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**THE INFLUENCE OF EXPERIENTIAL, INHERITED AND EXTERNAL KNOWLEDGE ON
THE INTERNATIONALIZATION OF VENTURE CAPITAL FIRMS**

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ABSTRACT

This paper aims to understand the effect of foreign knowledge accumulation on the internationalization of professional services, by focusing on the European venture capital industry. We distinguish between experiential knowledge acquired through previous activities, inherited knowledge through the international experience of a firm's management team and external knowledge accessed through its foreign network partners. We study how these three sources aid the firm in dealing with the high information asymmetries that characterize cross-border activities of highly intangible professional services. Our results, based on a unique sample of 110 European venture capital firms, provide empirical support for the positive effect of experiential knowledge and inherited knowledge on internationalization. External knowledge, however, has a more limited impact on internationalization. Interestingly, venture capital firms with intense international contacts decrease their international activities. Implications for management scholars and practitioners are highlighted.

Keywords: internationalization, venture capital, organizational knowledge, experiential knowledge, international experience, inherited knowledge, human capital, external knowledge, networks

INTRODUCTION

Increasing globalization is one of the most important developments in the professional service industry. Over the last thirty years, professional service firms have benefited from the possibilities of foreign activities for growth and diversification (Contractor, Kundu & Hsu, 2003; Hitt, Uhlenbruck & Shimizu, 2006). International activities are however associated with a steep increase of information asymmetries (Filatotchev & Wright, 2011). These are particularly pronounced in professional services, due to the knowledge-intensity of these activities and the inherent difficulties for the customers to verify the quality of the service ex-ante and to monitor it ex-post (Sanchez-Peinado & Pla-Barber, 2006; von Nordenflycht, 2010). Despite these characteristics, our knowledge of how professional service firms deal with information asymmetries in cross-border activities is still limited. Venture capital (VC) firms' cross-border investment activities are an interesting example of professional service firms' recent global development. VC firms' value creating activities reside to a large extent in their ability to address information asymmetries and agency issues. The latter are heavily influenced by local market conditions and practices (Filatotchev & Wright, 2011).

A central theme in international business research is the importance of foreign knowledge accumulation that helps firms to deal with internationalization uncertainties (Yli-Renko, Autio & Tontti, 2002). The goal of this paper is to understand how foreign knowledge accumulation influences cross-border activities under conditions of large information asymmetries that characterize internationalization of professional service firms and VC firms in particular. Early internationalization theorists recognized the importance of internal knowledge development (Johanson & Vahlne, 1977). Subsequent findings from early new venture internationalization studies (e.g. Oviatt & McDougall, 1994) showed that relevant foreign market knowledge may originate from outside the focal firm as well (e.g. Autio, 2005; Johanson & Vahlne, 2009). We therefore focus on both internal and external sources of foreign knowledge accumulation in this study: firm-level experiential knowledge acquired through previous foreign investments, inherited knowledge through the prior foreign work experience of its management and external knowledge through its foreign network partners.

A unique international dataset combining survey and archival data from 110 VC firms in five European countries is used as empirical setting. We use a broad definition of VC that includes not only seed and start-up capital but also later stage deals such as buy-outs (Wright & Robbie, 1998). Our results stress the positive effect of foreign knowledge accumulation on the international investment behavior of VC firms. Experiential knowledge has a large effect on international investment activity both in terms of the likelihood and the extent of international investments. Inherited knowledge through previous

international activities of its managers is important as well: the likelihood of being international is more strongly related to inherited knowledge than to experiential knowledge. Our results on external knowledge accumulation point to the importance of the foreign network structure and particularly to the differences between the number of international partners (network range) and the intensity of the cooperation with these partners. While the range of the international network does not have a significant effect on the likelihood of being international, the intensity of cooperation negatively affects it. International VC firms with intense foreign network relationships are more likely to become domestic. Finally, external knowledge accumulation does not affect the extent of international activities.

Our study makes several contributions. This paper advances our understanding of internationalization of professional service firms. As internationalization is associated with a steep increase of information asymmetries and agency issues, it is interesting to study the effects of foreign knowledge accumulation in a setting where these issues are particularly pronounced. In addition, this paper responds to a call for more research on the international development of the professional service industry. Despite the increasing international development of professional services, there is limited knowledge on the drivers of their cross-border activities. In addition, our results add to the general knowledge on the behavior of VC firms. While previous research has stressed the impact of internal and external knowledge accumulation on the outcomes of VC firms' investment activities (e.g. De Clercq & Dimov, 2008), this paper explains the effect of these resources on the investment behavior itself through a focus on the geographical expansion of investments.

