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**DO HUMAN CAPITAL AND FUND CHARACTERISTICS DRIVE FOLLOW-UP
BEHAVIOUR OF EARLY STAGE HIGH TECH VCS?**

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ABSTRACT

This paper uses a unique dataset to examine the neglected but important issue concerning the relationship between the human capital and fund characteristics of venture capitalists and post-investment follow-up behavior in early stage high tech investments. We found no indication that involvement in monitoring activities by the investment manager is determined by either fund or human capital characteristics. In relation to value-adding activities, human capital variables were the most important, with previous consulting experience and entrepreneurial experience contributing to a higher involvement in value-adding activities. Furthermore, the diversity of an investment manager's portfolio was negatively related to involvement in value-adding activities. Finally, with respect to fund level characteristics, we found that investment managers of captive funds were less involved in value-adding activities.

Keywords: venture capital, early stage high tech firms, post-investment follow-up behavior, human capital, fund characteristics.

1. INTRODUCTION

Increasing concern about the performance of early stage high tech firms has focused on their ability to access to two key resources, finance and human capital expertise. In principle, venture capital (VC) firms can provide both but there are major questions about the extent to which this occurs (Lockett, Murray, and Wright, 2002). This concern is particularly prevalent in Europe where there has traditionally been more emphasis on later stage investments (Martin et al., 2002; Murray, 1999; EVCA, 2003).

Previous research has focused on the nature of post-investment follow-up behavior and in particular monitoring and value-adding activities. This research has mainly considered the portfolio company and has focused on the initial stages of the company (Sapienza, Amason and Manigart, 1994; Gomez-Meija, Welbourne and Wiseman, 1990), the business experience and/or background of the CEO/entrepreneur (ibidem), venture performance (Gomez-Meija, Welbourne and Wiseman, 1990; Lerner 1995), agency risks and uncertainty (Sapienza, Manigart and Vermeir, 1995) etc.

The literature has shown that VCs monitor and add value to the companies in which they invest (Sapienza, Manigart, Vermeir, 1995; Van den Berghe and Levrau, 2002; Schefczyk and Gerpott, 2001). A major omission is research focusing on the human capital of VC investment executives and the characteristics of VC funds as determinants of post-investment follow-up behavior. Some research has contrasted VCs that are more versus less closely involved (MacMillan, Kulow and Khoylian, 1989; Sweeting and Wong, 1997), while Dimov and Shepherd (2005) have considered the link between human capital and VC investment performance.

Researchers have mainly considered the venture industry as a whole. Yet, both the skills of VC funds and the needs of investee companies are heterogeneous. The early stage high tech sector raises particular issues since these firms need relationships with VCs to access human capital and financial resources that will help them to meet the challenge of realizing new opportunities. Not all VC firms may be capable of providing these specific resources (Lockett, Murray and Wright, 2002). Thus, entrepreneurs need to be aware of the differences within the early stage high tech VC industry to identify the right investor for their needs.

This paper aims to fill the important gap in the literature concerning understanding of the determinants of the differences in post-investment follow-up behavior by VCs. Using a unique, hand-collected dataset of European early stage high tech investors, the paper examines the extent to which human capital and fund characteristics are determinants of follow-up behavior. A distinction is made between monitoring and value adding activities. Monitoring performance is carried out to address information asymmetries and agency conflicts, whereas value-adding activities are aimed at improving investment outcomes. Differences in human capital and fund characteristics may influence the extent and effectiveness of these activities.

The paper unfolds along the following lines. We begin with an outline of the theoretical background of the study and formulation of the hypotheses. Second, we discuss the methodology used. Third, we present the results. The paper ends with a discussion of the conclusions and policy recommendations.

2. CONCEPTUAL FRAMEWORK

This section provides an overview of the conceptual issues relating to the nature and intensity of VC involvement and how this is influenced by human capital and fund characteristics.

The nature and extent of venture capitalist involvement

An agency theory perspective is appropriate to examine the involvement by venture capital firms with their investees (Bruton, Fried and Hisrich, 1998). Agency theory applied to listed corporations with diffuse ownership and control recognizes that, because of incomplete contracts, there is a need to check self-serving behavior by managers (Hart, 1995). This perspective distinguishes between decision management, which refers to the initiation and implementation of decisions, and decision control, which concerns the ratification and monitoring of lower level decisions (Fama and Jensen, 1983). This separation enables management/entrepreneurs with specific skills to run the enterprise while outside investors assist in the making of unbiased decisions.

Entrepreneurs, by virtue of being intimately involved in their venture, are likely to possess greater information about it than are VCs who may find it difficult to access this information even with extensive due diligence. This information asymmetry leads to agency conflicts (Gompers, 1995). Agency theory suggests that although the entrepreneur can autonomously take certain decisions, part of the costs resulting from these decisions will be borne by the remaining shareholders, giving rise to problems of moral hazard. Agency costs may be especially important in high tech companies, where investors usually cannot evaluate the technology and have difficulties in assessing the commercial implications of strategic choices. With significant equity blockholding, VCs have the incentive to become active in decision control (Wright and Robbie, 1998) which includes exerting costly effort to improve outcomes (Kaplan and Strömberg, 2001).

