Industry-specific learning and specialization in venture capitalists' internationalization decisions

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Abstract: This study considers the impact of venture capitalists' industry specialization on cross-border investment decisions. Drawing on learning theory, the article argues that specialized venture capitalists' liability of foreignness is lower in specific international markets, as the assessment of the market and the behavior of the market participants is facilitated through industry-specific learning effects. This leads to a lower risk in cross-border investments from venture capitalists' point of view, as with increasing deal-specificity, the support and value enhancement of a foreign portfolio company are still ensured in international markets due to the investor's specialization. A multilevel investigation of 61,933 worldwide venture capital deals from 2001 to 2019 into 72 countries shows a positive relationship between venture capitalists' industry specialization and internationality. The results are in line with learning theory and show that the likelihood of a cross-border deal increases with higher industry specialization. Furthermore, this effect is negatively moderated by determinants at the institutional and portfolio company levels, reducing the importance of venture capitalists' own capabilities in international investment decisions.

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Code availability

I used Stata SE 15 to conduct the analyses. Stata code is available upon request.

1. Introduction

The investment behavior of venture capitalists is an increasingly international phenomenon. The literature discusses various factors influencing cross-border investments, frequently referring to country-specific and institutional differences facilitating or hampering international investments (Groh et al. 2010; Schertler and Tykvová 2011; Aizenman and Kendall 2012). Furthermore, several papers have examined some venture capitalist determinants, such as type of venture capital firm, experience, age, or size of their network, which are also likely to influence venture capital cross-border flows (Gupta and Sapienza 1992; Cumming and Dai 2010; Meuleman and Wright 2011; Devigne et al. 2013; Chemmanur et al. 2016).

However, previous studies do not delve deeply into the characteristics of different venture capital funds. Nevertheless, it is important to address these characteristics in order to understand venture capitalists' individual motives for investing abroad. Venture capital investors' internationalization decisions might differ in terms of risk assessment and selection of their portfolio companies, depending on their specific properties. This also applies to portfolio companies' value enhancement in the post-investment phase (Gompers et al. 2010; Devigne et al. 2013), which might be influenced by fund-specific characteristics. Considering the business activities of venture capital funds in more detail, the relevance of fund-specific characteristics in international investments becomes apparent.

Venture capital funds generally invest in young companies operating in aspiring markets (Stuart et al. 1999; Ueda 2004; Vanacker and Manigart 2010). In addition to the provision of capital, after the investment is made, close monitoring and intensive support towards their portfolio companies are crucial to increase the value of the company over the investment period. This is particularly important in international deals where funds are faced with institutional, geographical, cultural, and legal distance from their own nation (Devigne et al. 2018), resulting in liability of foreignness (Pruthi et al. 2003; Mäkelä and Maula 2008; Devigne et al. 2016). Thus, venture capitalists are opposed to higher information asymmetries and insecurities in international deals, which might hamper an investment in the foreign market from the institutional point of view. When considering the supplementary view, focusing on the characteristics and capabilities of the venture capital investor besides the mentioned institutional drivers, one could argue that – on the contrary – funds' characteristics may also facilitate an investment abroad, even though the international investment carries additional risks.

Drawing on learning theory (Levitt and March 1988), this paper highlights a fund's acquired knowledge within an industry as an important characteristic that might influence its internationalization decisions. Hereby, a central role is assigned to the tacit – i.e., learned – knowledge, which is continuously acquired by organizations through the exercise of their activities as such (Itami and Roehl 1991; Hart 1995). By investing several times within one industry, investors gain a precise understanding of industry-specific products and business models. This is particularly important for offering value-added services towards the portfolio company and increasing the portfolio company's value. Therefore, the investor's industry-specific expertise might play a central role in successfully managing the investment abroad and is likely to be a factor influencing investment decisions.

In addition to country-specific knowledge, industry-specific knowledge – which can be considered as funds' specialization within an industry – might be a relevant competence for guiding portfolio companies and may attenuate funds' liability of foreignness. It is likely that investors' industry specialization will determine how effectively an investor can advise his target company, as business processes within an industry are resembling and recurring. Thus, with each additional investment and support of a portfolio company within an industry, knowledge on how to support a portfolio company most efficiently increases, and successful practices are established. Even though funds' industry specialization might affect venture capitalists' internationalization decisions due to different competencies and knowledge resulting from their specialization, this is disregarded in the literature on international venture capital. The additional risks associated with an investment abroad may vary in severity, depending on the specificity of the deal. Investigating this omission is important to understand funds' investment decisions based on their learning effects from previous deals in an increasingly internationalized venture capital market. Consequently, a research gap exists with regard to the fit between the target company's business and the industry specialization of venture capitalists and how this affects the likelihood to invest abroad.

Previous studies include the general experience of venture capital funds as a measure of funds' characteristics. Experience is there measured in terms of the absolute number of investments made into different countries or into an industry group (Cumming and Dai 2010; Schertler and Tykvová 2011; Devigne, Manigart and Wright 2016), or through surveys (De Prijcker et al. 2012). Given the assumption that industry specialization is relevant for successful investments, especially under the difficult conditions of a cross-border investment, the experience of investors could be examined more specifically. This paper aims to provide more nuanced results comparing experience measured in absolute values in terms of the extent to which industry specialization affects funds' decision to invest abroad, incorporating their industry-specific learning effects over time.

As extant research highlights how institutional target market characteristics play a major role in attracting international venture capital, it can be expected that both views – the institutional view and the fund-internal view – are not independent of each other. Therefore, institutional characteristics are included as potential moderators for the impact of industry specialization on the likelihood to invest abroad. Furthermore, portfolio companies' attributes are likely to have an impact on venture capitalists' investment decision. Accordingly, two portfolio company characteristics are included as moderators in the analyses.

To examine these issues, this study uses a data set containing detailed information about venture capital funds and corresponding portfolio companies at deal level from 2001 to 2019. The data set includes 61,993 initial investment decisions into a portfolio company deal with a global scope. The data are evaluated at funds' investment level, taking into consideration the individual decisions made within different funds' portfolios. The effect of venture capitalists' industry specialization is measured in a binomial logistic regression model.

This study shows that venture capitalists with higher industry specialization have a significantly higher probability of investing cross-border than venture capitalists with a lower industry specialization. Moreover, this effect is negatively moderated by characteristics at the institutional and portfolio company levels, which may reduce the importance of venture capitalists' own capabilities in international investment decisions.