The paper is organized as follows. We first describe our theoretical framework including the hypotheses. We proceed with a description of our research methodology and the presentation of our results. Thereafter, we discuss our findings and conclude

2. THEORY DEVELOPMENT AND HYPOTHESES

Cross-border activities increase information asymmetries and agency risks (Filatotchev & Wright, 2011), making a firm's knowledge base especially important for overcoming these problems. Knowledge on operating in foreign markets may be accumulated through three different sources: (i) firm level experiential knowledge, developed through previous international investments, (ii) inherited knowledge, acquired by individual investment managers through their previous managerial experience in an international context and (iii) external international knowledge accessed through a firm's network of foreign co-investment partners.

Information asymmetries and agency risks are especially important for venture capital firms, as they typically specialize in managing these risks through careful screening and due diligence before investing and through actively monitoring the venture after the investment (Manigart et al., 2006). VC firms pursue different strategies to mitigate higher levels of information asymmetries and agency risks in cross-border investments. For example, they may invest in more information-transparent (Dai, Hoje & Kassiech, 2010), use more staged financing (Chemmanur, Hull & Krishnan, 2010) or seek cooperation with a domestic co-investment partner (Meuleman & Wright, 2010). We expand hereafter on how the three different sources of knowledge may also help to overcome problems of information asymmetries and agency risks in cross-border VC investment activities.

2.1. Experiential knowledge

Experiential knowledge is acquired and developed within an organization through its previous experience. International experience has traditionally been proposed as one of the primary sources of knowledge accumulation for international development (Johanson & Vahlne, 1977): internationalization is regarded as a learning process where firms create procedural knowledge about how to handle higher agency risk and related monitoring costs and the higher uncertainties that accompany international activities (Chetty, Eriksson & Lindbergh, 2006). Experiential knowledge can be beneficial in a VC context to assess opportunities and to mitigate information asymmetries. This gradually results in a smoother incorporation of general internationalization knowledge within the firm, positively affecting the perception about its ability to further engage in cross-border activities (Cohen & Levinthal, 1990). As a result of this learning process, firms that develop general internationalization knowledge through past international experiences are expected to further increase their commitment to pursue even more international activities (Johanson & Vahlne, 1977).

The importance of experiential knowledge for reducing information asymmetries in cross-border investments has been recognized in the VC industry. For example, VC firms are less likely to syndicate with domestic partners when they have more international experience (Meuleman & Wright, 2011). This suggests that international experience alleviates information asymmetries and monitoring costs. Moreover, investment in international knowledge development through previous international activities is irrecoverable. This is expected to strengthen the positive relationship between past international experience and future international investment activities. Hence we propose:

H1: Experiential knowledge increases the cross-border investment activities of VC firms.

2.2. Inherited knowledge

In addition to internal knowledge development, we expect the international operations of professional service firms to be positively related with their inherited knowledge (Huber, 1991). Inherited knowledge refers to the previous international work experience of their managers (Sambharya, 1996) and contributes to a stronger understanding of foreign markets. This increases domain familiarity (Cohen & Levinthal, 1990) and enables the development of schemata for dealing with increasing information asymmetries in foreign markets (Takeuchi, Tesluk & Yun, 2005). As such, investors with more inherited knowledge are expected to be more capable of managing international operations and to have a better risk perception concerning foreign market activities (Bruneel, Yli-Renko & Clarysse, 2010). This is particularly important for professional service firms where the professionalization of a firm's workforce largely determines the quality of the services provided (von Nordenflycht, 2010). Its human capital base is therefore important for the implementation of local market conditions in different investment regions (Hitt et al., 2006). In addition, managers with international experience will have better risk perceptions and a more positive attitude towards cross-border activities (Herrmann & Datta, 2006). This will encourage firms to collect and integrate information about international opportunities (Erramilli, 1991) and make them more aggressive in committing relevant resources to international operations (Novicevic & Harvey, 2001).

Inherited knowledge has proven to reduce information asymmetries in the VC industry. For example, VC investors with more experienced managers, hence with more inherited knowledge, provide more value-adding activities thereby improving the success rate of their portfolio firms (Botazzi, Da Rin & Hellman, 2008). In the context of international investing, foreign market knowledge gained through the experience of VC firms' managers increases their attention towards agency issues and market risks which they perceive as more manageable and controllable (Patzelt, Knyphausen- Aufsess & Fischer, 2009). In addition, VC firms with a stronger human capital base learn how to compete with more established investors in foreign regions (Meuleman & Wright, 2011), enhancing their willingness and ability to invest internationally. Therefore, we hypothesize:

H2: Inherited knowledge increases the cross-border investment activities of VC firms.

2.3. External knowledge

An increasing stream of international business literature stresses the importance of networks for foreign knowledge accumulation (Yli-Renko et al., 2002). According to Johanson & Vahlne (2009), knowledge accumulation through foreign partners does not solely provide an opportunity to use or copy the extant knowledge from others, it may result in the development of new knowledge as well. It can hence provide an incentive to internationalize, with or without the aid from the external network partner (Koza & Lewin, 1999).

