{1}{k}\ x \sum_j P_{ij}$ $where,$ $p_{ij} = 1\ (if\ at\ least\ one\ syndication\ relationship\ exists)$ $k = \ all\ firms\ active\ in\ Sweden\ in\ the\ respective\ year$ $Average\ Degree\ Centrality = \frac{(Total\ sum\ of\ Degree\ Centrality\ of\ all\ snydication\ members)}{(Tot.nr.of\ syndication\ members)}$	VentureXpert
AVG-HNETWORK*	Measures average *Historical Network*. The variable captures the historical network which has been developed by the syndication members in Sweden. We use the same approach as described for Degree Centraility but instead of only focusing on ties within a year, we count all years since the foundation of the firm. Effect: Positive effect	$Historical\ Network = \sum_j P_{ij}$ $where,$ $p_{ij} = 1\ (if\ at\ least\ one\ synd.relationship\ has\ occurred\ prior\ to\ the\ investment\ date) *$ *Only unique co-investors are counted (=each firm co-invested with is counted once) $Average\ Historical\ Network = \frac{(Total\ sum\ of\ Historical\ Network\ of\ all\ snydication\ members)}{(Tot.nr.of\ syndication\ members)}$	VentureXpert
AVGAUM*	Measures the average amount of the natural logarithm of the *Assets under Management* of the syndication members. AUM is denoted in millions of USD. Effect: Positive effect	$Average\ Assets\ under\ Management = LN(1 + \frac{(Tot.Assets\ under\ Management\ of\ syndication\ members)}{(Tot.nr.of\ syndication\ members)})$	VentureXpert
Fixed Time Effect			
Period 1	Dummy to capture in which *Time Period* the first investment in the venture was made. Date of first investment is defined as the date of the first round.	1 = First round conducted between 1991-1996 0 = First round conducted in any other year	VentureXpert
Period 2	Dummy to capture in which *Time Period* the first investment in the venture was made. Date of first investment is defined as the date of the first round.	1 = First round conducted between 1997-2001 0 = First round conducted in any other year	VentureXpert
Period 3	Dummy to capture in which *Time Period* the first investment in the venture was made. Date of first investment is defined as the date of the first round.	1 = First round conducted between 2002-2007 0 = First round conducted in any other year	VentureXpert

Period 4	Dummy to capture in which *Time Period* the first investment in the venture was made. Date of first investment is defined as the date of the first round.	1 = First round conducted between 2008-2012 0 = First round conducted in any other year	VentureXpert
Period 5	Dummy to capture in which *Time Period* the first investment in the venture was made. Date of first investment is defined as the date of the first round.	1 = First round conducted between 2013-2014 0 = First round conducted in any other year	VentureXpert
Fixed Industry Effect			
Industry Dummy	Dummy to account for the *Industry of the Venture* (as categorized by VentureXpert).	1 = Tech 0 = Non-Tech	VentureXpert

Table 16: Pairwise correlation matrix first round

The table below shows the pairwise correlations of all variables used in our Probit regression models. The significance level of 5% is denoted by the asterisk.*

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)
(1) EXIT	1.00						
(2) AVGDIST	0.07*	1.00					
(3) DOMINV	0.09*	-0.56*	1.00				
(4) USINV	0.09*	0.59*	-0.20*	1.00			
(5) FOREIGN	0.06*	0.62*	-0.45*	0.04*	1.00		
(6) AVGGENEXP	0.08*	0.27*	-0.27*	0.10*	0.24*	1.00	
(7) AVGSUCCESS	0.14*	-0.19*	-0.18*	0.04*	-0.02	0.16*	1.00
(8) VENTURESTAGE	-0.14*	-0.03*	0.06*	-0.03*	-0.01	-0.08*	-0.03*
(9) ROUNDS	0.16*	0.08*	0.01	0.05*	0.03*	0.00	-0.07*
(10) AVGSTAGINGTIME	0.16*	0.11*	-0.04*	0.05*	0.09*	0.10*	-0.04*
(11) AVGSYNDSIZE	0.02*	0.21*	-0.00	0.25*	0.24*	0.04*	0.15*
(12) AVGHNETWORK	0.24*	-0.13*	-0.12*	0.12*	-0.04*	0.22*	0.77*
(13) AVGDEGREE	0.06*	-0.06*	-0.04*	-0.01	-0.01	0.04*	0.32*
(14) AVGAUM	0.11*	0.30*	-0.31*	0.17*	0.21*	0.33*	0.17*

Variables	(8)	(9)	(10)	(11)	(12)	(13)	(14)
(8) VENTURESTAGE	1.00						
(9) ROUNDS	0.14*	1.00					
(10) AVGSTAGINGTIME	-0.03*	0.24*	1.00				
(11) AVGSYNDSIZE	0.09*	0.12*	0.05*	1.00			
(12) AVGHNETWORK	-0.07*	0.06*	0.05*	0.08*	1.00		
(13) AVGDEGREE	-0.01	0.00	0.06*	0.09*	0.32*	1.00	
(14) AVGAUM	-0.09*	0.04*	0.09*	0.09*	0.17*	0.15*	1.00