The main reason for VCs to be involved in value-adding activities is to improve outcomes through some form of mutual cooperation with the entrepreneur (Repullo and Suarez, 1990; Cable and Shane, 1997). Entrepreneurs specialize in the development of knowledge about combining resources to exploit new opportunities (Kirzner, 1973) and in the day-to-day development of new business activities (MacMillan, Kulow and Khoylian, 1989), while VCs focus mainly on creating networks to reduce the cost of acquiring capital, to find customers and suppliers and to establish the venture's credibility (ibidem; Lam, 1991). VCs also advise their ventures, helping entrepreneurs to formulate their business strategy, and identifying appropriate management (Steier and Greenwood, 1995). Since it is not feasible to specify contractually all potential contingencies, VCs also typically play a role in decision management. This involvement helps to protect the interest of the VC, to ameliorate the problems of information asymmetry and to add value to the venture (Sahlman, 1990).

Agency and resource based theories offer some rationale as to *why* VCs involve themselves in monitoring and value adding activities. Studies have analyzed which specific monitoring and value-adding activities certain VCs undertake but few researchers have focused on *whether* VCs differ in their emphasis and time commitment to follow-up activities and *how* it can be explained.

To explore these questions further, we consider two factors that differentiate between VCs: first the human capital of the investment manager and second, the

characteristics of their funds. We subsequently explore the nature of these factors and their possible relation with follow-up behavior.

Human capital and venture capital involvement

Human capital is an important contributor to organizational strategy and performance (Dahlqvist, Davidsson and Wiklund, 2000; Gimeno et al., 1997; Ucbasaran, Wright and Westhead, 2003). Dimov and Shepherd (2005) demonstrate the importance of human capital in their study of the relationship between the education and experience of the top management teams of VCs and their firms' performance. The skills of VC executives influence their ability both to identify suitable high tech investments and to monitor and add value to them subsequently (Lockett, Murray and Wright, 2002). Human capital theory suggests that individuals with greater human capital achieve higher performance in executing relevant tasks (Dimov and Shepherd, 2005). Greater human capital, both qualitatively and quantitatively, is associated with better performance at a particular task (Becker, 1975). Human capital can be divided into two: general human capital concerns the overall education and practical experience of an investment manager, while specific human capital refers to education and experience within a particular activity (Gimeno et al., 1997; Becker, 1975; Ucbasaran, Lockett, Wright and Westhead, 2003). While the quantitative effects of human capital on organizational performance have been studied, there has been relatively little attention to the qualitative specific and general dimensions, especially in respect of the contribution of VCs to their investee portfolio companies (for exceptions in relation to habitual entrepreneurs see Ucbasaran, Wright and Westhead (2003) and for VCs see Dimov and Shepherd (2005)). It is especially pertinent, therefore, to adopt a human capital perspective in examining the behavior of investment executives.

We build on self-efficacy theory to explain how the human capital of investment managers may influence their follow-up behavior. Self-efficacy theory suggests that people who think they can perform well at a task do better than those who think they will fail (Gist and Mitchell, 1992). Thus, people perform activities and pick social environments they judge themselves capable of managing (Wood and Bandura, 1989). More experience in a certain task will increase self-efficacy in that task. This contributes

to the development of a strong sense of efficacy through mastery experience. In the context of this study, self-efficacy theory posits that individuals with greater experience achieve higher performance in executing pre-and post-investment activities. In an early stage high technology venture capital context, we argue that experience will relate to experience of specific industry sectors. That is, an investment manager who focuses on a more narrow range of industries will have greater experience of those industries than an investment manager who has a more diversified portfolio. This is because experience is often more relevant to the individual when it occurs in similar circumstances (*ibidem*). In addition, specialization at the investment management level may lead to information and networking advantages through the development of social capital.

Fund characteristics and venture capital involvement

Two theories provide guidance into why funds might differ in following up on their portfolio companies: strategic investment (Hellman, 2002) and portfolio theory.

First, strategic investment theory suggests that shareholders of funds may have different objectives and different measures for assessing a fund's success. Public shareholders in high tech VC funds mainly focus on creating technological renewal, as this is expected at a macro level to increase employment rates and stimulate economic growth. In contrast, financial institutions look for complementarities between their VC and lending activities and therefore measure the success of the fund both by the return of the fund itself and the returns on other activities generated by the investment (*ibidem*).

The incentive system for investment managers is also influential. Investment managers at non-captive VC companies are under more pressure to generate high profits compared to captive VCs. Profit-oriented VCs more frequently offer carried interest to investment executives than public sector VCs, which aligns their interests in generating profits with those of the investors (Weber and Dierkes, 2002). A high profit orientation of VCs suggests they will provide greater post-investment management support to increase the chances of achieving these performance targets (Engel, 2004).

Second, portfolio theory suggests that having a portfolio of investments minimizes risk while maximizing the overall portfolio return. In constructing an investment portfolio, VCs can follow two strategies. Traditional finance theory argues

that portfolio diversification reduces total portfolio risk. The resource-based view (RBV), however calls for portfolio specialization to minimize the risk of individual investments (Manigart et al., 2002; Sapienza and Gupta, 1994). From the RBV perspective, investors should specialize by constructing a portfolio of investments that are within their specific technical and product expertise (Manigart et al., 2002). Given the complexities of technologies, it is critical that the professional investor is highly informed on both technical and commercially related issues (Murray, 1998). Thus, some VCs manage risk by specializing in certain technology areas rather than by diversification across several technologies. Thus, the degree of specialization at the fund level impacts involvement in following up behavior.