For VC firms, relevant network relationships originate mainly from syndicated deals with investment partners. Syndication entails a combined equity investment which requires substantial commitments and frequent interactions of investors (Wright & Lockett, 2003). We expect that network partners are furthermore important as a source of external knowledge about international markets. There are two mechanisms through which external network relations may expand a VC firm's knowledge base. First, VC firms depend on the knowledge base of their international co-investors during shared activities. Second, shared investments, whether they are local or international, may create ability to access and incorporate relevant knowledge about non-domestic environments from their international partners (Bruneel et al., 2009).

A foreign network structure is characterized by both the number of partners (or the network range) and the strength of the ties with the partners (or the network intensity) (Uzzi, 1997). We explain below how the range and the intensity of the foreign network may contribute to external knowledge accumulation (De Clercq & Dimov, 2008; Watson, 2007).

Foreign network range is defined as the number of different non-domestic co-investment partners (Zhao & Aram, 1995). We expect that it influences ex-ante information asymmetries and ex-post monitoring issues through several mechanisms. First, having a large international network increases the potential of deal reciprocity thereby reducing information asymmetries in deal sourcing across distance (Sorenson & Stuart, 2001). Second, it diminishes post-investment information asymmetries, particularly if the international partner is willing to take the lead (Meuleman & Wright, 2011). Third, more foreign partners offer more opportunities to acquire knowledge on how to deal with different market conditions, skills and approaches in foreign investments (Lavie & Miller, 2008). This may incentivize VC investors to internationalize, either as a sole investor or with the aid of other partners.

The intensity of the relationship with international partners is also expected to impact knowledge accumulation (Uzzi, 1997) and ultimately international investment activity. Professional service firms often repeat interactions with the same partners to reduce transaction costs and

behavioral uncertainty inherent in the intangible nature of the services rendered (Hitt et al., 2006; Wright & Lockett, 2003). Intense networks signal a higher trust and restrain opportunistic behavior (Wright & Lockett, 2003), further reducing information asymmetries and monitoring costs (De Clercq & Dimov, 2008). A more intense network of relationships hence leads to a higher willingness to invest across distance (Sorenson & Stuart, 2001). Moreover, repeated exchanges facilitate the flow of knowledge and in particular the acquisition of tacit information (Lane & Lubatkin, 1998; Uzzi, 1997). As a result, the firm may be dislodged from its competency traps, stimulating new solutions (Hitt et al., 2006; Lavie & Miller, 2008). Hence, we hypothesize:

H3: External knowledge through foreign network range and foreign network intensity increases the cross-border investment activities of VC firms.

3. RESEARCH METHOD

3. 1. Sample

The hypotheses are tested using a representative sample of VC firms in five European countries: Belgium, Germany, the Netherlands, Sweden and the United Kingdom. These countries are chosen because they are major VC markets that cover a substantial and diverse part of Europe (Manigart, De Waele, Wright, Robbie, Desbrières, Sapienza & Beeckman, 2002).

Our unique hand-collected dataset combines information from questionnaires and archival data sources. Information concerning inherited knowledge was, together with the control variables, collected through postal or e-mail surveys administered in 2002 (in the UK) and 2003 (in the other countries) with senior managers or managing partners as key respondents. The sample was identified through national and European VC associations. Non-member firms that act as VC firms were added. This process resulted in 189 responses (response rate of 34.30%) which compares favorably with rates reported in other recent questionnaires (Cycyota & Harrison, 2006).

Information on international investment partners and international investments required to compute the network variables and the dependent variables, was obtained from the Zephyr-Bureau Van Dijk commercial database. This database has a strong pan-European focus and is thus well suited to develop the variables of interest. To avoid potential biases from cross-sectional research, the dependent variables are measured in a later time period than the independent variables. Hence, only international

activities between 2002-2004 (for the UK) or 2003-2005 (for the other countries) are taken into account. We omitted 53 cases due to missing data in the Zephyr database, 20 cases due to incomplete survey data and six cases due to unreliable data¹. This resulted in a final sample of 110 usable responses (=18.83% of the original sample): 17 Belgian, 28 German, 6 Dutch, 15 Swedish and 44 UK VC firms.

Overall, our sample is broadly representative of the population with some explicable differences. The sample contains proportionally more British firms (40.00% versus 27.40%), while the proportion of Dutch VC companies in our sample is somewhat low (5.45% versus 11.43%). The overrepresentation of UK VC firms is not surprising as these firms are on average larger and more international than Continental European firms, which increases their tendency to respond to the survey and to have information recorded in Zephyr. Compared to the European VC population, the sample contains more (semi-)captive (33.64% versus 26.30%) and less independent firms (56.36% versus 66.90%) (EVCA, 2004). Table 1 describes all variables, both for the total sample and for the subsamples of domestic and international VC firms, and bivariate statistics comparing domestic and international firms.