The study makes several contributions to the understanding of venture capital funds' international investment behavior. By examining the role of funds' industry specialization and learning effects in international investments, the study contributes an explanation of fund behavior at the micro level. This paper uses the theoretical lens of learning theory, which states that organizations learn by encoding inferences from past history into processes and strategies that guide their behavior (Levitt and March 1988), to investigate the relation between venture capital funds' specialization and internationality. Compared to studies drawing on network theory (Patzelt et al. 2009; De Prijcker et al. 2012; Vedula and Matusik 2017), which describe fund characteristics dependent on their partners, this paper offers alternative explanations for funds' behaviors by focusing primarily on their own capabilities and their development based on learning effects and specialization. As such, the results add to the strand of literature on international venture capital that refer to fund-level determinants (e.g., (Gupta and Sapienza 1992; Cumming and Dai 2010; Vedula and Matusik 2017) of cross-border investments.

By interacting fund-specific characteristics with institutional-level and company-level characteristics, this study also provides insight into the interplay of fund-specific and external criteria, as they might not operate independently (Vanacker et al. 2014; Devigne et al. 2018). This allows for the formulation of more precise conclusions referring to the investors' individual circumstances, including internal and external determinants and how they affect investment decision behavior in international markets.

The remainder of this study is organized as follows: Section 2 describes the theoretical considerations and the development of the hypotheses. Section 3 details the data set and variables used. Section 4 presents the results of the descriptive and multivariate analyses, and Section 5 provides the conclusions.

2. Theoretical Considerations and Hypothesis Development

2.1 Drivers of International Venture Capital Investments

Previous research examines several drivers of venture capital cross-border capital flows. These mainly relate to the characteristics of the institutional environment and the characteristics of the country in which an investment is made. Investors prefer to invest in countries with a highly developed institutional environment, as this implies greater market transparency and regulatory stability from the investor's point of view (Groh, Von Liechtenstein and Lieser 2010; Guler and Guillen 2010; Aizenman and Kendall 2012). In particular, the literature mentions strong legal, financial, and political institutions facilitating cross-border venture capital flows (Devigne et al. 2018). Beyond that, it is also known that a common language, colonial ties (Aizenman and Kendall 2012), as well as economic integration between countries (for example in the European Union) affects international investments (Alhorr et al. 2008).

Furthermore, the economic growth of the target market is mentioned as a driver of international venture capital (Groh, Von Liechtenstein and Lieser 2010; Schertler and Tykvová 2011; Aizenman and Kendall 2012). Economic growth within a country can be represented in a dynamic development of entrepreneurial ecosystems, which may foster the creation of new companies (Neck et al. 2004). An entrepreneurial ecosystem is defined as a system of interactions between individuals and organizations – for example, financial intermediaries, research institutions, suppliers, customers, or the government (Colombo et al. 2019). It thus covers the area in which start-ups are established. From the perspective of a foreign investor, this leads to attractive investment opportunities, particularly due to the framework created by the strong institutional environment for investors (Mack and Mayer 2016).

2.2 Specialization and the Importance of Industry-Specific Knowledge

Despite the aforementioned drivers of international venture capital investments, comprising strong institutions and commonalities between countries, it is nevertheless argued that compared to domestic deals, international venture capital deals are characterized by higher information asymmetries and additional risks. These risks arise from geographical, cultural, and institutional distance between the investor and the portfolio company (Lockett and Wright 2002; Pruthi, Wright and Lockett 2003; Wright et al. 2005; Devigne, Manigart and Wright 2016; Devigne et al. 2018), which is described as liability of foreignness, capturing all additional costs arising for the investor that would not occur in a domestic deal (Zaheer 1995). This view, however, tends to focus on the institution-based view (Peng 2002). Likewise, the drivers of international venture capital flows mainly relate to institutional differences. At this point, the supplementary view focusing on the characteristics and capabilities of the investors, following the resource-based view by Wernerfelt (1984) is missing.

Some previous findings relate to the differentiation of venture capital providers by type of investor and how that might affect their probability of investing abroad. For example, it is shown that corporate venture capitalists exhibit a broader geographic scope, as corporate venture capital funds invest in such companies from which they can derive a strategic advantage for their own corporation. Such target companies require a certain fit to the parent company's product and service offerings so that the corporate investor can access the target's technologies and knowledge. From a strategic point of view, limiting investment opportunities to the domestic market would reduce the number of target companies fitting the investor's product (Gupta and Sapienza 1992; Bertoni et al. 2015).

In addition, several studies consider the characteristics of the investor's human capital (De Prijcker et al. 2012; Devigne et al. 2018). With regard to the international investment expertise of the venture capitalists' investment managers, there is evidence that more experienced managers are more likely to invest abroad (Patzelt, zu Knyphausen-Aufseß and Fischer 2009; Schertler and Tykvová 2011). This is substantiated by the superior knowledge of the institutional environment and better access to networks (Devigne et al. 2018). In terms of the investor's social capital (e.g., networks), research findings show that venture capitalists' social networks have an impact on their international investment behavior, as better networked venture capitalists are able to solve problems arising abroad with the help of their local partners (Sorenson and Stuart 2001; Cumming and Dai 2010; Vedula and Matusik 2017).

In contrast to the capabilities of external partners, this paper aims to present an expansion of fund-specific characteristics that influence the internationalization decision. This is meaningful because funds' characteristics determine their success in enhancing their portfolio companies' value and internal efficiency (Mahoney and Pandian 1992; Hart 1995; Abell and Nisar 2007). These characteristics include investors' level of industry-specific knowledge on technological product development or access to key resources like personnel, raw materials, and distribution channels – what can be considered as the investors' level of industry specialization (Gupta and Sapienza 1992). Industry specialization is not static; rather, organizations acquire it in the form of tacit knowledge through experience and practice (Itami and Roehl 1991; Hart 1995). According to learning theory (Levitt and March 1988), funds can learn directly from their own investment experience and thus develop specialized knowledge (Gupta and Sapienza 1992; Liu and Maula 2016). From venture capitalists' point of view, the provision of industry-specific and product-specific support and advice toward their portfolio companies is likely to be facilitated if funds have already developed their industry specialization in the past (Zhang and Pezeshkan 2016). Specialization development might help investors to learn about the characteristics and behaviors of markets and their participants within a specific field of business, which is not limited to the domestic market but can also be applied globally. It is likely that the greater the previous learning effects and specialization, the more investors' liability of foreignness is attenuated, as the benefits of specialization in the market exceed the risks of a cross-border investment. Through a high degree of industry specialization, the insecurity linked to an investment abroad may be reduced by accumulated industry-specific learning effects through similar previous investments. Consequently, the first hypothesis is as follows:

Hypothesis 1: Venture capitalists' degree of specialization is positively related to the probability of internationalization.