3. THE MODEL AND HYPOTHESES

Drawing on the theoretical perspectives elaborated above, this section formulates hypotheses for VC involvement in both monitoring and value-adding activities. The conceptual framework behind the hypotheses is summarized in Figure 1.

Insert Figure 1 About Here

Involvement in Monitoring Activities

VCs tend to spend little time monitoring well-performing investments, but may be highly involved in monitoring those that are poorly performing (Lerner, 1995). Monitoring activities may not be related to the human capital and financial characteristics of the VC firm. Monitoring may be necessary to avoid losses but not sufficient to create value added. As such it is an institutionalized professional feature of the VC industry (Bruton, Fried and Manigart, 2005), adopted by each VC. The European Venture Capital Association Book of Guidelines (EVCA, p. 40) clearly indicates this institutionalization, stating that: “monitoring should allow the manager to confirm that the investment is progressing in accordance with the relevant business plan and should provide sufficient information to identify any failures to meet targets or milestones and to formulate remedial plans where necessary”. Studies have also suggested that a common feature of

behavior across VCs is the monitoring of investees (Mitchell, Reid and Terry, 1997; Pruthi, Wright and Lockett, 2003). Hence:

H1: Involvement in portfolio firm monitoring is not influenced by human capital or firm characteristics of the VC.

Involvement in value-adding activities

As explained above, self-efficacy theory (Wood and Bandura, 1989) suggests that individuals with more successful previous experience will be more involved in post-investment value-adding activities. Dimov and Shepherd (2005) differentiate between the specific and general experience embodied in the human capital of the investment manager. They define education and experience in business, law and consulting as specific to the pre-and post-investment value adding activities of VCs, while education in humanities and science, along with entrepreneurial experience is categorized as general. Furthermore, we argue that it is also important to focus on the investment manager's specific experience in relation to the industry sectors in which he/she is investing. The more specialized the portfolio, the more likely it is that the investment manager will have developed specific human capital in relation to his / her investments. Conversely, the more diversified the investments in the portfolio, the less likely it is that the investment manager will have developed specific human capital in relation to his / her investments.

The degree of specific human capital will be positively related to the chance of obtaining mastery experiences and thus the degree of self-efficacy. This will lead to a higher involvement in value-adding activities that require specific expertise. Similarly, general human capital, especially entrepreneurial experience, may enable the VC manager to assist the entrepreneur by drawing on the experience of the steps required to successfully negotiate the hurdles along the development trajectory. Therefore:

H2a: Involvement in value-adding activities is positively related to specific human capital

H2b: Involvement in value-adding activities is positively related to general human capital

Fund characteristics and policy may also impact the follow up behavior of investment managers. Strategic investment theory suggests that fund shareholders' different expectations concerning fund performance may affect involvement in value-adding activities. Specifically, fund objectives may differ between captive (i.e. private equity arms of banks or public funds) and non-captive funds. As non-captive funds have a higher profit-orientation (Manigart et al., 2002) and have incentive systems based on profit generation, they are more likely to be closely involved in value adding activities to achieve their rate of return targets. Hence:

H2c: Involvement in value-adding activities is negatively related to captive funds

Traditional finance theory suggests that funds should deal with risk through diversification. In contrast, the RBV suggests that specialist VCs might cumulate specific skills and resources and obtain a competitive advantage. As is the case at the level of the individual investment manager, information and networking advantages are likely to occur when VCs specialize as they are able to deepen their knowledge of particular markets (ibidem). This may result in information and network advantages between investment managers working at the same fund, enabling them to be more involved in value-adding activities. Hence:

H2d: Involvement in value-adding activities is negatively related to the degree of diversification at fund level.

4. RESEARCH METHODOLOGY

The sample

A stratified sample of 68 VC firms was drawn from different regions across Europe. As the focus of this paper is on early stage high tech ventures, the regions selected were those with the highest R&D intensity and VC presence. The seven regions were: Cambridge/London (UK), Ile de France (France), Flanders (Belgium), North Holland (the Netherlands), Bavaria (Germany), Stockholm (Sweden), Helsinki (Finland).

In each region, we sought representation of small and large funds. We collated directory information from EVCA with those of the various regional venture capital associations and information obtained through contacts with academics in each of the seven regions selected. This resulted in a population of 220 early stage and high tech funds. The sample frame was stratified into different groups according to the scale of the funds and their institutional investors.

Research design

Interviews with investment managers were carried out between January and December 2003 to collect information on the resource-based characteristics of the venture capital firm and on the investment manager. Information was collected on the investment manager's previous experience and follow-up behaviour in terms of both monitoring and value-adding activities.

A synthesis of existing research, notably Sapienza et al (Sapienza, 1992; Sapienza, Manigart and Vermeir, 1995), Pruthi et al (2003) and MacMillan et al(1989) resulted in five monitoring activities, and 14 value-adding activities. The pilot interviews identified three additional value-adding activities, all of which were specific to high tech investing: "negotiating intellectual property rights", "recruiting the head of R&D" and "forming the Advisory Board". The resultant 22 follow-up activities are presented in Table 1.