Insert Table 1 about here

3.2. Variables

3.2.1. Dependent variable: Cross-border investment activity

We acknowledge the multidimensional nature of cross-border investment activity. As the projects undertaken by professional service firms require client and context adapted solutions, they are more vulnerable to increasing complexity and excessive governance costs to manage the information asymmetries in having a larger number of projects (Contractor et al., 2003; O'Farrell, Wood & Zheng, 1998). For this reason, we measure the effect of our variables on two different outcomes of internationalization. First, we model the likelihood of investing internationally. A dummy variable *international VC firm* takes the value of 1 if the VC firm made at least one investment outside the country where its headquarters are located and 0 if all investments were domestic. The sample

comprises 66 (60%) domestic and 44 (40%) international VC firms (see Table 1). Second, we model the degree of international activity, conditional on having made at least one cross-border investment. Therefore, the *number (No) of international investments* made by VC firms with at least one international investment is recorded. International VC firms made on average 6.93 cross-border investments. As this variable is skewed, a log transformation is used in further analyses. Analyzing both the likelihood of investing cross-border and, conditional on investing cross-border, the extent of the international investment activity allows for a more fine-grained understanding of the impact of different sources of knowledge on international activities.

3.2.2. Independent variables

In line with the dependent variable, we incorporate the effect of experiential knowledge through previous international activities using two variables: a *dummy variable of experiential knowledge* indicating whether the VC firm was international in the previous period and a variable that measures *experiential knowledge in terms of the number (No) of previous international deals*. Both are obtained from the Zephyr database. An average VC firm made 2.17 cross-border investments in the period 2001-2002 (or 2000-2001 for UK VC firms). This variable is skewed and therefore log transformed.

Inherited knowledge is a self-reported variable. Respondents indicated the percentage of executives with international work experience prior to their current position. This variable quantifies the cultural and regulatory knowledge obtained together with the ability to build relevant expertise, organizational learning and a global mindset (Sambharya, 1996).² On average, 45% (median 37%) of the executives have international work experience.

External knowledge is measured through foreign network range and foreign network intensity. These variables are derived using information from the Zephyr database, based upon investments during 2001-2002 (for UK VC firms: 2000-2001). *Foreign network range* is defined as the number of foreign syndication partners with at least one co-investment with the focal VC firm, and is on average 7.99. As it is skewed, the log of this variable is used in the analyses. To avoid missing values for firms without international syndication partners, a constant (0.1) is added.

Foreign network intensity quantifies VC firms' tendency to work multiple times with the same foreign investor. We first counted the number of investments the focal VC firm made together with the same foreign investor. If the firm made at most one co-investment together with all foreign syndication partners, its network intensity is set to 0. If the firm had more than one co-investment with at least one

foreign partner, the average number of co-investments per foreign partner was calculated. Foreign network intensity is equal to that average minus one. As such, we calculate the average number of subsequent investments with the same foreign partner. For example, if a VC firm with four foreign syndication partners made two investments with foreign syndication partners A and C and one investment with syndication partner B and D, it has an average network intensity of $0.50 = [(2+1+2+1)/4 - 1]$. The average foreign network intensity in our sample is 0.07.

3.2.3. Control variables

In line with previous research, we control for *investment stage focus*, distinguishing between early stage and later stage investors (Hall & Tu, 2003). Fifty seven firms invest in later stage deals, with 46 investing in both early and later stage deals. We further include *fund size* and the *number of investment executives* in our analyses to capture the influence of size (Hall & Tu, 2003) and general human resources (Hitt et al., 2006). The average VC firm has a fund size of €550 million and has 9.59 investment executives. The log of these two measures is included. We also take into account if the VC firm is government related or not (dummy variable: *Public VC firm*), because government related firms may have a more local investment strategy. Finally, we controlled for the origin of the VC firm by including a dummy variable taking the value of 1 if the VC firm is British, as the UK VC market developed earlier than in Continental Europe. As a consequence, British VC firms are on average larger and invest more internationally. This variable contributes towards capturing the UK VC market as the most mature and the Continental European countries being at similar stages of development.

3.3. Comparison of international versus domestic VC firms

Table 1 presents bivariate statistics distinguishing between domestic and international VC firms. All independent variables differ significantly between the subsample of domestic versus international firms. 75% of the international VC firms have developed experiential knowledge through international experience in the previous time period, compared to only 15% for domestic VC firms. International investors made on average more international investments in the previous period (4.80 compared to 0.42). In addition, 56% of the executives of international VC firms have international work experience, compared to 39% for domestic VC firms. International VC firms have a higher foreign network range (16.89 compared to 2.06) and cooperate more with the same foreign network partner (0.08 versus 0.06) than domestic VC firms. This implies that international VC firms make on average a second investment

with 1 out of 12 foreign network partners compared to 1 out of 15 for domestic firms. In addition, international VC firms have a significantly larger fund size (€984 million compared to €232 million) and employ significantly more investment managers (14.18 versus 6.53). They do not differ significantly in terms of investment stage, the proportion of public VC firms and the proportion of UK firms.

