Value Added by Angel Investors through Post-Investment Involvement: Exploratory Evidence and Ownership Implications*

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Abstract

Using the Kauffman Foundation data, we provide exploratory evidence that post-investment involvement of angel investors adds value. Furthermore, the values appear to be added mainly through post-investment involvement related to mentoring rather than monitoring. We then explore the implications of this finding for the theoretical problem of splitting the venture's ownership between the angel investor and the entrepreneur.

1 Introduction

Securing the needed financing is difficult for new ventures partly because of the informational asymmetry between entrepreneurs and capital suppliers, especially serious at the early stages of development, and partly because the entrepreneurs, commonly in high-tech ventures, have little previous business experience. As a result, different contractual arrangements and working relationships between the capital suppliers and the venture are required to deal with the agency problems arising from informational asymmetry and to help the venture realize its value creation potential (e.g., Sapienza, Manigart and Vermeir, 1996; Keuschnigg and Nielson, 2000). Tybjee & Bruno (1984) were among the first to refer to the interactive activities unrelated to supplying financial capital as post-investment involvement (PII). Sapienza and Timmons (1989) then characterized the involvement as either monitoring or value adding, further differentiating the value adding activities by the strategic, interpersonal, and networking roles of the capital suppliers.

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These suppliers of capital to new ventures may be roughly divided into those where the funds are supplied by institutional investors and managed by professionals and those supplied and managed by wealthy individuals who are typically entrepreneurs or former ones themselves. The former are commonly called venture capitalists (VC) while the latter are called informal venture investors or angel investors (angels). There exists an extensive literature on the behavior, organization, and influence of VCs but not about angels. Studies that directly compare angels and VCs indicate that they differ significantly (e.g., Erlich, De Noble, Moore and Weaver, 1994; Mason and Harrison, 1995; Fiet, 1995a, 1995b; Elitzur and Gavious, 2003; Chahine, Filatotchev, and Wright, 2007; Morrissette, 2007; Schwienbacher, 2007). Thus, these results imply that evidence concerning VCs cannot be directly applied to angels and that more studies about angels are needed.

In this study, we use the data from the "The Performance Project: Group Angel Investor" released by the Kauffman Foundation and the Angel Capital Education Foundation in May 2007 to investigate the value added by angels through their PII with ventures. In contrast with findings showing that VC PII may not significantly affect venture performance (MacMillan, Kulow and Khoylian, 1989; Barney, Busenitz, Fiet and Moesel, 1996; Buzenitz, Fiet and Moesel, 2004; Florin, 2005), our results show that the PII of angels contributes significantly to value creation. Further analysis suggests that the value added is due to involvement related to mentoring rather than monitoring. This resultant value added has a very important implication for the ownership share that angel investors deserve or, conversely, the share that the entrepreneurship retains. It is an important factor missing in current discussions about splitting the firm's ownership between the entrepreneur and investors. We therefore discuss the implication conceptually and propose an adjustment to the model proposed in the literature to determine the theoretical ownership share that entrepreneurs deserve to retain.

Due to data limitations as a result of the low response rate, the empirical results should be seen as exploratory rather than confirmatory. Nevertheless, we believe that the study

makes multiple contributions to the literature on informal venture capital. First, the study adds to the evidence that angel investments are different from VC investments. By adding to the limited empirical findings in the literature, this study helps improve our understanding about angel investors. Second, if the results showing that angels add value through their PII are corroborated by future research, then they open up new directions of research into what angels and VCs do that are different. Third, if angels add value through PII, then they deserve a higher ownership share than that prodicted by the extant concept and model. Our proposed adjustment to the extant model thus makes an important contribution to the theory of venture financing in general and to the pricing of venture equity in particular.

2 Post-Investment Involvement of VCs

Research about the PII of venture investors have centered on VCs. As previously discussed, evidence from direct comparisons indicate that VC investment behavior is likely different from that of angels. Nevertheless, the literature on VC investments is still a useful guide for research on angel investments.

Tybjee and Bruno (1984) characterized the investment process of VCs into five steps as: deal origination, screening, evaluation, structuring, and post-investment activities. They listed (Table 5, p. 1062) serving as director, recruiting executives, helping shape strategy, serving as sounding board for management, providing guidance and business contacts, and helping raise additional capital as examples of post-investment activities. To this, Timmons and Bygrave (1986) added providing credibility to suppliers and customers. Based on a survey, Gorman and Sahlman (1989) estimated that VCs spend an average of 80 hours of on-site time and 30 hours of phone time per year on each of the company in their portfolios. They also found that the most frequently performed service is related to raising additional capital. MacMillan et al. (1989) concurred with them about the importance of financing but found that VCs' involvement were not uniform, ranging from a laissez-faire attitude to

close tracking. Sapienza and Gupta (1994) showed that this variation in involvement can be partially explained by perceived agency problems and the required information processing in addition to individual VC operating style.