2.3 Market and Portfolio Company-level Determinants Influencing Venture Capitalists' Decision to Invest Abroad

Besides venture capitalists' own industry-specific learning effects and specialization, there is considerable research examining the mechanisms to overcome information asymmetries within foreign markets. One strategy mentioned is the observation and interpretation of the determinants of the market and the portfolio company (Valliere 2012).

With regard to the determinants of the target market, the concept of the entrepreneurial ecosystem is widely used to represent increased entrepreneurship and growth within a certain region (Cohen 2006; Stam 2015; Spigel 2017). Entrepreneurial ecosystems are defined as the union of social, cultural, political, and economic elements referring to a region and contributing to the competitiveness and success of new ventures located within this system (Dubini 1989; Spigel 2017). This is because favorable institutional conditions for growth – easing firm communication and cooperating (Gertler 2003), wide social networks creating pathways for knowledge spillovers (Powell et al. 2005), and a strong connection between founders and founding sources (Powell et al. 2002) – are created in a developed entrepreneurial ecosystem. From venture capital investors' point of view, the risk related to the cross-border deal might be evaluated as lower if the investment takes place in an evolved entrepreneurial ecosystem. Thus, an evolved entrepreneurial ecosystem may act as a quality signal of the target market. Due to the entrepreneurial ecosystems' supporting and assisting effect, the investor's ability in terms of tacit knowledge is less essential, as it is locally available. Therefore, investors are not only compelled to rely on their own expertise. Assuming that venture capitalists assess the entrepreneurial ecosystems' stage of development as being highly developed, it may attenuate the positive relationship between specialization and the probability of investing abroad. Thus, the second hypothesis is as follows:

Hypothesis 2a: If the portfolio company is located in an evolved entrepreneurial ecosystem, this negatively moderates the relationship between specialization and internationalization.

Another determinant influencing venture capital investors' international investment decisions could arise from the fact of whether the portfolio company under consideration has a previous financing history or not. New ventures financing usually proceeds in several rounds of financing. In such rounds, portfolio companies have to reach milestones and prove progress in their business activities (Gompers

1995). Therefore, each additional round carries certification effects from previous rounds, and an investment decision in a later round is thus made with less uncertainty compared to the first round (Ruhnka and Young 1987; Gompers 1995; Wang and Zhou 2004). Portfolio companies with longer financing histories are also likely to enter a more advanced stage of the life cycle; accordingly, investors might be faced with fewer investment risks as the first operational challenges within the portfolio company have already been solved by investors who were already involved. Therefore, previous financing rounds might mitigate new investors' possible insecurities due to the provision of the skill sets, experiences, and networks of the investors already involved (Schertler and Tykvová 2012; Devigne et al. 2013). Hence, it can be argued that the funds' own industry-specific learning effects and specialization are less important if the investment is made in a later round. Accordingly, the third hypothesis is as follows:

Hypothesis 2b: If the fund initially invests in a later round, this negatively moderates the relationship between specialization and internationalization.

The literature also relates differences in the amount of entrepreneurial funding to the characteristics of the start-up (Hsu 2007). If the foreign portfolio company has already received a higher amount of funding, this can be considered a security from a potential investor's point of view. This is because investors who are already involved in the portfolio company have an incentive to not lose their invested capital, as they would incur financial as well as reputational damage (Walter 2013). In order to prevent losses, it can be assumed that previous investors have already contributed to the improvement of the portfolio company's product and processes. Consequently, it is likely that the company's development would have progressed further with higher financing amounts. Additional technical support from a specialized investor may then be less necessary, as this has already been provided in advance. Thus, the fourth hypothesis is as follows:

Hypothesis 2c: If the portfolio company's funding to date is high, this negatively moderates the relationship between specialization and internationalization.

3. Data and Methodology

3.1 Data on Venture Capitalists' Investment Decisions

The main data set is taken from the Refinitiv database Eikon (formerly Thomson Reuters Eikon) and consists of detailed information about independent venture capitalists' internationalization decisions on the deal-level. Information on the corresponding venture capital funds and referring portfolio companies for the last two decades (2001–2019) is included. This time span includes several global economic events like the global financial crisis, which may have affected internationality and investment decisions within the venture capital industry. Some variables and further information referring to the institutional characteristics of the target markets were taken from the website of Rafael La Porta and from the International Monetary Fund (IMF). The data are analyzed in terms of each internationalization decision in initial investments in a company. A detailed overview and explanation of the variables is provided in Table 1.

**********Insert Table 1 about here**********

Every observation contains information about the investing venture capital funds' characteristics and information about the corresponding portfolio company into which the investment was made. Data with respect to institutional and cultural levels were collected separately from the investment deal information and merged into the main data set. Table 2 shows the descriptive statistics of the sample consisting of 61,933 observations.

**********Insert Table 2 about here**********

Only venture capitalists' initial investment decisions into a portfolio company are analyzed. These can either take place in the first round or in later rounds. With respect to follow-on investments into the same portfolio company, decisions would no longer be a decision to internationalize in the sense that the portfolio company and its environment are afflicted with uncertainty. Since funds already gain information about the processes, stakeholders, and business environment of the company within the first investment round, initial investment decisions and follow-on investments might differ substantially. It

is likely that there is a different intention behind a first investment into a company, compared to that of a follow-on investment. For example, it may be that the dilution of the investor's share should be protected if additional investors enter or that further capital is required to achieve company-specific goals. Therefore, the decision to internationalize is not a new one, nor is the addition of a new company to the portfolio. However, since funds also realize industry-specific learning effects by investing into the same company multiple times, these investments are also counted as further industry specialization.

3.2 Descriptive Statistics

10,651 deals of the sample are labeled as cross-border deals, whereas 51,282 deals are labeled as domestic deals. Therefore, slightly more than 17 percent of all deals included in the sample are characterized as a cross-border deal.

On average, funds' industry specialization is 0.225. This means that, on average, 22.5 percent of the fund's portfolio investments at the time of the investment decision can be assigned to the industry classification of the company in which the investment is made. Therefore, on average, funds do not invest in a company without realizing industry-specific learning effects beforehand. Maximum industry specialization within the sample is 0.971, while no industry specialization at all is the minimum value that industry specialization takes. Most deals can be classified into the categories of computer software and services (29.94 percent), internet specific (21.80 percent), medical/health (10.66 percent), and biotechnology (10.33 percent). The fewest deals take place in the category of consumer related (2.86 percent). A detailed overview of funds' industry specialization is displayed in Table 3.