3.4. Method of analysis

We eschewed employing a zero inflated negative binomial regression model as this method may cause substantial discrepancies in small to medium sized samples (Gujarati, 2003) and because test results showed that the log transformation of the dependent variable is not skewed. Instead, we adopted a Heckman two-stage model to analyze the cross-border investment activities of VC firms, estimating first the probability of investing cross-border in a selection equation and, conditional on investing cross-border, estimating the number of cross-border investments (Estrin, Meyer, Wright & Foliano, 2008; Heckman, 1979). The latter is estimated through an OLS regression which includes the ‘inverse Mills ratio’, an estimate based on the selection regression that measures the existence of international investments (Li & Prabhala, 2007). To avoid multicollinearity issues, there should be at least one instrument that affects the probability of foreign investments, but not the number of foreign investments. We therefore include whether the VC firm is government-related or not in the selection equation, as most public VC firms have a purely domestic focus. Being a government related VC firm should therefore only impact the selection equation. Further, experiential knowledge is measured through a dummy variable in the first step and through a continuous variable (log number of cross-border investments in the previous time period) in the second step of the analyses.

Table 2 provides an overview of the correlations between the variables. With respect to the control variables in our study, there is a high correlation between the number of investment executives and fund size. For this reason, two separate models are estimated: the first model includes fund size only, while the second model includes the number of investment executives only. Concerning the correlations between our independent variables, there is no correlation problem between the two measures of experiential knowledge as they are used in different regression steps. Table 2 furthermore shows that experiential knowledge is highly correlated with external knowledge in terms of the foreign network range. This is not surprising as firms that invest abroad are more likely to co-invest with a larger range of non-domestic partners. There is also a positive and significant correlation between experiential knowledge and the intensity of foreign network relationships but this is relatively low. Variance inflating

factors were calculated and range between 1.16 and 4.07. The latter corroborate the limited threat of multicollinearity.

Insert Table 2 here

4. RESULTS

The results of the multivariate analyses are presented in Table 3. Model I includes fund size and Model II includes the number of investment executives as indicators of the size of the VC firm. The left hand columns in each Model show the regressions that focus on the control variables only. In line with previous findings, VC firms with larger investment funds and more investment managers are more likely to invest across borders (e.g. Hall & Tu, 2003). We furthermore find that VC firms who invest solely in later stage deals are less inclined to operate internationally compared to VCs with an pure early stage or a more generalist approach. These effects are however only significant in the control models. Moreover, the Mills ratio is not significant in most models. Consequently, we conclude that the results would not change substantially if the second step of the regression was estimated through an OLS regression, but that inclusion of the Mills ratio is necessary due to the potential of a bias (Estrin et al., 2008).

Insert Table 3 here

The right hand columns in each Model present the regressions including the independent variables. The multivariate analyses provide strong support for hypothesis 1, which predicts that VC firms with more experiential knowledge will be more international. Both the likelihood of investing internationally and the number of international investments are significantly ($p < 0.01$) and positively associated with experiential knowledge developed in the previous period. The odds of investing internationally are around 7.5 times higher (7.45 in Model I and 7.83 in Model II)³ for VC investors with cross-border investing experience in the previous period. In addition, a percentage increase in international investment experience is related to an increase in international investments of 0.42 percent (0.47 in Model II), conditional on being international. This implies that for an average

international VC firm with two international investments in the previous period, having an additional international investment will increase the number of international investments in the subsequent period with 21%. The latter shows the high impact of experiential knowledge on the cross-border activities of VC firms, both in terms of the number and the likelihood of international investing.

Hypothesis 2 suggests that VC firms with more inherited knowledge will be more international. Table 3 shows a significantly ($p < 0.05$) positive effect in the first step of the Heckman regression. More specifically, for an average firm with 10 investment managers of which 45% have international experience, adding one investment manager with international experience increases the odds of being international by on average 18.7 % (Model I) or 22.2 % (Model II). The influence of this variable on the number of international investments is also supported ($p < 0.10$). Adding one investment manager with international experience to an average international VC firm increases its number of international investments by 3.6% (Model I) or 3.9% (Model II), pointing to a relatively low economic impact. Hypothesis 2 is hence supported.

Hypothesis 3 suggests a positive relationship between external knowledge and the VC firm's cross-border investment behavior. The results indicate that external knowledge measured as foreign network range does not have a significant impact on the likelihood of international investing if VC firm fund size is taken into account (Model I). When the number of executives is included in the regression model, the variable is positive and marginally significant at a 10% level. Foreign network range is not significantly related to the number of international investments.