Table 17: Pairwise correlation matrix all rounds

The table below shows the pairwise correlations of all variables used in our Probit regression models. The significance level of 5% is denoted by the asterisk.*

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)
(1) EXIT	1.00						
(2) AVGDIST	0.13*	1.00					
(3) DOMINV	-0.02	-0.57*	1.00				
(4) USINV	0.17*	0.61*	-0.57*	1.00			
(5) FOREIGN	0.14*	0.63*	0.61*	0.18*	1.00		
(6) AVGGENEXP	0.11*	0.31*	0.63*	0.15*	0.25*	1.00	
(7) AVGSUCCESS	0.15*	-0.19*	0.31*	0.04*	-0.00	0.14*	1.00
(8) VENTURESTAGE	-0.14*	-0.01	-0.19*	0.02	0.04*	-0.05*	-0.01
(9) ROUNDS	0.16*	0.30*	-0.01	0.24*	0.33*	0.08*	-0.06*
(10) AVGSTAGINGTIME	0.16*	0.21*	0.30*	0.12*	0.23*	0.12*	-0.02*
(11) AVGSYNDSIZE	0.02*	0.28*	0.21*	0.34*	0.36*	0.08*	0.14*
(12) AVGHNETWORK	0.25*	-0.07*	0.28*	0.18*	-0.00	0.22*	0.78*
(13) AVGDEGREE	0.07*	-0.04*	-0.07*	0.03*	0.00	0.08*	0.35*
(14) AVGAUM	0.13*	0.36*	-0.04*	0.23*	0.27*	0.38*	0.15*

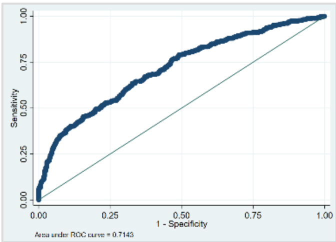
Variables	(8)	(9)	(10)	(11)	(12)	(13)	(14)
(8) VENTURESTAGE	1.00						
(9) ROUNDS	0.14*	1.00					
(10) AVGSTAGINGTIME	-0.03*	0.24*	1.00				
(11) AVGSYNDSIZE	0.09*	0.12*	0.05*	1.00			
(12) AVGHNETWORK	-0.06*	0.07*	0.06*	0.09*	1.00		
(13) AVGDEGREE	0.01	-0.00	0.02*	0.11*	0.34*	1.00	
(14) AVGAUM	-0.08*	0.13*	0.11*	0.14*	0.19*	0.15*	1.00

Appendix C: Econometrics and statistical tests

Table 18: Overview of statistical tests conducted

The table below shows the main statistical tests conducted in the course of this paper including the null hypothesis (if applicable), their respective interpretation and our results.

Conducted Test	Null hypothesis	Interpretation	Results
Test for correctly predicted outcomes after Probit regression (cutoff at 0.5) according to Greene (1997)	-	The test calculates the percentage of observations that are correctly predicted by the model. Econometric programs (such as STATA) can classify each observation according to a certain cutoff point (we used 0.5) as correct or not correct. Then these predictions are compared to the true outcome of the respective event giving a table of false-true combinations. A high % of correctly predicted outcomes suggests that the model discriminates well between cases and non-cases (50% would assume that the model does not better in predicting the exit outcome than a random selection)	All models show a >70% correct prediction rate
Hosmer-Lemeshow goodness-of-fit test (HL) according to Hosmer and Lemeshow (2013, 1980)	H0: Data fits the model used	The null hypothesis states that the model is a good fit. Thus, low p-values indicating a bad fit of the used model. Yet, a caveat of this test is that it does not take overfitting into account and is highly sensitive to the number of subgroups used in the model. However, we use the HL test as one of several goodness-of-fit measures to check for explanatory power of our regressions. The HL test calculates if the observed events match the expected events in population subgroups. It is calculated as follows: $G^2{}_{HL} = \sum_{j=1}^{10} \frac{(O_j - E_j)^2}{E_j\left(1 - \frac{E_j}{n_j}\right)} \sim X^2$ $Where:$ $X^2 = chi\ squared$ $n_j = number\ of\ observations\ in\ the\ j^{th}\ group$ $O_j = number\ of\ observed\ cases\ in\ the\ j^{th}\ group$ $E_j = number\ of\ expected\ cases\ in\ the\ j^{th}\ group$	All specifications reject the null hypothesis thus constituting a good fit according the HL test
Variance Inflation Factor (VIF) according to Hair et al. (2006) and Marquardt (1970)	Test provide VIF factor; a VIF above 10 suggests multicollinearity among variables	-	See Table 19 for detailed results
Linktest test based on an idea of Tukey (1949), which was further developed by Preigbon (1980).	H0: predictor is different from 0	If y_hat is statistically significant our variables used are a good predictor (have the right form). If y_hat2 is statistically significant we are missing variables that would add to the explanatory power of the model.	See Table 20 for detailed results