**********Insert Table 3 about here**********

Slightly less than half of the deals included in the sample are located in a hot entrepreneurial ecosystem (mean=0.406). The average funding a portfolio company received (measured in logarithmic values) at the date of the investment of the fund under consideration is 17.081 US dollars (SD=1.620). Funds are on average 1.325 years old and at maximum 5.495 years old at the time of the investment (also measured in logarithmic values). The logarithmic age of the portfolio company is on average 1.325 years and 5.537 years at maximum. The earliest investments into portfolio companies take place in the year of establishment.

Most deals take place in countries with a legal system that is considered to be efficient (mean=9.676). The efficiency of the legal system is 2.5 points at its lowest score and 10 points at the highest, the maximum efficiency. Similar patterns can also be observed with regard to financial market depth and the financial openness of the target market. The financial market depth of the target market is 0.919 points on average, with 1 as the maximum score and 0.003 as the lowest score. The financial openness of the target market is 0.967 points on average, with 1 as the maximum score and 0 as the lowest score.

3.3 Dependent Variable

The dependent variable *Cross-border deal* is a binary variable, indicating the internationalization decision of the venture capital fund under consideration. *Cross-border deal* equals zero if the deal is a domestic deal and one if the deal is an international one.

3.4 Independent Variables

The main independent variable *Industry specialization* is a ratio variable, reflecting the proportional deal experience of a venture capital fund within an industry, measured against all its previous investments. A similar ratio of industry to general experience measure has been used by Gompers et al. (2009). *Industry specialization* can take on values of zero if no experience has been made within the industry whose deal is being investigated. *Industry specialization* can take a maximal value of one if all deals a fund has made can be assigned to the industry of the deal under consideration to date. The measurement of *Industry specialization* incorporates learning effects by assuming that, with each additional deal within an industry, experience increases in terms of successfully supporting companies in that industry in the market. For the first deal within a portfolio, the variable industry specialization therefore always equals zero, as no learning effects could occur until the fund's first investment.

Industry classification within the sample is done by Refinitiv Eikon Industry Minor Classification and has been adopted. Possible specialization categories are biotechnology, communication and media, computer hardware, computer software and services, consumer related, industrial/energy, internet specific, medical/health, other products, and semiconductor.

Since it is likely that, besides a fund's industry specialization, target market and portfolio company characteristics influence venture capitalists' decision to invest abroad, three different moderators referring to the portfolio company and the corresponding target market are taken into account. The first one refers to a *hot entrepreneurial ecosystem* and measures whether the region in which the portfolio company is headquartered is known for supporting the creation and growth of new ventures. *Hot entrepreneurial ecosystem* is measured as a dummy variable, equaling one if the portfolio company is located in a start-up hotspot and zero otherwise. Start-up hotspots were identified based on Crunchbase data and StartupBlink's Startup Ecosystem Ranking. Therefore, portfolio companies located in California, New York, London, Boston, Beijing, Tel Aviv, Berlin, Moscow, and Shanghai are assigned to this category.

In addition to looking at institutional factors that can influence investments, the study also examines known indicators of the portfolio companies' financing history that may influence the decision to invest abroad. The round in which the investment takes place (*Funding round*) takes the value of the respective investment round. *Log(Company funding to date)* is the logarithm of the amount of financing in US dollars received by a portfolio company from all investors up to the respective investment date.

3.5 Control Variables

Several control variables are included in the multivariate analyses. Since it is likely that in addition to industry specialization, knowledge of other institutional environments and cultures is also necessary, this general international investment experience is also controlled for (Gupta and Sapienza 1992; Cumming and Dai 2010). International investment experience influences investment decisions, as investors are more familiar with foreign institutional and legal environments and have better access to international networks (Patzelt, zu Knyphausen-Aufseß and Fischer 2009; Schertler and Tykvová 2011; De Prijcker et al. 2012; Devigne et al. 2018). Furthermore, the age of the fund (Age of fund) is included as a control variable. Age of fund is measured as the logarithmic value of the difference between the establishment of the fund and the time of the investment. Likewise, the age of the portfolio company (Age portfolio company) is included. The age of the portfolio company (Age portfolio company) is also measured as the logarithm of the difference between founding date and investment decision. As particularly young ventures imply a higher risk associated with the investment compared to older companies, venture capitalists may be affected by this in their investment decision (Zhang and Pezeshkan 2016).

In addition to the characteristics of funds and portfolio companies, the study also covers other institutional characteristics of the target market. The efficiency of the legal system (Efficiency legal system) has an impact on venture capital investments in terms of better assertiveness of mechanisms for solving agency and control problems (Cumming et al. 2010). The analyses use the index conducted by Porta et al. (1998) to illustrate legal efficiency. Efficiency legal system can take values from zero to ten, where lower scores indicate low efficiency.

Financial market depth captures the size of the financial sector relative to the economy and is measured as the ratio of market capitalization and private credit of the target nation divided through the gross domestic product. Financial market depth can range from zero to one. As there is a statistical link from financial market depth to the long-term prospects of economic growth, this might be an indicator of the target market to be promising for successful investments.

Another factor included in the analyses is Financial openness, measured by the Chinn-Ito Index (Chinn and Ito 2008). The Chinn-Ito Index tries to capture the intensity of capital controls. There is statistical evidence that financial openness has a positive impact on the entrepreneurial development and financial development of countries (Behvar et al. 2020; Rahman et al. 2020). There is also evidence in the FDI sector that financial openness increases cross-border capital flows (Tan et al. 2019). The Chinn-Ito Index is calculated on binary dummy variables that codify the tabulation of restrictions on cross-border financial transactions reported in the International Monetary Fund's Annual Report on Exchange

Arrangements and Exchange Restrictions (AREAER). Financial openness can take values from zero to one.

Year, legal, and country effects are included in the analyses as well. Legal classification fixed effects capture the legal classification of the target nation country based on the "Legal Classification of Investment Nation" by Porta et al. (1998). Countries are classified as French, English, German, Scandinavian, or Socialist. In terms of country effects for the portfolio company under consideration, dummy variables indicating the region of the country of the portfolio company are included. Country effects captures Africa, Asia, Europe, North America, and Middle/South America.

3.6 Multivariate Analysis

Within the framework of a multivariate analysis, this paper examines if and to what extent funds' industry specialization has an impact on international investment decisions. In addition, the analyses include the extent to which characteristics of the portfolio company and the corresponding target market influence the relationship between a fund's industry specialization and the decision to invest abroad. Binomial regression models are conducted to investigate the relationship between a fund's industry specialization and internationalization decisions.

Model 1 investigates the isolated effect that a fund's industry specialization has on the probability of investing abroad. Models 2 to 4 include the three moderation effects. To interpret the results of the logit models, the corresponding log odds are also displayed. Thus, the probability of a cross-border deal depending on a fund's industry specialization is provided.