VC firms with a more intense foreign network have a significantly ($p < 0.05$) lower probability of investing internationally, in contrast to hypothesis 3. The economic effect of this relationship is substantial. The average VC firm in our sample has a foreign network intensity of 0.07 which equals an average number of subsequent investment with one out of fourteen non-domestic network partners. If it would double its foreign network intensity, it would decrease the odds of being international by 30.30%. Further, foreign network intensity is not associated with the number of international investments, conditional on investing internationally. Hypothesis 3 is hence not supported.

Additional analyses were performed to further investigate the negative relationship between foreign network intensity and the likelihood of investing internationally. We split the foreign network intensity variable in two: one variable measures foreign network intensity for firms that were international in the previous period, while a second variable measures foreign network intensity for firms that were domestic. Table 4 provides the results. Firms with previous international experience significantly decrease their propensity to remain international if they have a larger foreign network

intensity. The negative effect of foreign network intensity is far less important for firms with no international experience in the past years, however. Overall, hypothesis 3 is not supported.

Insert Table 4 here

5. DISCUSSION

The highly intangible activities of professional service firms pose major challenges for their internationalization. Through a focus on the VC industry, we highlight the effect of three different sources of knowledge accumulation that originate internally or externally to the firm. We thereby consider internationalization in terms of both the likelihood and the number of cross-border investments.

Our findings stress that especially experiential knowledge built up through previous international activities facilitates cross-border investments. The large and positive effects of this variable on both the likelihood and the number of international activities indicate that dealing with the potential issues of different local institutional contexts is a learning process. In addition, knowledge inherited through previous international experience of a VC firm's investment managers has an important and positive influence on its international activities. This relationship is strongest in terms of the likelihood of international investing. Professional service firms with international aspirations can hence build upon inherited knowledge to reduce the information asymmetries of cross-border investing, even if they have relatively low international experience.

Interestingly, external knowledge developed through foreign network partners in a previous period does not show the expected positive association with international investment activities in a subsequent period. First, we fail to find an effect of the number of international investment partners. Two possible reasons may explain this. There is increasing awareness that professional service firms are not inclined to follow their network partners abroad if they do not have the strategic intent to internationalize (Hitt et al., 2006). They may hence ignore information or not respond positively to invitations for international cooperation if they do not have a clear and strong internationalization strategy. Further, non-domestic network partners might be unwilling to invite the focal VC firm for non-

domestic investments if they assume that the VC firm lacks other sources of foreign knowledge. Additional research may provide more detailed insights into the underlying reasons and the role of foreign network partners in internationalization strategies. Second, our results suggest that foreign network intensity is negatively related to the likelihood of investing internationally, but not to the number of international investments. These findings add to reservations about an overly positive view about the influence of intense network relationships for international development (Ojala, 2009). This also advances our knowledge on the effects of network embeddedness. While intense network reduce the transaction costs of activities characterized by a high information asymmetry, they could insulate firms from other sources of external knowledge (Yli-Renko et al., 2002). As professional service firms with strong ties can easily turn into familiar partners, this could create a preference to search inside their established information channels. The latter is however important for the international growth of knowledge-intensive firms (Chetty & Agndal, 2007). We thereby add to previous research indicating that professional service firms should balance the cost and benefits of working with trusted partners with the need to develop a central position in a larger network (Meuleman, Lockett, Manigart & Wright, 2010). We find that firms that reduce agency issues by working in intense network relationships are less likely to operate in environments that are characterized by increasing agency issues. Firms that want to continue to invest internationally may be particularly hampered. This does not necessarily imply that international network relationships have an overall negative influence. Our results do not indicate that international network partners decrease the propensity to be international. However, VC firms are less likely to be international if they have especially intense relationships with their existing international partners.

5.1. Managerial implications

Our results have important managerial implications for professional service firms, and VC firms in particular. While previous research has stressed the need for a well-developed human resource function in multinational organizations (Reiche, 2008), only a small number of firms focus on global talent management (Collings, Scullion & Dowling, 2009). Given the importance of executives with cross-border working experience, professional service firms should pro-actively develop a human resource management that specializes in the search and retention of international management talent. In addition, VC firms with international aspirations have to reflect on their cooperation with non-domestic syndication partners. While they may provide a first contact with international markets, overly intensive

contacts may constrain the continuity of their international development. Hence, this may prove a suboptimal strategy. Knowledge-intensive firms should in contrast actively build a broad social network fostering international development (Yli-Renko et al., 2002).

5.2. Limitations and future research directions

This research is not without limitations, which provide avenues for future research. We measured international exposure in terms of the existence and the number of international investments. While beyond the scope of our current study, future studies could consider additional outcomes such as the number of countries in which the firm has international investments or its mode of entry in international markets. In addition, despite the care taken to achieve rigor, the operationalization of the independent variables implies some limitations. Due to lack of data, we were only able to measure experiential and external knowledge over a limited time period as the Zephyr database only started in 1997 and its coverage is rather low in the first years. Our approach hence implies that the effects of experiential and external knowledge fade away over time. It would be interesting to understand the longevity of the effect of experiential and external knowledge, however. Finally, external knowledge might be gained through other network partners, for example domestic syndication partners that have relevant international investment experience, international shareholders or service providers such as lawyers or consultants. Future research could test to what extent these partners are substitutes for foreign syndication partners, or whether they complement them in different ways.