McFadden Pseudo R^2 according to McFadden, (1973)	-	Since the Probit model does not have a corresponding measure to the OLS R^2 we use the adjusted McFadden Pseudo R^2 measure which is calculated as follows: $R^2_{MCFadden} = 1 - \frac{\log(L_C)}{\log(L_{null})}$ $Where:$ L_c $= maximized\ log$ $-\ likelihood\ value\ from\ current\ fitted\ mo$ L_{null} $= log - likelihood\ from\ null\ model$ $(only\ one\ intercept\ and\ no\ covariates)$ As compared to the usual OLS setting, the McFadden Pseudo R squared always increases as the number of predictors increase. To get a more meaningful measure, is it possible to adjust it considering the number of independent variables in the model (added model complexity). The adjusted measure can be calculated as follows where k denotes the number of independent variables: $Adjusted\ Pseudo\ R^2_{MCFadden}$ $= 1 - \frac{(L_c - k - 1)}{(L_{null} - 1)}$	All R^2 -values range from 7,4% to 14,9% which itself has not much informative value. Yet, when comparing with existing papers conducting similar research, we find that most range between 5% and 25% indicating a reasonable explanatory power of our models (Botazzi et al., 2008; Cumming and Dai, 2010; Dai et al., 2012; Hochberg et al., 2007; Humphery-Jenner and Suchard, 2013).
Area under ROC curve according to Metz (1978) and Zweig and Cambell (1993))	-	This test lets us evaluate the Receiver Operating Characteristic (ROC) curve analysis. This analysis is used to test our model if it can discriminate exits from non-exits. The test plots the true positive rate (sensitivity) as a function of the false positive rate (specificity). The outcome look like this:  A model that perfectly discriminates has a ROC curve passing the upper left corner. A model that goes along the 45°-degree line would have no discriminatory (equal to a coin flip). The higher the area under the ROC curve the better the accuracy of the test. A good discrimination value is considered to be >0.7 (Mandrekar, 2010).*	All specifications show a value of ~0.7 (most are above) indicating that the discrimination between exits and non-exits is fairly good.

**This measure is usually used in diagnostic analysis (medicine); we use this measure in combination with the correctly predicted outcomes to get a sounder understanding of how good our model predicts exits*

Table 19: Mean and maximum Variance Inflation Factors

The Variance Inflation Factor measures by how much the variation of a variable's coefficient increases as a result of collinearity. The VIFs are computed for all variables and all specifications shown in section 5. According to Marquardt (1970) and Hair et al. (2006), a VIF above 10 indicates a strong presence of multicollinearity.

Regressions	Mean VIF	Max VIF
Hypothesis 1		
Table 1		
Specification 1 (1st)	2.15	4.89
Specification 2 (all)	2.18	4.84
Specification 3 (1st)	2.19	4.91
Specification 4 (all)	2.23	4.85
Table 2		
Specification 1 (1st)	5.76	22.30*
Specification 2 (all)	5.60	21.93*
Specification 3 (1st)	5.84	22.31*
Specification 4 (all)	5.52	21.47*
Table 3		
Specification 1 (1st)	2.39	4.92
Specification 2 (all)	2.37	4.85
Specification 3 (1st)	2.42	4.94
Specification 4 (all)	2.35	4.90
Hypothesis 2		
Table 4		
Specification 1 (1st)	2.20	4.89
Specification 2 (all)	2.26	4.84
Specification 3 (1st)	2.46	5.55
Specification 4 (all)	2.43	4.85
Hypothesis 3		
Table 5		
Specification 1 (1st)	2.15	4.88
Specification 2 (all)	2.22	4.85
Specification 3 (1st)	2.13	4.90
Specification 4 (all)	2.24	4.85

**The high collinearity is on our period dummy (2012-2104)*

Table 20: Linktest

*The linktest examines if our regressions which link our dependent variable exit to our independent variables suffers from misspecification. Specifically, it checks whether or not correct forms of the independent variables (=right interaction terms, power, function) have been used or whether or not additional independent variables not initially included in our analysis should have been used. The linktest will calculate the predicted values generated by our regressions (y_hat) and the power of this value (y_hat2). A good model would expect y_hat to be a good predictor (significant) and y_h2at to be a bad predictor (not significant). If the latter is significant this would mean that the powers add useful explanatory power to the model so we should add these powers of our independent variables to the model to improve it. We applied the linktest only on all regressions shown in section 5. ***, **, * denote significance at the 10%, 5% and 1% confidence level respectively.*

Regressions	*y_hat*	*y_hat2*
Hypothesis 1		
Table 1		
Specification 1 (1st)	0.976***	-0.053
Specification 2 (all)	1.052***	0.095
Specification 3 (1st)	0.977***	-0.051
Specification 4 (all)	1.053***	0.100
Table 2		
Specification 1 (1st)	0.900***	-0.149
Specification 2 (all)	0.944***	-0.065
Specification 3 (1st)	0.914***	-0.127
Specification 4 (all)	0.904***	-0.112
Table 3		
Specification 1 (1st)	0.974***	-0.059
Specification 2 (all)	1.047***	0.088
Specification 3 (1st)	0.980***	-0.043
Specification 4 (all)	1.072***	0.129
Hypothesis 2		
Table 4		
Specification 1 (1st)	0.982***	-0.052
Specification 2 (all)	1.048***	0.089
Specification 3 (1st)	0.982***	-0.052
Specification 4 (all)	1.041***	0.079
Hypothesis 3		
Table 5		
Specification 1 (1st)	0.970***	-0.068
Specification 2 (all)	1.012***	0.024
Specification 3 (1st)	0.983***	-0.038
Specification 4 (all)	1.069***	0.124