To avoid biased regression estimates, all regression models control for possible cross-correlation effects arising from unobserved individual fund effects among all deals made by a respective fund. Therefore, clustered standard errors are used. Pearson correlations of all variables included in the models are displayed in Table 4. As variance inflation factors (VIFs) do not exceed values of 4.17 (see Table 5), there is no evidence of multicollinearity.

**********Insert Table 4 and 5 about here**********

4. Empirical Results and Discussion

For the relation between venture capitalists' industry specialization and the probability of investing abroad, results show a significant positive effect. To interpret the effects of the binary model, odds ratios measuring the strength of the relationship are provided (see Table 6). Interpreted in economic effects, this means that if the fund's industry specialization – measured by the proportional deal experience of a venture capital fund within a specific industry – increases by one deal, the probability of investing abroad increases by 30 percent. This underlines the assumption that the higher the investor's industry-specific learning effects are, the more likely investors' perceived insecurity linked to the cross-border investment may be reduced. Hence, the investor might already know how to increase growth of the specific business model and possibly already knows the customers and business partners.

**********Insert Table 6 about here**********

Referring to the moderation effects, as hypothesized, the probability of a cross-border deal is lower if the deal takes place in an evolved entrepreneurial ecosystem. The effect of a fund's industry specialization on the probability of a cross-border deal decreases by 73.3 percent if the portfolio company is located in an evolved entrepreneurial ecosystem. This might stem from the entrepreneurial ecosystems' supporting and assisting effect (Gertler 2003; Powell et al. 2005), which attenuates the necessity of investors' own ability in terms of tacit knowledge. Consequently, investors are less tied to their own industry specialization and former learning in their investment decision.

Likewise, both the moderating effects of funding round (Model 3) and the company's funding to date (Model 4) lower the effect that a fund's industry specialization has on the probability of investing abroad. The relation between industry specialization and internationality is weaker if the investment takes place in a later funding round. Referring to Model 3, the relation between industry specialization and the probability of investing abroad is mitigated by 6 percent for each additional round. This is in line with the literature, which states that each additional round carries certification effects from previous

rounds (Ruhnka and Young 1987; Gompers 1995; Wang and Zhou 2004). Compared to later rounds, the investment decision is thus made with less uncertainty. Additionally, as the portfolio company is already further developed at later entry points, it may not require the same level of support as in earlier rounds.

A similar effect can also be observed with regard to the funding the portfolio company has received to date. The relationship between industry specialization and the probability of investing cross-border is weaker (odds ratio=0.808) if the company under consideration received a higher amount of funding so far. A reason for this might be that the amount of funding provides an indication of portfolio companies' heterogeneity in terms of their social capital and associated capabilities (Hsu 2007). If capabilities and specific experience are already present in the portfolio company, the investor's support in this respect is less necessary.

4.1 Differentiating between Low and High Levels of Industry Specialization

In addition to the measured effect of the general industry specialization on funds' internationalization decision, this effect is also measured for various subsamples. This is motivated by the assumption that there might be heterogeneity in the decisions to invest abroad based on the levels of industry specialization. With a lower degree of industry specialization, the experience of the fund is lower compared to funds that are highly specialized. Following this argument, the risk of an investment abroad is associated with a higher risk compared to funds with high levels of industry specialization. However, with regard to portfolio diversification, a high degree of specialization also indicates a possible cluster risk for the fund if one industry strongly dominates the portfolio. The risk-reducing aspect of increasing experience through industry specialization and the risk-increasing aspect of high degrees of industry specialization are opposed to each other; therefore, it might be that, with high levels of industry specialization, the portfolio diversification argument outweighs the risk-reducing aspect of industry specialization, and a decision is made less in favor of the specialized deal abroad.

In order to discern whether there is a difference in the decision to invest abroad based on the degree of specialization, the sample is split into two groups of venture capital funds (see Table 7). The first group only includes funds with low experience gained so far and thus low grades of industry specialization. The second group only includes funds with high experience gained so far and thus high grades of industry specialization. The distinction between the two groups is made on the basis of the bottom (25%) and top (75%) quartiles of the funds that already have industry experience.

The results are in line with the assumptions and hypothesis that, for both the low and high industry specialization groups, the decision to invest abroad is driven by previous experience within an industry. This effect is slightly stronger within the group of funds that have gained less experience by the time of investment than for funds that have already gained a considerable amount of experience. Within the group of funds with lower industry specialization, the probability of investing abroad increases more than threefold with each additional deal. In comparison, the probability of investing abroad within the group of funds with high specialization doubles with every additional deal. It should be noted that the coefficient for the group of funds with high specialization is significant at the one percent level, whereas the coefficient for the group with low specialization is significant only at the ten percent level. Nevertheless, both results indicate the same direction, and it is unclear whether there are substantial differences between the groups.

**********Insert Table 7 about here**********

4.2 Robustness Check

The venture capital industry is mainly located in the North American market, including the United States and Canada (Tykvová 2018). This is also reflected in the sample; 26.12 percent of all deals refer to the North American market. Therefore, it might be questionable whether the results from the entire global data set can be generalized if the results are dominated by the North American market. For this reason, a robustness check excluding the North American market is conducted. The models for the entire sample are calculated in the same way for the reduced data set.

**********Insert Table 8 about here**********

As displayed in Table 8, the results are largely robust to changes in the data set. Except for the moderating effect of the hot entrepreneurial ecosystem, which is not significant. One reason for this could be that many entrepreneurial hotspots domicile companies with digital business models that require less specific experience than, for example, in the high-tech sector, where business models are comparatively more complex. This would be the case for the tech hotspot of Silicon Valley, which is no longer in the data set.

The moderation effect of the financing round is also insignificant. One possible reason for this could be that the certification effects associated with later rounds are less meaningful to investors in the North American market. This can possibly be explained by the different perception of risks accompanying early venture capital investments by American investors compared to investors from other continents. As the American venture capital market is characterized as risk affine (Gantenbein et al. 2019), the risk alongside first round investments carries less weight.

5. Conclusion

This paper analyzes the effects of venture capital funds' industry specialization on their decision to invest abroad. Based on learning theory (Levitt and March 1988), it explains that investors acquire industry-specific knowledge through experience-based learning, which facilitates their investments abroad. This follows the idea that the industry specialization gained through learning effects significantly improves the value enhancement and support of the portfolio company. Furthermore, the study also investigated the interplay between the funds' industry specialization and the characteristics of the target market, as well as the financing-specific characteristics of the portfolio company.