6. CONCLUSION

Through the focus on venture capital firms, this paper studied the effects of foreign knowledge accumulation on the international development of professional service firms. Using a unique international dataset, we have shown that dealing with the increased complexities of international investing is a learning process where professional services build upon their experiential knowledge. In addition to internal sources of knowledge accumulation, inherited knowledge and external knowledge had also an influence on cross-border investments. In sum, this paper has advanced our understanding of how different types of knowledge enable or constrain dealing with severe information asymmetries and agency issues inherent in the international activities of intangible service providers.

NOTES

1. For each of the cases, we checked whether they had a very low number of national, international or total investments. If one of these figures was very low according to the database, we checked other sources (firms' websites, newspaper articles, ...) to ensure that the data provided by the database were reliable. For six VC firms, this was not the case. Hence, these cases were omitted.
2. An alternative approach is to collect information on the foreign work experience of its executives from the website of the VC firm. This information is however often unavailable or incomplete (Patwelt et al., 2009), especially in the context of our study. We therefore rely on survey information.
3. The calculation of the economic significance of the variables of the selection model is based on the corresponding logit model instead of a probit model. In a probit model, the evaluation of the economic effect depends on the chosen start value. In addition, the interpretation of an odds ratio is far less tedious than the interpretation of the coefficients of a probit model (Gujarati, 2003).

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Table 1

International versus domestic VC firm characteristics

	<i>Total sample</i>						<i>International VC firms</i>					<i>Domestic VC firms</i>							
	<i>ean</i>	<i>ed</i>	<i>D</i>	<i>in</i>	<i>ax</i>		<i>ean</i>	<i>ed</i>	<i>D</i>	<i>in</i>	<i>ax</i>	<i>ean</i>	<i>ed</i>	<i>D</i>	<i>in</i>	<i>ax</i>			
International (Dummy)	10	.40	0	.49	0	1													
No of international investments ¹	4	6.93	4.50	7.94	1	38													
Experiential knowledge through previous international investments (Dummy)	10	.39	0	.49	0	1	4	.75	1	.44	0	1	6	.15	0	.36	0	1	*
Experiential knowledge through the number of previous international investments ¹	10	2.17	0	5.35	0	31	4	4.80	1.50	7.50	0	31	6	.42	0	1.72	0	13	*
Inherited knowledge	10	.45	.37	.35	0	1	4	.56	.60	.37	0	1	6	.39	.33	.31	0	1	
External knowledge through foreign network range ¹	10	7.99	1	19.48	0	121	4	6.89	5.00	8.06	0	21	6	2.06	0	.11	0	28	*
External knowledge through foreign network intensity	10	.07	0	.17	0	1	4	.08	0	.13	0	.50	6	.06	0	.19	0	1	*
Later stage deals included (Dummy)	10	.52	1	.50	0	1	4	.50	.50	.51	0	1	6	.53	1	.50	0	1	
Both stages included (Dummy)	10	.42	0	.50	0	1	4	.41	0	.50	0	1	6	.42	0	.50	0	1	
No of investment executives ¹	10	9.59	6	10.82	1	70	4	4.18	9	5.06	2	70	6	6.53	5	4.73	1	26	*
Fund size ¹	04	50	39	223	2	200	4	84	55	696	22	200	0	32	69	20	2	750	*
Public VC firm (Dummy)	10	.05	0	.23	0	1	4	.02	0	.15	0	1	6	.08	0	.27	0	1	
UK VC firm (Dummy)	10	.40	0	.49	0	1	4	.48	0	.50	0	1	6	.35	0	.48	0	1	

¹ The log of this measure is included in the multivariate analyses.

Significance levels indicate test results from differences between international and domestic VC firms (Chi-square tests or Mann-Whitney tests).

Significant at (**) 1%, (*) 5% or (†) 10% on a two-tailed test.

Table 2

Correlation matrix of the variables included in the regressions

											0.
1. Experiential knowledge through previous international investments (Dummy)	.00										
2. Experiential knowledge through the number of previous international investments	85	.00									
3. Inherited knowledge	.12	10	.00								
4. External knowledge through foreign network range	72	76	.15	.00							
5. External knowledge through foreign network intensity	21	30	.03	.46	.00						
6. Later stage deals included (Dummy)	.02	.06	.35	.09	.11	.00					
7. Both stages included (Dummy)	.07	.10	.25	.02	.05	.82	.00				
8. No of investment executives	.40	.49	.11	.44	.10	.32	.22	.00			
9. Fund size	.47	.54	.11	.49	.19	.36	.22	.84	.00		
10. Public VC firm (Dummy)	.19	.16	.12	.07	.02	.09	.04	.03	.06	.00	
11. UK VC firm (Dummy)	.14	.15	.19	.06	.09	.42	.40	.34	.38	.20	

All correlations with absolute values above 0.18 are significant ($p < 0.05$).