Appendix D: Robustness Checks

Table 21: The effect of geographical distance on exit rates (robust)

*The sample consists of 1,157 Swedish VC-backed deals receiving their first funding during the period from 1989 - 2014. We analyze the relationship between distance and the likelihood of exits (M&A or IPO) as of 01. October 2019. The table reports the outcomes of Probit regression models of average distance between the venture and the VC firms (AVGROBUST) on the likelihood of exits (study variable) and several control variables. The independent measure AVGROBUST is derived with regards to the logic presented in section 4.4.2. Specifications (1) and (2) are the baseline models including all control variables introduced in Section 4.3. In specifications (3) and (4) we add a US dummy (USINV) to control for the presence of an American investor. While the variables in specifications (1) and (3) are calculated based on 1st round characteristics, specifications (2) and (4) show the results using variables calculated on all rounds. Venture industry dummies and time dummies are included in all regressions (1-4) but are not reported. We used the periods 91-96 (pre dot.com), 97-01 (dot.com era), 02-07 (pre crisis), 08-12 (crisis) and 13-14 (post crisis) to control for time related effects corresponding to the reasoning provided in section 4.2. We also control for industry-specific effects by including an industry dummy taking the value of 1 for tech and 0 for non-tech related deals. For a detailed discussion of the variables used, please refer to Section 4.3 above. A complete overview of all variables and correlation matrices are provided in the Tables in Appendix B. The robust standard errors for each variable are reported in parentheses. The significance level is denoted by asterisks at the ***(1%), **(5%), and *(10%) level.*

VARIABLES	(1) Base 1st	(2) Base all	(3) Base + US 1st	(4) Base + US all
AVGROBUST	0.167*	0.266***	0.156	0.142
	(0.094)	(0.100)	(0.128)	(0.135)
USINV			0.024	0.234
			(0.177)	(0.158)
VENTURESTAGE	-0.385***	-0.385***	-0.385***	-0.387***
	(0.082)	(0.082)	(0.082)	(0.082)
AVGGENEXP	-0.000	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)
AVGSUCCESS	0.001	-0.000	0.001	-0.000
	(0.004)	(0.004)	(0.004)	(0.004)
ROUNDS	0.078***	0.067***	0.078***	0.064***
	(0.021)	(0.021)	(0.021)	(0.021)
AVGSTAGINGTIME	0.087***	0.081***	0.088***	0.083***
	(0.030)	(0.029)	(0.030)	(0.029)
AVGSYNDSIZE	-0.021	-0.040	-0.022	-0.057
	(0.047)	(0.047)	(0.048)	(0.050)
AVGHNETWORK	0.049***	0.062***	0.048***	0.058***
	(0.010)	(0.012)	(0.010)	(0.013)
AVGDEGREE	-0.571	-0.517	-0.564	-0.457
	(0.750)	(0.947)	(0.752)	(0.952)
AVGAUM	0.023	0.019	0.024	0.020
	(0.022)	(0.024)	(0.022)	(0.024)
Constant	-1.032***	-1.035***	-1.029***	-0.989***
	(0.238)	(0.240)	(0.240)	(0.242)
Observations	1,157	1,157	1,157	1,157
Fixed Time Effect	YES	YES	YES	YES
Industry Fixed Effect	YES	YES	YES	YES
Pseudo R-squared	0.098	0.107	0.098	0.109
Wald chi2	130.645	140.523	131.459	144.696
Prob > chi2	0.000	0.000	0.000	0.000

Table 22: The effect of geographical distance on exit rates – a non-US sample (robust)

*The sample consists of 1,157 Swedish VC-backed deals receiving their first funding during the period from 1989 - 2014. The sub-sample excluding US investors consists of 1,021 (first round) and 960 (all rounds) Swedish VC-backed deals, respectively. We analyze the relationship between distance and the likelihood of exits (M&A or IPO) as of 01. October 2019. The table reports the outcomes of Probit regression models of average distance between the venture and the VC firms (AVGROBUST) on the likelihood of exits (study variable) and several control variables. The independent measure AVGROBUST is derived with regards to the logic presented in section 4.4.2. We compare the effect of distance on exit rates between a sample including US investors and a sample excluding these deals to check for robustness of the results presented in regression Table 21. Specifications (1) and (2) are the baseline model without US observations including all control variables introduced in Section 4.3. In specifications (3) and (4) we add a foreign dummy (FOREIGN) to control for the presence of a foreign investor (excluding US). While the variables in specifications (1) and (3) are calculated based on first round characteristics, specifications (2) and (4) show the results using variables calculated on all rounds. Venture industry dummies and time dummies are included in all regressions (1-4) but are not reported. We used the periods 91-96 (pre dot.com), 97-01 (dot.com era), 02-07 (pre crisis), 08-12 (crisis) and 13-14 (post crisis) to control for time related effects corresponding to the reasoning provided in section 4.2. We also control for industry-specific effects by including an industry dummy taking the value of 1 for tech and 0 for non-tech related deals. For a detailed discussion of the variables used, please refer to Section 4.3 above. A complete overview of all variables and correlation matrices are provided in the Tables in Appendix B. The robust standard errors for each variable are reported in parentheses. The significance level is denoted by asterisks at the ***(1%), **(5%), and *(10%) level.*