Insert Table 1 About Here

Investment managers were asked to score these follow-up activities on two scales: frequency and importance. The frequency of each activity was scored on a Likert scale ranging from 1 = never carry out this activity to 5 = always carry out this activity for portfolio companies. The importance attached to the activities was scored on a scale ranging from 1 = little important follow-up activity to 5 = very important follow-up activity. Multiplying both scores resulted in 'involvement indicators' for each of the 22

follow-up activities, with scores ranging between 1 and 25, with 1 being low involvement for the follow-up activity and 25 being very high involvement.

Individuals were asked to explain and justify their responses in order that we could understand the context of the VC industry, at the time of interview, better. This part of the interview took about half an hour per respondent.

Measures

Dependent variables

Involvement in monitoring and value-adding activities

We combined the indicators for each of the five monitoring activities and the 17 value-adding activities into summated scales. To check consistency, we used Cronbach's Alpha. All summated scales met the 0.60 value for acceptability (Hair et al., 1998)¹. One issue in assessing Cronbach's Alpha is that increasing the number of items increases the reliability value. Therefore, Cronbach's Alpha is higher for value-adding activities compared to monitoring ones, even though they are both acceptable (ibidem).

All assumptions necessary to carry out explorative factor analysis were met, with values in the anti-image correlation matrix being close to zero, the Bartlett test of sphericity rejecting the null hypothesis of no correlation between variables (p-value<.001) and a Kaiser-Meyer-Olkin measure larger than .50. A component analysis model was used. Communalities of variables were all above the .50 limit, with .568 being the lowest communality for a variable. Factors were interpreted using VARIMAX factor rotation, summarizing the sum of variances of required loadings of the factor matrix.

Exploratory factor analysis revealed that none of the monitoring activities loaded on value-adding activities and vice versa, allowing us to use the initial subdivision of activities in monitoring and value adding. Summated scores were retained in the analysis as the relatively small sample meant that the relatively high factor loadings (larger than .70) required to use factor scores were not met. Factor analysis however revealed similar types of follow-up activities identified by previous research, namely strategic roles, networking roles, operational roles and interpersonal roles. Monitoring activities loaded

¹ Cronbach Alpha of 0.65 for monitoring activities, 0.774 for value-adding activities.

on a different factor. Board membership loaded only on the strategic factor, indicating that our sample regarded this mainly as strategic rather than a monitoring function. This was supported by the interviews, where investment managers mentioned that it was more efficient to monitor a portfolio company by regularly telephoning the entrepreneur rather than spending time at board meetings. Table 2 presents descriptives for each follow-up activity.

Insert Table 2 About Here

Table 2 shows that early stage high tech investors seem to be the least involved in operational roles and networking activities. They tend to be more involved in monitoring activities, strategic activities and interpersonal roles.

Independent variables

Human capital

A number of measures based on their previous experience were used to identify VC executives' human capital. The investment managers interviewed had either worked at a bank, consulting firm, in industry, in academia, or had been entrepreneurs before joining the VC industry. Consulting experience, financial experience, business experience and investment management experience were, consistent with Dimov and Shepherd (2005), labeled 'specific human capital'.

We asked for the number of years worked at a bank, audit or accountancy firm before joining the VC industry, and coded this as the degree of financial experience. Years worked as a consultant was coded as consulting experience. Years experience in a management function in industry was coded as business experience.

People from the financial world had on average worked for 6.6 years in either a bank, audit firm or as accountant. Investment managers who worked in consulting before joining the VC industry had on average 3.9 years experience in consulting. Investment managers with a previous career as manager in a company had on average eight years of experience. The investment managers in our sample had on average 4.85 years of experience as a VC investment manager, with a range from 1 to 17 years.

A further specific dimension of specific human capital is whether the investment executives manage diversified or specialized portfolios of companies with respect to industry focus. To construct this measure, the EVCA industry classification was used, identifying eight high tech sectors.² This results in a score of 1 to 8 for each investment manager, 1 being the most specialized and 8 the most diversified.

Both academic and entrepreneurial experience was considered as general human capital (Dimov and Shepherd, 2005). If the investment managers had obtained a PhD, we labelled this academic experience (1=academic experience, 0=no academic experience). If they had been entrepreneurs themselves, we coded this as having entrepreneurial experience (1=entrepreneurial experience, 0= no entrepreneurial experience). Seven investment managers had academic experience, ten had been entrepreneurs.

Fund characteristics

Fund characteristics were measured by two variables. First, funds that were 100% publicly funded or that were private equity arms from banks were classified as “captive funds”, others were not (1=captive; 0=not captive). 15 of our sample of 68 were classified as “captive funds”, including six private equity arms from banks and nine public funds.

We measured the degree of specialization at fund level using the same EVCA industry classification mentioned above. This resulted in each fund being assigned a score from 1 to 8.

Control variables

We employ control variables in respect of VC fund location and size. First, we controlled for the location of the funds. The UK is the largest and most mature VC market in the EU (Martin, Sunley and Turner, 2002; La Porta et al., 1997). It is distinctive as a large amount of invested money goes to buy-outs (70% of the amounts invested in 2001 (EVCA, 2002)). The Scandinavian market is geographically distinct from other European regions, and venture capital activity in these countries (Finland and

² Communications, computer related, other electronics related, biotech, medical/health related, energy,

Sweden in our study) grew extraordinarily at the end of the 1990s (EVCA, 2002). Therefore, two dummy variables were created, one indicating whether the fund was located in the UK or not (0=non-UK, 1=UK), and one indicating whether the fund was located in Scandinavia or not (0=non-Scandinavia, 1=Scandinavia).