The study provides new insights into the decision-making behavior of venture capital funds. First, there is evidence that, in addition to the frequently studied country-level or network determinants (Patzelt, zu Knyphausen-Aufseß and Fischer 2009; De Prijcker et al. 2012; Vedula and Matusik 2017), fund-level determinants such as industry-specific learning effects also play a role in investment decisions. Therefore, the literature is enriched by analyzing funds primarily on the basis of their own capabilities. Drawing on learning theory, the results show that the probability of investing abroad increases with higher degrees of industry specialization, even though international deals are often associated with higher risk. This illustrates how the liability of foreignness has a varying influence on the investor's investment decision, which depends on the degree of previous learning effects that investors gained within the specific industry to which the deal is assigned. Thus, the results contribute to previous research dealing with strategies to compensate for the liability of foreignness (Devigne et al. 2018).

Second, by interacting the fund-level characteristic of industry-specific learning and resulting specialization with country-level and company-level characteristics, this study adds to the literature by examining the interplay of fund-level, target market, and portfolio company-level determinants in investment decisions, as they might not operate independently (Vanacker, Heughebaert and Manigart 2014; Devigne et al. 2018). If ex ante information asymmetries are lower – e.g., due to an evolved entrepreneurial ecosystem or when investing in companies in later rounds – the importance of a company's own specialization decreases in internationalization decisions. Therefore, these findings provide a refinement of the investigated influencing factors on the decision-making behavior of venture capital investors in an international context.

This study is, of course, subject to some limitations. Within this framework, industry specialization is considered to be equally relevant in all different industries. However, it could be that industry specialization is more important, for example, in research-intensive industries and for venture capitalists investing in complex business models compared to more accessible business models. Furthermore, this would mean that the investors' learning process in more complex industries is slower than in others. Therefore, it might be useful to score the provided industry specializations differently in terms of their learning effects. In addition, this study assumes that the structure of the venture capital fund does not change over the period under consideration. However, investment decisions may also be driven by personnel changes of the investment managers, as well as by having specific knowledge about industries and markets or ties towards a foreign country.

From a deal flow perspective, it might also be the case that investors with greater industry-specific learning effects are more likely to identify specific deals that have a large intersection with their specialization in foreign markets due to greater choices of investment opportunities at an international scope. Specialized investors may have a more dispersed network that is located globally due to the high specificity of the investment focus. It might be possible that specialized investors have to search more intensively for a suitable deal and the only investment opportunity available was in a foreign country. Hence, it would be interesting to investigate whether a venture capital investor had other investment options to select from in addition to the chosen international deal. Furthermore, it is likely that the number of other interested investors in the deal under consideration also plays a role. The consideration of the competitive situation that venture capitalists face within their decision-making process would also be another aspect that could be investigated. Consequently, there is a need for further research that addresses these points and examines venture capital funds' industry-specific learning effects and specialization in the context of international investment decisions more specifically.

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Appendix

Table 1: Summary of variables used in the regressions

Variables used in the regression models.

Variables	Description
Dependent variable	
Cross-border deal	A binary variable equaling one if the deal under consideration is a cross-border deal and zero otherwise.
Independent variables	
Industry specialization	A ratio variable reflecting the proportional experience of a venture capital fund within an industry, measured against all its previous investments. Industry specialization can take on values of zero if no experience has yet taken place within the industry whose deal is being investigated. Industry specialization can take a maximal value of one if all deals a fund has made can be assigned to the industry of the deal under consideration to date.
Hot entr. ecosystem	A dummy variable equaling one if the portfolio company is located in a start-up hotspot and zero otherwise. Start-up hotspots were identified based on Crunchbase data and StartupBlink's Startup Ecosystem Ranking based on the top ten City Ecosystems Rankings. Therefore, portfolio companies located in California, New York, London, Boston, Beijing, Tel Aviv, Berlin, Moscow, and Shanghai are assigned to this category.
Funding round	Variable indicating the financing round in which the deal under consideration takes place. Only initial investments of funds into portfolio companies are included.
Log(Company funding to date)	Logarithm of the amount of financing in US dollars received by a portfolio company up to the respective investment date.
Internat. investment experience	Variable indicating the number of cross-border deals a fund has made until the date of the respective deal.
Log(Age of fund)	Logarithm of the age of the investment fund in years.
Log(Age portfolio company)	Logarithm of the age of the portfolio company in years.
Efficiency legal system (target market)	Efficiency and integrity of the legal system produced by the country risk rating agency Business International Corp. Efficiency of the legal system can take values from zero to ten, where lower scores indicate low efficiency. Data were downloaded from the website of Rafael La Porta at https://faculty.tuck.dartmouth.edu/rafael-laporta/research-publications/.
Financial market depth (target market)	Financial market depth provided by the International Monetary Fund and Financial Index Database, measured as the ratio of market capitalization and private credit of the target nation divided through the gross domestic product. Financial market depth can therefore range from zero to one. Data were downloaded from the website of the IMF at https://data.imf.org/?sk=F8032E80-B36C-43B1-AC26-493C5B1CD33B.
Financial openness (target market)	Chinn-Ito index, measuring a country's degree of capital account openness, is calculated on binary dummy variables that codify the tabulation of restrictions on cross-border financial transactions reported in the IMF's Annual Report on Exchange Arrangements and Exchange Restrictions (AREAER). Financial openness can take values from zero to one. Data were downloaded at http://web.pdx.edu/~ito/Chinn-Ito_website.htm.
Legal classification effects (target market)	Legal classification fixed effects. The variable contains the legal classification of the target nation country based on the "Legal Classification of Investment Nation" by La Porta et al. (1998). Countries are classified as French, English, German, Scandinavian, or Socialist.
Year effects	Investment year fixed effects.
Country effects (target market)	For the portfolio company under consideration, dummy variables indicating the region of the country of the portfolio company are included. Country effects captures Africa, Asia, Europe, North America, and Middle/South America.

Table 2: Descriptive statistics

Summary statistics of variables used in the regression models.

Variables	Obs.	Mean	Std. Dev.	Min	Max
Cross-border deal	61,933	.172	.377	0	1
Industry specialization	61,933	.225	.223	0	.971
Hot entr. Ecosystem	61,933	.406	.491	0	1
Funding round	61,933	2.147	1.841	1	21
Log(Company funding to date)	55,413	17.081	1.620	4.605	23.213
Internat. investment experience	61,933	5.495	18.851	0	267
Log(Age of fund)	61,933	1.551	1.078	0	5.303
Log(Age portfolio company)	61,933	1.325	.879	0	5.537
Efficiency legal system (target market)	61,933	9.676	.873	2.5	10
Financial market depth (target market)	61,933	.919	.154	.003	1
Financial openness (target market)	61,933	.967	.148	0	1
Legal classification effects					
Country effects					
Year effects					

Summary statistics of all variables used in the regression models except the fixed effects variables. Displayed values refer to the observations used in the base model. Summary statistics of the moderator variables are taken from the respective interaction models.