VARIABLES	**(1) Non-US Base 1st**	**(2) Non-US Base all**	**(3) Non-US Base + Foreign 1st**	**(4) Non-US Base + Foreign all**
AVGROBUST	0.286**	0.347**	0.329	0.162
	(0.138)	(0.152)	(0.224)	(0.214)
FOREIGN			-0.043	0.192
			(0.173)	(0.150)
VENTURESTAGE	-0.418***	-0.441***	-0.418***	-0.442***
	(0.088)	(0.091)	(0.088)	(0.091)
AVGGENEXP	-0.001	-0.001	-0.001	-0.001
	(0.000)	(0.000)	(0.000)	(0.000)
AVGSUCCESS	-0.001	0.001	-0.001	-0.000
	(0.004)	(0.005)	(0.004)	(0.005)
ROUNDS	0.082***	0.063**	0.082***	0.055**
	(0.023)	(0.027)	(0.023)	(0.028)
AVGSTAGINGTIME	0.083**	0.083**	0.082**	0.081**
	(0.033)	(0.034)	(0.033)	(0.034)
AVGSYNDSIZE	0.021	-0.038	0.024	-0.071
	(0.059)	(0.067)	(0.060)	(0.073)
AVGHNETWORK	0.040***	0.035**	0.040***	0.038***
	(0.011)	(0.014)	(0.011)	(0.015)
AVGDEGREE	-0.337	-0.362	-0.337	-0.329
	(0.737)	(0.969)	(0.737)	(0.969)
AVGAUM	0.037	0.035	0.037	0.034
	(0.023)	(0.025)	(0.023)	(0.025)
Constant	-1.125***	-1.068***	-1.129***	-1.012***
	(0.259)	(0.275)	(0.259)	(0.280)
Observations	1,021	960	1,021	960
Fixed Time Effect	YES	YES	YES	YES
Industry Fixed Effect	YES	YES	YES	YES
Pseudo R-squared	0.085	0.074	0.085	0.075
Wald chi2	97.076	77.503	97.134	80.822
Prob > chi2	0.000	0.000	0.000	0.000

Table 23: The effect of geographical distance on exit rates – further analysis (robust)

*The sample consists of 1,157 Swedish VC-backed deals receiving their first funding during the period from 1989 - 2014. We analyze the relationship between distance and the likelihood of exits (M&A or IPO) as of 01. October 2019. The table reports the outcomes of Probit regression models of average distance between the venture and the VC firms (AVGROBUST) on the likelihood of exits (study variable) and several control variables. The independent measure AVGROBUST is derived with regards to the logic presented in section 4.4.2. Specifications (1) and (2) are the baseline models including all control variables introduced in Section 4.3 as well as a US (USINV) and foreign (FOREIGN) dummy to control for their respective presence. In specifications (3) and (4) we recalculated the distance measure by removing the distance associated with US presence. We did so to account for the potential bias associated with US investors affecting both exit rates and distance. While the variables in specifications (1) and (3) are calculated based on first round characteristics, specifications (2) and (4) show the results using variables calculated on all rounds. Venture industry dummies and time dummies are included in all regressions (1-4) but are not reported. We used the periods 91-96 (pre dot.com), 97-01 (dot.com era), 02-07 (pre crisis), 08-12 (crisis) and 13-14 (post crisis) to control for time related effects corresponding to the reasoning provided in section 4.2. We also control for industry-specific effects by including an industry dummy taking the value of 1 for tech and 0 for non-tech related deals. For a detailed discussion of the variables used, please refer to Section 4.3 above. A complete overview of all variables and correlation matrices are provided in the Tables in Appendix B. The robust standard errors for each variable are reported in parentheses. The significance level is denoted by asterisks at the ***(1%), **(5%), and *(10%) level.*