Second, we controlled for the size of the fund, measured as the capital managed, which previous research has found to influence VC firm behavior (see Elango et al, 1995).

5. RESULTS

The correlations and descriptive statistics for the variables are presented in Table 3.

Insert Table 3 About Here

All variance inflation factors were below 3.0, suggesting that multicollinearity was not an issue (Hair et al., 1998). Hypotheses were tested using regression analysis. We conducted several diagnostic tests to ensure the data did not violate the assumptions of normality, linearity and homoscedasticity. Using Z scores and a visual inspection of histograms, we found all dependent variables to be normally distributed. Residuals were tested for independence, normality and constant variance. All necessary conditions were met.

Involvement in monitoring activities (H1)

The model is not statistically significant for monitoring activities (Table 4). Neither human capital variables nor fund characteristics seem to be important determinants of the degree of investment manager involvement in monitoring activities. Therefore, we find support for H1, that monitoring is not affected by human capital or fund level characteristics.

Insert Table 4 About Here

Involvement in value-adding activities (H2)

Table 5 presents the results of the analysis for H2a-d. The base model, only including control variables, was statistically significant. Adding human capital and fund characteristics variables increased the significance of the model. The full model was significant at the .001 level, with 36.8% of the variance explained. The full model had significant coefficients for consulting experience ($P < 0.10$), the industry diversification at investment manager level ($P < 0.10$), entrepreneurial experience ($P < 0.10$) and the captive fund variable ($p < 0.05$). These results indicate that both human capital variables and fund characteristics impact involvement in value-adding activities by the investment manager. A higher level of consulting experience indicates a higher involvement in value-adding activities. Investment managers that had been entrepreneurs were more involved in follow-up activities than others. Investment managers that specialize in one or a small number of sectors are more involved in these value-adding activities. The only fund level characteristic which was found to be statistically significant was captive funds, which was negatively related to involvement in value adding activities.

Insert Table 5 About Here

In summary, we find partial support for H2a: consulting experience has a significant positive effect on value-adding involvement. Furthermore, the more specialized the portfolio of an investment manager the greater the involvement in value-adding activities. Financial experience and the other specific human capital variables were not found to have a significant impact. We find partial support for H2b, that general human capital is positively related to value-adding activities. In particular, entrepreneurial experience has a significant positive effect on value-adding involvement but academic experience has a non-significant effect. We find support for H2c, captive funds are less involved in value-adding activities. Finally, we do not find support for

H2d, therefore, the degree of diversification of a fund has no significant impact on value-adding involvement.

6. CONCLUSIONS

Using a unique, hand collected dataset, this study has examined neglected aspects of VC behavior relating to early stage high tech ventures: to what extent do VCs play a role in their portfolio companies and what determines the differences between VCs in the way they approach their portfolio companies after investment?

From a theoretical perspective, we found two different dimensions of the VC that could impact its follow-up behavior: the human capital of the investment manager responsible for the portfolio company and the policy adopted by the fund. Neither human capital characteristics nor fund characteristics were found to influence monitoring behavior. We believe the reasons for this to be twofold. First, monitoring portfolio companies is institutionalized into the European VC industry such that VCs' *monitoring roles* are standardized in terms of regular procedures to allow the manager to confirm that the investment is progressing both financially and operationally in accordance with the business plan and to obtain sufficient information to identify any failures to meet targets and to formulate appropriate remedial plans (EVCA; Mithcell, Reid and Terry, 1997; Pruthi, Wright and Lockett, 2003). Second, differences in the types of *monitoring mechanisms* seem to be determined more by the performance and risk profile of the portfolio companies, and the expected agency costs (Sapienza, Amason and Manigart, 1994; Lerner, 1995). Hence, as our sample related to early stage high tech investments, a high degree of monitoring was expected to be prevalent. Cross-country studies show considerable commonality in the relative importance of the different formal (i.e. contractual and informational) and informal (relational) *monitoring mechanisms* that are used as VCs follow professional norms, although there are a small number of differences related to local institutional factors in particular countries (Kaplan and Strömberg, 2001; Mitchell, Reid and Terry, 1997; Pruthi, Wright and Lockett, 2003; Ray, 1991; Wright et al. 1999; Farag et al., 2004). These findings emphasize the importance of the agency perspective as a major determining factor in monitoring behavior.

We found that both human capital characteristics (hypotheses H2a and H2b) and fund characteristics (hypotheses H2c) determine the VC's involvement in value-adding follow-up activities. Concerning human capital characteristics, specific human capital in terms of consulting and general human capital in terms of entrepreneurial experience were related to value adding activities. Besides, specialization by the investment manager with respect to industry focus was found to positively impact value-adding involvement. These findings are consistent with the self-efficacy aspects of human capital which suggest that more experience in performing certain relevant tasks will enable actors to perform more effectively. The significance of the consulting variable suggests that investment managers with this experience will be more able to add value to high tech ventures by both identifying markets and helping ventures achieve competitive advantage in those markets. General human capital relating to entrepreneurial experience may be important as the self-efficacy gained from undertaking previous entrepreneurial ventures may help new venture entrepreneurs to negotiate the hurdles involved in successfully commercializing their ventures. Further, we found that the degree of diversification at investment management level has a negative impact on involvement in value adding activities. This is expected since it is difficult for investment managers to keep track of strategic information and build a network in different sectors and industries.