Table 3: Industry specialization

Industry specialization options.

Variable	Industry specialization option	Frequency	Percent
Industry specialization			
	Biotechnology	6,212	10.03
	Communication and media	4,030	6.51
	Computer hardware	1,910	3.08
	Computer software and service	18,545	29.94
	Consumer related	1,771	2.86
	Industrial/Energy	2,472	3.99
	Internet specific	13,504	21.80
	Medical/Health	6,602	10.66
	Other products	2,822	4.56
	Semiconductors	4,065	6.56
	Total	61,933	100.00

Industries in which funds under consideration invest and by which the industry specialization variable is measured on the basis of previous investments within the industry to which the deal under consideration is allocated. Frequency and percentage indicate in which category investments were made in the used dataset. Industry classification is done by Refinitiv Eikon Industry Minor Classification.

Table 4: Pearson correlations (N=61,933)

Correlation coefficients.

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(1) Cross-border deal	1.000							
(2) Industry specialization	0.010*	1.000						
(3) Internat. investment experience	0.191*	0.072*	1.000					
(4) Log(Age of fund)	0.053*	0.051*	0.324*	1.000				
(5) Log(Age portfolio company)	0.039*	-0.057*	-0.026*	0.078*	1.000			
(6) Efficiency legal system (target market)	-0.179*	0.048*	-0.034*	0.043*	-0.068*	1.000		
(7) Financial market depth (target market)	-0.172*	0.068*	-0.019*	0.052*	-0.022*	0.607*	1.000	
(8) Financial openness (target market)	-0.104*	0.056*	-0.022*	0.052*	-0.012*	0.594*	0.798*	1.000
(9) Legal classification effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
(10) Country effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
(11) Year effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

This table displays pairwise correlations for the variables used in the base model. Significance is marked by * at 5%.

Table 5: Variance inflation factors

Variance inflation factors.

Variables	VIF
(1) Cross-border deal	
(2) Industry specialization	1.07
(3) Internat. investment experience	1.15
(4) Log(Age of fund)	1.20
(5) Log(Age portfolio company)	1.05
(6) Efficiency legal system (target market)	4.17
(7) Financial market depth (target market)	3.55
(8) Financial openness (target market)	3.27
(9) Legal classification effects	
(10) Country effects	
(11) Year effects	
Mean VIF	2.21

This table displays variance inflation factors (VIF) for the variables used in the base model.

Table 6: Logistic regression using robust standard errors

Binomial logistic regression results: The impact of industry specialization of venture capital investments and quality signals of the investment opportunity on the probability of investing abroad in a worldwide sample of venture capital deals from 2001 to 2019.

	Model 1		Model 2		Model 3		Model 4	
	Log-Odds	Odds Ratios	Log-Odds	Odds Ratios	Log-Odds	Odds Ratios	Log-Odds	Odds Ratios
Probability of cross-border deals								
Dependent: Cross-border deal								
Independent and interactions:								
Industry specialization	0.262***	1.300***	0.693***	2.000***	0.399***	1.490***	3.821***	45.64***
	(0.0798)	(0.104)	(0.0869)	(0.174)	(0.100)	(0.149)	(0.756)	(34.50)
Hot entr. ecosystem			0.263***	1.301***				
			(0.0551)	(0.0717)				
Industry specialization * Hot entr. Ecosystem			-1.320***	0.267***				
			(0.158)	(0.0422)				
Funding round					0.110***	1.116***		
					(0.0108)	(0.0121)		
Industry specialization * Funding round					-0.0682**	0.934**		
					(0.0292)	(0.0273)		
Log(Company funding to date)							0.254***	1.289***
							(0.0158)	(0.0204)
Industry specialization * Log(Company funding to date)							-0.213***	0.808***
							(0.0443)	(0.0358)
Control variables:								
Internat. investment experience	0.0168***	1.017***	0.0169***	1.017***	0.0169***	1.017***	0.0147***	1.015***
	(0.00569)	(0.00579)	(0.00565)	(0.00575)	(0.00564)	(0.00573)	(0.00498)	(0.00505)
Log(Age of fund)	-0.0290	0.971	-0.0303	0.970	-0.0329	0.968	-0.0574*	0.944*
	(0.0310)	(0.0301)	(0.0310)	(0.0301)	(0.0308)	(0.0298)	(0.0300)	(0.0283)
Log(Age portfolio company)	0.107***	1.113***	0.107***	1.113***	0.0585***	1.060***	0.107***	1.113***
	(0.0196)	(0.0219)	(0.0197)	(0.0219)	(0.0201)	(0.0213)	(0.0208)	(0.0232)
Efficiency legal system (target market)	-0.181***	0.834***	-0.180***	0.835***	-0.185***	0.831***	-0.276***	0.759***
	(0.0401)	(0.0334)	(0.0400)	(0.0334)	(0.0397)	(0.0330)	(0.0429)	(0.0325)
Financial market depth (target market)	-1.390***	0.249***	-1.401***	0.246***	-1.343***	0.261***	-1.323***	0.266***
	(0.211)	(0.0525)	(0.211)	(0.0520)	(0.210)	(0.0547)	(0.225)	(0.0599)
Financial openness (target market)	0.678***	1.970***	0.686***	1.986***	0.684***	1.982***	0.874***	2.396***
	(0.246)	(0.485)	(0.249)	(0.493)	(0.247)	(0.489)	(0.262)	(0.627)
Year effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Legal classification effects (target market)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country effects (target market)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Intercept	1.597***	4.938***	1.507***	4.513***	1.542***	4.675***	-1.851***	0.157***
	(0.422)	(2.085)	(0.424)	(1.912)	(0.412)	(1.924)	(0.465)	(0.0731)
Number of observations	61,933	61,933	61,933	61,933	61,933	61,933	55,413	55,413
Pseudo R-squared	0.1246	0.1246	0.1272	0.1272	0.1282	0.1282	0.1452	0.1452

Results show a binomial logistic regression with the probability of investing domestic or cross-border as the dependent variable. As the independent variable, fund's proportional industry specialization as measured by its past investments to date and their industry classifications is used. Values can therefore range from 0 to 1. Interactions are performed with variables that are expected, indicating high quality and security of the investment opportunity. As other independent variables, several measures referring to the institutional environment of the investment and the experience of the investing funds were included. Heteroscedasticity robust standard errors are in parentheses. Significance at the 1%, 5%, and 10% levels is denoted by ***, ** and *, respectively. Standard errors are clustered by venture capital funds.