Table 3

Results of the multivariate regression analyses (Heckman two-step analyses)

<i>Step 1: Internationalization (Dummy)</i>		<i>Model I</i>			<i>Model II</i>							
range intensity	Experiential knowledge (Dummy)		.16	1	44)**	(.	.20	1	41)**	(.		
	Inherited knowledge		.04	1	52)*	(.	.20	1	51)*	(.		
	External knowledge: Foreign network		.41	.	28)	(.	.49	.	26) †	(.		
	External knowledge: Foreign network		3.22	-	1.38)*	(.	2.91	-	.31)*	(1		
	Later stage deals included (Dummy)	1.26	-.52)*	(.	.64	-	65)	(.	.82	-	48) †	(.
	Both stages included (Dummy)	.56	-.50)	(.	.01	-	59)	(.	.28	.	48)	(.
	No of investment executives							.82	1	46)**	(.	
	Fund size	.16	1	.24)**	(.	.74	.	31)*	(.			(.
	Public VC firm(Dummy)	1.06	-.68)	(.	.08	-	76)	(.	.89	-	63)	(.
	UK VC firm (Dummy)	.14	-.33)	(.	.43	.	39)	(.	.12	.	31)	(.
	Intercept	2.21	-.49)	(.	2.47	-	75)**	(.	1.48	-	37)	(.
	2.13	-.67)**	(.					2.13	-	67)**	(.	
<i>Step 2: Number of international investments</i>		<i>Model I</i>			<i>Model II</i>							
deals)	Experiential knowledge (No international		.42	.	12)**	(.	.47	.	13)**	(.		
	Inherited knowledge		.36	.	19) †	(.	.39	.	21) †	(.		
range	External knowledge: Foreign network		.01	-	12)	(.	.06	.	13)	(.		
	External knowledge: Foreign network		.06	-	65)	(.	.06	-	68)	(.		
intensity	Later stage deals included (Dummy)	.65	-.40) †	(.	.15	-	22)	(.	.33	-	37) †	(.
	Both stages included (Dummy)	.25	-.27)	(.	.06	-	20)	(.	.05	.	27)	(.
			.22	-	21)	(.	.22	-	21)	(.		

No of inv executives													
Fund size	87	.32**	(.41)	.13**	(.13)	.24	.61)	(.43)	.22)*	(.22)			
UK VC firm (Dummy)	.25	.16)	(.07)	.14)	(.14)	.07	.18)**	(.05)	.15)	(.15)			
Intercept	1.61	1.00)	(.75)	.43) †	(.43)	.86	.95)	(.36)	.40)	(.40)			
Mills ratio	50	.44)	(.37)	.24)	(.24)	52	.52)	(.41)	.25) †	(.25)			
Wald test	3.97	*	*	5	**	2.91	*	*	4	*	*	*	*
N	104	1	104	1	10	10	1	10	1	10			

Regression coefficients are displayed in the table, standard errors in parentheses.

Significant at (**) 1%, (*) 5% or (†) 10% on a two-tailed test.

Table 4

Sensitivity analysis: detailed analyses of foreign network intensity (probit analyses)

<i>Step I: Internationalization (Dummy)</i>	<i>Model I</i>		<i>Model II</i>					
Experiential knowledge (Dummy)		.24	.48)*		.25	.46)**		
Inherited knowledge		.08	.53)*		.22	.52)*		
External knowledge: Foreign network range		.38	.29)		.47	.27)†		
External knowledge: Foreign network intensity for VC firms that were international in the previous period		3.39	1.44)*		3.01	1.37)*		
External knowledge: Foreign network intensity for VC firms that were domestic in the previous period		2.22	2.61)		2.39	2.43)		
Later stage deals included (Dummy)	1.26	.52)*	.62	.65)	- .82	.48) †	.18	.62)
Both stages included (Dummy)	56	.50)	.01	.59)	.28	.48)	.21	.58)
No of investment executives					1.8	.46)**	.03	.62)†
Fund size					2			
Public VC firm (Dummy)	.16	.24)**	.74	.32)*				
UK VC firm (Dummy)	1.06	.68)	.12	.77)	- .89	.63)	.14	.73)
Intercept	.14	.33)	.42	.39)	.12	.31)	.61	.38)
LR Chi ²	2.21	.49)	2.54	.78)**	1.48	.37)	2.15	.68)**
Log likelihood	2.74		0.17	*	22.		9.82	*
N	54.48		40.77		10		62.98	
					110		44.12	
	04		04				10	

Regression coefficients are displayed in the table, standard errors in parentheses.

Significant at (**) 1%, (*) 5% or (†) 10% on a two-tailed test.