Concerning fund characteristics, we found a difference between captive funds and others (H2c). Investment managers at captive funds were less involved in value-adding managers to develop activities. This is especially surprising for public funds since they typically invest in seed stage ventures with high risk and uncertainty, incomplete teams of entrepreneurs, and far from market-ready technology. Since these portfolio companies need a lot of coaching, one would expect high value-adding involvement by the VC. It may be that, as public funds invest relatively small amounts of money in a large number of companies in very different technologies, their diversification may not allow investment managers to develop skills or a complementary network. In addition, these funds tend to be smaller in size and smaller in the amount of management fee they can spend. This can result in the attraction of investment managers with less experience and a

smaller team of investment managers for a larger and more diversified portfolio of companies.³

7. POLICY AND MANAGEMENT IMPLICATIONS

The findings have interesting implications for investment managers, entrepreneurs and policy makers.

Our study shows that the degree to which a deal is monitored and the kind of monitoring activities performed do not differ between early stage, high tech VCs or between their investment managers, on average (Hypothesis H1). This means that agency theory based “monitoring” as such does not lead to differences in performance between VC funds. In contrast, early stage high tech VC funds tend to differentiate their involvement in value-adding activities (Hypotheses H2-H2d). With respect to fund characteristics, our results suggest that specialized, private VC firms typically investing in early stage projects tend to invest most in value adding activities afterwards. In contrast, public funds that invest in earlier stages spend less effort in value adding activities. This is surprising since one would expect an even larger involvement in these earlier stages.

Even within funds, our findings provide more fine-grained analysis than previous research with respect to human capital (Lockett, Murray and Wright, 2002) by indicating that investment managers as individuals differ in the way they deal with the portfolio companies they manage. Investment managers with human capital relating to a consulting background tend to be most intensively involved in following up their deals from a value-adding point of view. Besides, if they specialize in a limited number of sectors, they are more involved in value-adding activities. Additionally, investment managers with a background as entrepreneurs tend to be more involved with value-adding activities. This implies that the investment manager’s prior experience determines to a large extent

³ Additional tests on our sample show that public funds are smaller (average capital managed 83.8 million Euro compared to 297.8 million Euro for non-public funds; difference significant at $P < .10$), construct diversified portfolios and have less investment managers per sector managed (.80 compared to 3.09 for non-public funds; difference significant at $P < .01$), and that investment managers at public funds manage more investments at a time than their non-public counterparts (9.40 investments per investment manager compared to 4.09 for non-public funds; difference significant at $P < .05$)

his/her management style once he/she enters into the VC world⁴. This observation has important implications for the recruitment policy of VC companies and is an interesting signal to entrepreneurs who look for “smart” money.

If an entrepreneurial team is confident that it does not require advice or detailed value adding assistance from a VC investor, it may seek to be funded by a public or captive fund. Alternatively, where it does need advice, it may better to seek investment with an independent, specialist VC firm.

Our results also have important policy implications. Government attempts to bridge the equity gap for high tech start-ups and academic spin-outs in particular have involved the setting up public-private partnership funds. The private partners in these funds are usually captive private equity arms of large financial institutions who are often asked to manage the fund. These financial institutions have the slack capacity to invest in government relations and the geographical coverage to set up different public/private partnerships in a particular country. The drawback, as our evidence shows, is that these funds typically engage less in value adding activities.

This study points to several interesting questions for future research. An interesting extension would be to interview more than one investment manager per fund in order to determine whether the importance of fund characteristics still hold when looking at the entire group of investment individuals involved in a VC fund. It would also be interesting to investigate whether involvement in value-adding activities has a positive impact on portfolio company performance. This would then contribute to the recent debate of whether venture capital is an art of building winners or picking them (Baum and Silverman, 2004). Finally, linking involvement in monitoring activities to performance of the portfolio companies followed up by the investment manager could shed light on our view that the degree of monitoring will be linked to portfolio company performance.

⁴ Interaction terms involving consulting and investment management experience were tested and found to be not significantly positive. Interaction terms involving financial and investment management experience were also found to be not significantly positive.