VARIABLES	(1) Base + US + Foreign 1st	(2) Base + US + Foreign all	(3) Adjusted Distance 1st	(4) Adjusted Distance all
AVGROBUST	-0.005	-0.122	0.139	0.022
	(0.156)	(0.155)	(0.093)	(0.095)
USINV	0.197	0.471***	0.147	0.362***
	(0.202)	(0.173)	(0.134)	(0.123)
FOREIGN	0.203*	0.386***	0.064	0.322***
	(0.120)	(0.110)	(0.132)	(0.118)
VENTURESTAGE	-0.387***	-0.395***	-0.393***	-0.393***
	(0.082)	(0.083)	(0.082)	(0.083)
AVGGENEXP	-0.000	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)
AVGSUCCESS	0.000	-0.002	0.001	-0.001
	(0.004)	(0.004)	(0.004)	(0.004)
ROUNDS	0.079***	0.041*	0.080***	0.044**
	(0.021)	(0.022)	(0.021)	(0.022)
AVGSTAGINGTIME	0.086***	0.068**	0.082***	0.069**
	(0.030)	(0.029)	(0.030)	(0.029)
AVGSYNDSIZE	-0.043	-0.120**	-0.031	-0.111**
	(0.050)	(0.056)	(0.050)	(0.055)
AVGHNETWORK	0.048***	0.061***	0.049***	0.061***
	(0.010)	(0.013)	(0.010)	(0.013)
AVGDEGREE	-0.580	-0.464	-0.568	-0.456
	(0.745)	(0.940)	(0.743)	(0.935)
AVGAUM	0.024	0.018	0.020	0.014
	(0.022)	(0.024)	(0.022)	(0.024)
Constant	-1.015***	-0.899***	-1.031***	-0.923***
	(0.240)	(0.248)	(0.240)	(0.248)
Observations	1,157	1,157	1,157	1,157
Fixed Time Effect	YES	YES	YES	YES
Industry Fixed Effect	YES	YES	YES	YES
Pseudo R-squared	0.099	0.116	0.101	0.116
Wald chi2	137.061	158.884	135.688	157.183
Prob > chi2	0.000	0.000	0.000	0.000

Table 24: The effect of domestic investors on exit rates (robust)

*The sample consists of 1,157 Swedish VC-backed deals receiving their first funding during the period from 1989 - 2014. We analyze the relationship between distance and the likelihood of exits (M&A or IPO) as of 01. October 2019. The table reports the outcomes of Probit regression models of average distance between the venture and the VC firms (AVGROBUST) on the likelihood of exits (study variable) and several control variables. The independent measure AVGROBUST is derived with regards to the logic presented in section 4.4.2. Specifications (1) and (2) are the baseline models including all control variables introduced in Section 4.3 as well as a domestic dummy (DOMINV) to account for a local investor being present. In specifications (3) and (4) we add a US dummy (USINV) to control for the presence of an American investor. While the variables in specifications (1) and (3) are calculated based on first round characteristics, specifications (2) and (4) show the results using variables calculated on all rounds. Venture industry dummies and time dummies are included in all regressions (1-4) but are not reported. We used the periods 91-96 (pre dot.com), 97-01 (dot.com era), 02-07 (pre crisis), 08-12 (crisis) and 13-14 (post crisis) to control for time related effects corresponding to the reasoning provided in section 4.2. We also control for industry-specific effects by including an industry dummy taking the value of 1 for tech and 0 for non-tech related deals. For a detailed discussion of the variables used, please refer to Section 4.3 above. A complete overview of all variables and correlation matrices are provided in the Tables in Appendix B. The robust standard errors for each variable are reported in parentheses. The significance level is denoted by asterisks at the ***(1%), **(5%), and *(10%) level.*

VARIABLES	**(1)** **Base + Domestic 1st**	**(2)** **Base + Domestic all**	**(3)** **Base + Domestic + US + Foreign 1st**	**(4)** **Base + Domestic + US + Foreign all**
AVGROBUST	0.818***	0.376***	1.091***	0.007
	(0.122)	(0.136)	(0.208)	(0.193)
DOMINV	1.082***	0.202	1.333***	0.203
	(0.128)	(0.172)	(0.146)	(0.182)
USINV			0.503	0.431**
			(0.243)	(0.177)
FOREIGN			0.294**	0.398***
			(0.131)	(0.112)
VENTURESTAGE	-0.395***	-0.393***	-0.417***	-0.403***
	(0.084)	(0.082)	(0.085)	(0.083)
AVGGENEXP	-0.000	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)
AVGSUCCESS	0.008**	0.000	0.010***	-0.001
	(0.004)	(0.004)	(0.004)	(0.004)
ROUNDS	0.088***	0.062***	0.088***	0.036
	(0.023)	(0.022)	(0.023)	(0.023)
AVGSTAGINGTIME	0.092***	0.078***	0.082***	0.064**
	(0.030)	(0.029)	(0.031)	(0.029)
AVGSYNDSIZE	-0.134**	-0.064	-0.158***	-0.143**
	(0.052)	(0.052)	(0.057)	(0.061)
AVGHNETWORK	0.053***	0.060***	0.060***	0.060***
	(0.010)	(0.012)	(0.010)	(0.013)
AVGDEGREE	-0.637	-0.564	-0.885	-0.522
	(0.722)	(0.953)	(0.719)	(0.945)
AVGAUM	0.038*	0.019	0.037	0.018
	(0.023)	(0.024)	(0.023)	(0.024)
Constant	-1.989***	-1.196***	-2.291***	-1.068***
	(0.268)	(0.268)	(0.288)	(0.278)
Observations	1,157	1,157	1,157	1,157
Fixed Time Effect	YES	YES	YES	YES
Industry Fixed Effect	YES	YES	YES	YES
Pseudo R-squared	0.145	0.108	0.158	0.117
Wald chi2	195.715	143.496	207.986	161.338
Prob > chi2	0.000	0.000	0.000	0.000