Table 7: Logistic regression results for subsamples

Binomial logistic regression results: The impact of industry specificity of venture capital investments on the probability of investing abroad for subsamples covering venture capital funds with low and high industry specialization.

	Industry specialization			
	Low 25%-quartile		High 75%-quartile	
	Log-odds	Odds ratio	Log-odds	Odds ratio
Dependent variable:				
Cross-border deal	1.237*	3.446*	2.049***	2.049***
	(0.750)	(2.583)	(0.566)	(0.566)
Control variables:				
Internat. Investment experience	0.0237***	1.024***	0.0683	0.0683
	(0.00681)	(0.00697)	(0.0599)	(0.0599)
Log(Age of fund)	-0.0466	0.954	0.00982	0.00982
	(0.0566)	(0.0540)	(0.0969)	(0.0969)
Log(Age portfolio company)	0.137***	1.147***	0.203***	0.203***
	(0.0388)	(0.0445)	(0.0513)	(0.0513)
Efficiency legal system (target market)	-0.213**	0.809**	-0.393***	-0.393***
	(0.0982)	(0.0794)	(0.0990)	(0.0990)
Financial market depth (target market)	-2.299***	0.100***	-0.714	-0.714
	(0.517)	(0.0519)	(0.520)	(0.520)
Financial openness (target market)	0.186	1.204	1.702***	1.702***
	(0.525)	(0.632)	(0.516)	(0.516)
Legal classification effects	Yes	Yes	Yes	Yes
Country effects	Yes	Yes	Yes	Yes
Year effects	Yes	Yes	Yes	Yes
Intercept	3.147***	23.28***	1.083	1.083
	(0.888)	(20.67)	(0.935)	(0.935)
Number of observations	10,736	10,736	6,896	6,896
Pseudo R-squared	0.1771	0.1771	0.2317	0.2317

This table displays binomial logistic regression results with the probability of investing cross-border as the dependent variable for subsamples of low and high grades of industry specialization. Low industry specialization includes funds from the 25%-quartile, whereas high industry specialization includes funds from the 75%-quartile. Heteroscedasticity robust standard errors are in parentheses. Significance at the 1%, 5%, and 10% levels is denoted by ***, ** and *, respectively. Standard errors are clustered by venture capital funds.

Table 8: Robustness check – excluding the North American market

Robustness check: The impact of industry specialization of venture capital investments and quality signals of the investment opportunity on the probability of investing abroad in a sample of venture capital deals from 2001 to 2019, excluding the North American market.

	Model 1		Model 2		Model 3		Model 4	
	Log-Odds	Odds Ratios	Log-Odds	Odds Ratios	Log-Odds	Odds Ratios	Log-Odds	Odds Ratios
Probability of cross-border deals								
Dependent: Cross-border deal								
Independent and interactions:								
Industry specialization	0.799***	2.224***	0.860***	2.363***	0.618***	1.856***	2.909**	18.35**
	(0.119)	(0.264)	(0.124)	(0.293)	(0.178)	(0.330)	(1.156)	(21.22)
Hot entr. ecosystem			0.348***	1.417***				
			(0.104)	(0.147)				
Industry specialization * Hot entr. Ecosystem			-0.487	0.614				
			(0.297)	(0.182)				
Funding round					0.205***	1.227***		
					(0.0221)	(0.0271)		
Industry specialization * Funding round					0.0930	1.097		
					(0.0752)	(0.0825)		
Log(Company funding to date)							0.414***	1.512***
							(0.0220)	(0.0333)
Industry specialization * Log(Company funding to date)							-0.136**	0.873**
							(0.0692)	(0.0604)
Control variables:								
Internat. investment experience	0.0704***	1.073***	0.0701***	1.073***	0.0683***	1.071***	0.0557***	1.057***
	(0.0133)	(0.0142)	(0.0132)	(0.0141)	(0.0128)	(0.0137)	(0.0109)	(0.0115)
Log(Age of fund)	-0.000571	0.999	-0.000468	1.000	0.00320	1.003	-0.0202	0.980
	(0.0431)	(0.0431)	(0.0431)	(0.0431)	(0.0431)	(0.0432)	(0.0439)	(0.0430)
Log(Age portfolio company)	0.0146	1.015	0.0210	1.021	-0.0358	0.965	0.0199	1.020
	(0.0272)	(0.0276)	(0.0275)	(0.0281)	(0.0277)	(0.0267)	(0.0301)	(0.0307)
Efficiency legal system (target market)	0.0137	1.014	0.0158	1.016	0.00402	1.004	-0.0510	0.950
	(0.0430)	(0.0436)	(0.0429)	(0.0436)	(0.0430)	(0.0431)	(0.0449)	(0.0426)
Financial market depth (target market)	-0.978***	0.376***	-0.978***	0.376***	-0.964***	0.381***	-0.775***	0.461***
	(0.235)	(0.0883)	(0.235)	(0.0884)	(0.236)	(0.0899)	(0.252)	(0.116)
Financial openness (target market)	0.0787	1.082	0.0321	1.033	0.0932	1.098	0.246	1.279
	(0.276)	(0.298)	(0.276)	(0.285)	(0.276)	(0.303)	(0.304)	(0.388)
Year effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Legal classification effects (target market)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country effects (target market)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Intercept	-0.294	0.745	-0.349	0.705	-0.404	0.667	-6.747***	0.00117***
	(0.493)	(0.367)	(0.492)	(0.347)	(0.484)	(0.323)	(0.560)	(0.000658)
Number of observations	16,176	16,176	16,176	16,176	16,176	16,176	13,160	13,160
Pseudo R-squared	0.1453	0.1453	0.1462	0.1462	0.1575	0.1575	0.1926	0.1926

Regression results robustness check in a sample excluding the North American market. Results show a binomial logistic regression with the probability of investing domestic or cross-border as the dependent variable. As the independent variable, fund's proportional industry specialization as measured by its past investments to date and their industry classifications is used. Values can therefore range from 0 to 1. Interactions are performed with variables that are expected, indicating high quality and security of the investment opportunity. As other independent variables, several measures referring to the institutional environment of the investment and the experience of the investing funds were included. Heteroscedasticity robust standard errors are in parentheses. Significance at the 1%, 5%, and 10% levels is denoted by ***, ** and *, respectively. Standard errors are clustered by venture capital funds.