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FIGURE 1

Conceptual framework

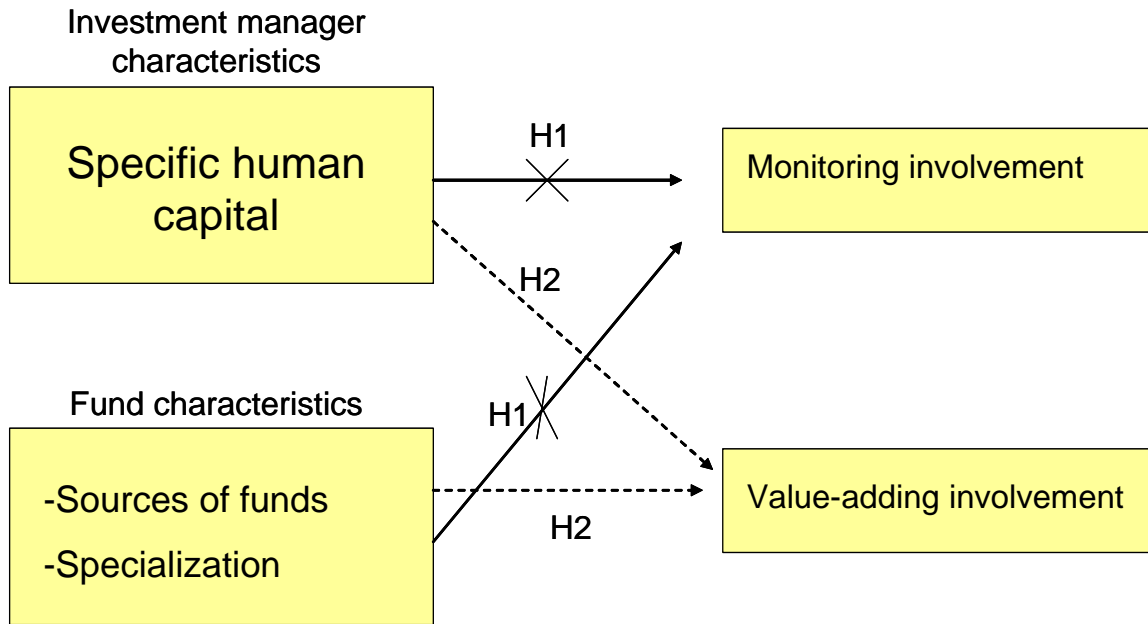


TABLE 1

Overview of follow-up activities

| | Sapienza et al (1992 and 1996) | Pruthi et al (2003) | MacMillan et al (1989) | Pretests |
|--|--------------------------------------|------------------------|---------------------------|----------|
| Monitoring activities | | | | |
| Have a look at the financial overview regularly | | X | X | |
| regularly check sales figures and pipe restrictions on changes in ownership | | X | X | |
| restrictions on additional borrowings | | X | | |
| restrictions on CEO's remuneration | | X | | |
| Value-adding activities | | | | |
| have a seat on Board of Directors | X | X | | |
| Form an advisory Board | | | | X |
| Determine the composition of the Board | | X | | |
| contact potential customers | X | X | X | |
| open doors (network) | X | X | X | |
| Meet the entrepreneurs regularly | X | | X | |
| hire the head of marketing and sales | X | X | X | |
| hire a CFO | X | X | X | |
| hire the R&D head | | | | X |
| hire a CEO | X | X | X | |
| negotiate important contracts | X | | | |
| find additional financing | X | X | X | |
| hire new employees | X | X | X | |
| negotiate intellectual property rights | | | | X |
| strategic planning | X | X | X | |
| act as a sounding board | X | X | X | |
| daily management (operational tasks) | X | X | X | |

TABLE 2

Descriptives of follow-up activities (frequency, importance and involvement indicator)

| | Frequency | | Importance | | Involvement indicator (frequency*importance) | |
|---|-------------|--------------------|-------------|--------------------|---|--------------------|
| | Mean | Standard Deviation | Mean | Standard Deviation | Mean | Standard Deviation |
| Monitoring activities | | | | | | |
| Have a look at the financial overview regularly | 4.80 | .50 | 4.58 | .73 | 22.12 | 4.65 |
| Regularly check sales figures and orderbook | 4.44 | .99 | 4.45 | .79 | 20.14 | 6.20 |
| Restrictions on changes in ownership | 4.41 | 1.04 | 4.10 | 1.15 | 18.60 | 7.23 |
| Restrictions on CEO's remuneration | 3.52 | 1.48 | 3.43 | 1.32 | 16.98 | 7.26 |
| Restrictions on additional borrowings | 4.13 | 1.09 | 3.94 | 1.09 | 13.29 | 8.35 |
| Monitoring average | 4.26 | 1.02 | 4.1 | 1.02 | 18.25 | 4.43 |
| Value-adding activities | | | | | | |
| Meet the entrepreneurs regularly | 4.67 | .71 | 4.62 | .82 | 21.88 | 5.43 |
| Strategic planning | 4.24 | .95 | 4.41 | .87 | 19.35 | 6.20 |
| Have a seat on Board of Directors | 4.17 | 1.09 | 4.29 | 1.09 | 18.77 | 7.33 |
| Act as a sounding board | 4.24 | .98 | 4.24 | 1.03 | 18.75 | 6.76 |
| Find additional financing | 4.00 | .98 | 4.47 | .95 | 18.41 | 6.57 |
| Open doors (use network) | 4.17 | 1.05 | 4.15 | .95 | 17.92 | 6.75 |
| Determine the composition of the Board | 3.88 | 1.14 | 4.09 | .99 | 16.62 | 7.03 |
| Hire a CEO | 2.92 | 1.03 | 4.41 | 1.25 | 13.33 | 6.07 |
| Contact potential customers | 3.08 | 1.22 | 3.26 | 1.23 | 10.94 | 6.80 |
| Hire a CFO | 2.74 | .90 | 3.52 | 1.18 | 10.02 | 4.76 |
| Hire the head of marketing and sales | 2.52 | .97 | 3.42 | 1.27 | 9.18 | 5.48 |
| Form an advisory Board | 2.38 | 1.21 | 2.77 | 1.32 | 7.94 | 7.13 |
| Negotiate important contracts | 2.30 | 1.16 | 2.94 | 1.45 | 7.92 | 6.60 |
| Negotiate intellectual property rights | 2.24 | 1.23 | 3.14 | 1.47 | 7.92 | 6.57 |
| Hire the R&D head | 1.77 | .80 | 2.82 | 1.40 | 5.53 | 4.14 |
| Hire new employees | 1.74 | 1.06 | 1.68 | .88 | 3.42 | 3.60 |
| Daily management (operational tasks) | 1.65 | .79 | 1.80 | 1.14 | 3.31 | 3.09 |
| Value-adding average | 3.10 | .94 | 3.53 | 1.13 | 12.63 | 2.66 |