Table 25: The effect of average distance between VCs on exit rates (robust)

*The sample consists of 1,157 Swedish VC-backed deals receiving their first funding during the period from 1989 - 2014. We analyze the relationship between distance and the likelihood of exits (M&A or IPO) as of 01. October 2019. The table reports the outcomes of Probit regression models of average distance between VC firms (AVGROBUSTVC) on the likelihood of exits (study variable) and several control variables. The independent measure AVGROBUSTVC is derived with regards to the logic presented in section 4.4.2. Specifications (1) and (2) are the baseline models including all control variables introduced in Section 4.3. In specifications (3) and (4) we add a US (USINV) and foreign (FOREIGN) dummy to control for the presence of a foreign investor. While the variables in specifications (1) and (3) are calculated based on first round characteristics, specifications (2) and (4) show the results using variables calculated on all rounds. Venture industry dummies and time dummies are included in all regressions (1-4) but are not reported. We used the periods 91-96 (pre dot.com), 97-01 (dot.com era), 02-07 (pre crisis), 08-12 (crisis) and 13-14 (post crisis) to control for time related effects corresponding to the reasoning provided in section 4.2. We also control for industry-specific effects by including an industry dummy taking the value of 1 for tech and 0 for non-tech related deals. For a detailed discussion of the variables used, please refer to Section 4.3 above. A complete overview of all variables and correlation matrices are provided in the Tables in Appendix B. The robust standard errors for each variable are reported in parentheses. The significance level is denoted by asterisks at the ***(1%), **(5%), and *(10%) level.*

VARIABLES	(1) Base 1st	(2) Base all	(3) Base + US + Foreign 1st	(4) Base + US + Foreign all
AVGROBUSTVC	-0.023	0.078*	-0.107*	-0.026
	(0.054)	(0.045)	(0.062)	(0.052)
USINV			0.326**	0.405***
			(0.151)	(0.138)
FOREIGN			0.239**	0.350***
			(0.099)	(0.098)
VENTURESTAGE	-0.389***	-0.397***	-0.382***	-0.391***
	(0.082)	(0.082)	(0.082)	(0.083)
AVGGENEXP	-0.000	0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)
AVGSUCCESS	-0.001	-0.001	-0.001	-0.001
	(0.004)	(0.004)	(0.004)	(0.004)
ROUNDS	0.077***	0.062***	0.079***	0.045**
	(0.021)	(0.022)	(0.021)	(0.022)
AVGSTAGINGTIME	0.090***	0.077***	0.087***	0.071**
	(0.030)	(0.029)	(0.030)	(0.029)
AVGSYNDSIZE	0.006	-0.043	-0.017	-0.108*
	(0.050)	(0.051)	(0.052)	(0.056)
AVGHNETWORK	0.048***	0.060***	0.048***	0.061***
	(0.010)	(0.012)	(0.010)	(0.013)
AVGDEGREE	-0.634	-0.672	-0.434	-0.426
	(0.759)	(0.953)	(0.755)	(0.939)
AVGAUM	0.034	0.030	0.023	0.015
	(0.021)	(0.023)	(0.022)	(0.024)
Constant	-1.069***	-1.027***	-1.031***	-0.921***
	(0.241)	(0.241)	(0.242)	(0.247)
Observations	1,157	1,157	1,157	1,157
Fixed Time Effect	YES	YES	YES	YES
Industry Fixed Effect	YES	YES	YES	YES
Pseudo R-squared	0.096	0.104	0.101	0.116
Wald chi2	128.326	137.247	138.154	157.012
Prob > chi2	0.000	0.000	0.000	0.000

Appendix E: Supplementary Regressions

Table 26: The effect of geographical distance on exit rates (additional) – first round

*The sample consists of 1,157 Swedish VC-backed deals receiving their first funding during the period from 1989 - 2014. We analyze the relationship between distance and the likelihood of exits (M&A or IPO) as of 01. October 2019. The table reports the outcomes of Probit regression models of the logarithm of average distance between the venture and the VC firms (AVGDIST) on the likelihood of exits (study variable) and several control variables. Specifications (1) to (6) use a particular set of control variables to determine the unique effect on exit rates and distance. All are calculated based on first round characteristics. Venture industry dummies and time dummies are included in all regressions (1-4) but are not reported. We used the periods 91-96 (pre dot.com), 97-01 (dot.com era), 02-07 (pre crisis), 08-12 (crisis) and 13-14 (post crisis) to control for time related effects corresponding to the reasoning provided in section 4.2. We also control for industry-specific effects by including an industry dummy taking the value of 1 for tech and 0 for non-tech related deals. For a detailed discussion of the variables used, please refer to Section 4.3 above. A complete overview of all variables and correlation matrices are provided in the Tables in Appendix B. The robust standard errors for each variable are reported in parentheses. The significance level is denoted by asterisks at the ***(1%), **(5%), and *(10%) level.*