TABLE 3**Descriptive statistics and correlations**

| | Mean | S.D. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|--|--------|--------|------|-------|------|------|------|------|------|------|------|
| 1. Consulting experience | 1.02 | 2.03 | 1.00 | | | | | | | | |
| 2. Financial experience | 2.23 | 4.65 | -.06 | 1.00 | | | | | | | |
| 3. Business experience | 4.55 | 6.07 | -.03 | -.25* | 1.00 | | | | | | |
| 4. Investment managem exp | 4.85 | 3.99 | -.24 | -.01 | .11 | 1.00 | | | | | |
| 5. Diversification by investment manager | 3.21 | 2.42 | .21 | .31* | .00 | .00 | 1.00 | | | | |
| 6. Diversification at fund level | 4.09 | 2.30 | .18 | .19 | .00 | .10 | .78 | 1.00 | | | |
| 7. VC Fund size ^a | 269.04 | 654.25 | .06 | -.14 | -.03 | -.10 | -.22 | -.05 | 1.00 | | |
| 8. Monitoring involvement | 18.25 | 4.43 | .05 | .02 | -.10 | -.13 | -.03 | -.05 | .00 | 1.00 | |
| 9. Value-adding involvement | 12.63 | 2.66 | .05 | -.40* | .14 | -.02 | -.46 | -.37 | .05 | .04 | 1.00 |

^a indicates the capital managed by the VC fund, measured in millions of Euros

Pearson correlations for continuous variables, * correlations are significant at $P < .05$, $n = 68$

TABLE 4

Regression analysis for involvement in monitoring activities

| | Base model | Base model + specific human capital | Base model + fund characteristics | Full model |
|--|------------|--|--------------------------------------|------------|
| <u>Investment manager characteristics</u> | | | | |
| <i>Specific human capital</i> | | | | |
| Consulting experience | | .051 | | .045 |
| Financial experience | | -.031 | | .002 |
| Business experience | | -.158 | | -.166 |
| Investment management exp | | -.166 | | -.183 |
| Diversified portfolio experience by IM | | .058 | | .082 |
| <i>General human capital</i> | | | | |
| Academic experience | | -.015 | | -.017 |
| Entrepreneurial experience | | .100 | | .110 |
| <u>Fund characteristics</u> | | | | |
| Captive fund | | | | -.137 |
| Diversification at fund level | | | | .030 |
| <u>Control variables</u> | | | | |
| UK-based | .077 | .108 | .078 | .110 |
| Scandinavia-based | .096 | .121 | .074 | .111 |
| VC fund size | .017 | -.021 | .004 | -.017 |
| Constant | 17.797**** | 11.825**** | 14.077**** | 11.207**** |
| <u>Model</u> | | | | |
| F statistic | .221 | .413 | .346 | .394 |
| R ² | .011 | .078 | .028 | .091 |
| Adjusted R ² | -.038 | -.110 | -.054 | -.141 |

Levels of significance: *.10; **=.05; ***=.01; ****=.001; n=63

TABLE 5

Regression analysis for involvement in value-adding activities

| | Base model | Base model + specific human capital | Base model + fund characteristics | Full model |
|--|------------|--|--------------------------------------|------------|
| <u>Investment manager characteristics</u> | | | | |
| <i>Specific human capital</i> | | | | |
| Consulting experience | | .246* | | .229* |
| Financial experience | | -.160 | | -.089 |
| Business experience | | .134 | | .111 |
| Investment management exp | | .070 | | .043 |
| Diversified portfolio experience by IM | | -.493**** | | -.335* |
| <i>General human capital</i> | | | | |
| Academic experience | | .068 | | .065 |
| Entrepreneurial experience | | .215 | | .222* |
| <u>Fund characteristics</u> | | | | |
| Captive fund | | | -.345*** | -.321** |
| Diversification at fund level | | | -.207* | -.050 |
| <u>Control variables</u> | | | | |
| UK-based | -.044 | -.037 | -.012 | -.028 |
| Scandinavia-based | .303** | .058 | .240** | .051 |
| VC fund size | .087 | .040 | .047 | .061 |
| Constant | 12.065**** | 17.410**** | 21.122**** | 17.802**** |
| <u>Model</u> | | | | |
| F statistic | 2.330* | 3.518** | 5.579**** | 3.862**** |
| R ² | .103 | .418 | .321 | .496 |
| Adjusted R ² | .059 | .299 | .263 | .368 |

levels of significance: *=.10; **=.05; ***=.01; ****=.001; n=63