VARIABLES	(1) Distance only	(2) Venture Stage	(3) Investment EXP	(4) Monitoring	(5) Network	(6) AuM
AVGDIST	0.024**	0.021*	0.033**	0.020	0.036***	0.012
	(0.012)	(0.012)	(0.013)	(0.013)	(0.012)	(0.013)
VENTURESTAGE		-0.368***				
		(0.078)				
AVGGENEXP			0.000			
			(0.000)			
AVGSUCCESS			0.014***			
			(0.002)			
ROUNDS				0.081***		
				(0.020)		
AVGSTAGINGTIME				0.108***		
				(0.030)		
AVGSYNDSIZE				-0.023		
				(0.047)		
AVGHNETWORK					0.057***	
					(0.007)	
AVGDEGREE					-0.704	
					(0.737)	
AVGAUM						0.063***
						(0.019)
Constant	-0.590***	-0.444**	-1.057***	-0.690***	-1.011***	-0.955***
	(0.168)	(0.172)	(0.204)	(0.188)	(0.187)	(0.202)
Observations	1,157	1,157	1,157	1,157	1,157	1,157
Fixed Time Effect	YES	YES	YES	YES	YES	YES
Fixed Industry Effect	YES	YES	YES	YES	YES	YES
Pseudo R-squared	0.006	0.022	0.035	0.035	0.064	0.013
Wald chi2	9.354	31.321	54.308	45.067	94.534	20.192
Prob > chi2	0.155	0.000	0.000	0.000	0.000	0.005
Correctly predicted test	66,72%	65,86%	69,92%	67,42%	69,49%	66,46%
Hosmer-Lemeshow GOF	0.3882	0.1292	0.0000	0.2405	0.0000	0.0299
Area under ROC curve	0.5562	0.6075	0.6050	0.6336	0.6427	0.5799

Table 27: The effect of geographical distance on exit rates (additional) – all rounds

*The sample consists of 1,157 Swedish VC-backed deals receiving their first funding during the period from 1989 - 2014. We analyze the relationship between distance and the likelihood of exits (M&A or IPO) as of 01. October 2019. The table reports the outcomes of Probit regression models of the logarithm of average distance between the venture and the VC firms (AVGDIST) on the likelihood of exits (study variable) and several control variables. Specifications (1) to (6) use a particular set of control variables to determine the unique effect on exit rates and distance. All are calculated based on all round characteristics. Venture industry dummies and time dummies are included in all regressions (1-4) but are not reported. We used the periods 91-96 (pre dot.com), 97-01 (dot.com era), 02-07 (pre crisis), 08-12 (crisis) and 13-14 (post crisis) to control for time related effects corresponding to the reasoning provided in section 4.2. We also control for industry-specific effects by including an industry dummy taking the value of 1 for tech and 0 for non-tech related deals. For a detailed discussion of the variables used, please refer to Section 4.3 above. A complete overview of all variables and correlation matrices are provided in the Tables in Appendix B. The robust standard errors for each variable are reported in parentheses. The significance level is denoted by asterisks at the ***(1%), **(5%), and *(10%) level.*

VARIABLES	**(1) Distance only**	**(2) Venture Stage**	**(3) Investment EXP**	**(4) Monitoring**	**(5) Network**	**(6) AuM**
AVGDIST	0.049***	0.049***	0.057***	0.035***	0.053***	0.036***
	(0.012)	(0.012)	(0.013)	(0.013)	(0.012)	(0.013)
VENTURESTAGE		-0.371***				
		(0.078)				
AVGGENEXP			0.000			
			(0.000)			
AVGSUCCESS			0.016***			
			(0.002)			
ROUNDS				0.070***		
				(0.021)		
AVGSTAGINGTIME				0.102***		
				(0.030)		
AVGSYNDSIZE				-0.041		
				(0.048)		
AVGHNETWORK					0.068***	
					(0.008)	
AVGDEGREE					-0.910	
					(0.959)	
AVGAUM						0.064***
						(0.020)
Constant	-0.674***	-0.529***	-1.170***	-0.692***	-1.118***	-1.044***
	(0.170)	(0.174)	(0.206)	(0.190)	(0.190)	(0.206)
Observations	1,157	1,157	1,157	1,157	1,157	1,157
Fixed Time Effect	YES	YES	YES	YES	YES	YES
Industry Fixed Effect	YES	YES	YES	YES	YES	YES
Pseudo R-squared	0.016	0.031	0.049	0.038	0.079	0.023
Wald chi2	23.103	44.637	72.163	49.935	107.368	33.229
Prob > chi2	0.001	0.000	0.000	0.000	0.000	0.000
Correctly predicted test	66,72%	66,29%	70,35%	67,59%	71,39%	66,55%
Hosmer-Lemeshow GOF	0.3286	0.2249	0.0000	0.2980	0.0003	0.0504
Area under ROC curve	0.5840	0.6216	0.6353	0.6347	0.6648	0.6052