PII may be separated into monitoring and value-adding activities. While monitoring, in the agency theoretic sense, is about protecting the interests of the investors or the investors' slice of the pie, the value adding activities are for enlarging the pie. Sapienza and his co-authors (Sapienza and Timmons, 1989; Sapienza et al., 1996) later classified VCs' value-adding activities into strategic (as sounding board, financier, and business adviser), interpersonal (as mentor and confidant), and networking (as recruiter of managers, contact for professional consultants, and contacts for suppliers and customers) roles. They also provided evidence from four countries: US, UK, France, and Netherland showing that the importance of the three roles follow the sequence by which they are listed above.

Since these activities incur costs, the observations about their widespread practice naturally beg the question about why VCs devote such time and resources to them. The question has been studied by researchers from several points of view in terms of the value added. One is whether the activities are appreciated by the entrepreneurs. Another is whether they add perceived value. A third is whether such activities enhance financial performance.

Entrepreneurs appear to appreciate most the strategic, especially financial, and networking advice given by VCs but they are equivocal about advice concerning internal management matters (Gomez-Mejia, Balkin and Wellbourne, 1990; Yitshaki, 2007). They are likely to be most receptive when need for help is perceived (Barney et al., 1996; Bygrave and Timmons, 1992). Thus, the more experienced the entrepreneurs, the less they appreciate advice concerning business management and operational advice (Barney et al., 1996). Sapienza et al. (1996) show that perceived value, measured as the product of the perceived importance of the advice and the perceived effectiveness, is positively related to VCs' previous experience in the focal industry. They also find a significant relationship between perceived value added and venture performance. But because the causality examined was from venture per-

formance to perceived value added, no conclusion was made with respect to whether VCs' value adding activities lead to superior financial performance for ventures. In fact, studies that focused on this relationship found inconclusive linkage between these activities and the financial performance of the firm (MacMillan et al., 1989; Barney et al., 1996; Buzenitz et al., 2004). MacMillan et al. (1989) found that most of the statistically significant regression coefficients for specific PII activities were negative. Barney et al. (1996) also found no significant relationship between PII and short-term financial performance. Busenitz et al. (2004) found no significant relationship between VC strategic assistance and long-term performance and a negative effect when VCs involve themselves in the dismissal of CEOs. They did find a positive impact for arrangements set up to establish procedural justice and concluded that social processes are important mediating factors. These results suggest that there may be many intervening mediating and moderating factors between VCs' PII and venture financial performance.

More recent research continues to present conflicting evidence. For example, Baum and Silverman (2004), Dimov and De Clercq (2006), Bottazzi, Da Rin and Hellmann (2008) show that venture capitalist's expertise add value to new ventures. On the other hand, studies by Lee and Wahal (2004), Brau, Brown and Osteryoung (2004), and Florin (2005) report no significant difference between VC- and non-VC-backed firms in terms of IPO and post-IPO performances. Interpretation of the accumulated evidence is further confounded by whether any positive correlation found between VC involvement and venture performance is due to VC's ability in "picking winners", a third-party certification effect, or value added.

3 Post-Investment Involvement of Angels and Research Questions

Studies about angels are rare compared to those on VCs possibly due to the scarcity of data. As suppliers of capital to new or early ventures, researchers have identified some significant

differences between them and VCs. For example, angels tend to invest in ventures at their earlier stages of development (Wetzel, 1983; Mason and Harrison, 1995; Prowse, 1998). Fiet (1995b) finds angels to be more concerned about agency risks rather than market risks. Since angels are less diversified than the institutional investors supplying funds to VCs, they should be equally concerned about the two types of risk. Therefore, the results suggest that angels may use strategies other than diversification to control market risk. Fiet (1995a) also provides evidence that angels rely more on close associates and less on formal networks. Prowse (1998) confirms this by observing that the most important criterion used by angels when screening investment opportunities is whether the entrepreneur is known and trusted by them or by a trusted associate. This could be due to the absence of formal networks for angels. As Mason and Harrison (1995) observed, even business introduction services for angels may not be economically feasible without government support. Wetzel (1983) concluded from responses to his survey that angels derive non-financial returns from their investments. He lists contribution to job creation, urban renewal, and helping other entrepreneurs (especially minorities and female) establish successful businesses as socio-economic benefits that angels find valuable; in fact, a large proportion of the respondents indicated that they would sacrifice financial returns in exchange.

In terms of the PII, however, researchers have not listed activities that are different from those for VCs. They remain: serving as sounding board, providing business ideas, helping recruit top managers, and providing network connections (Ehrlich et al., 1994; Ardichvili, Cardozo, Tune, and Reinach, 2002). If the PII of VCs do not appear to have easily detectable impact on the financial performance of ventures and angels are basically engaged in similar activities, then one is tempted to extrapolate and conclude that the results should be similar for angels. There are observations from the literature, however, that suggest the experience of angels may be different.

First, researchers (Ehrlich et al., 1994) found that there may be a self-selection in terms of ventures that receive angel financing. The entrepreneurs in these ventures may be more

receptive to advice from angels. Second, by investing in ventures at their earlier stage (Wetzel, 1983; Mason and Harrison, 1995; Prowse, 1998) when problems related to idea maturity, uncertainty, and legitimacy are more acute, angels may be able to add more value through their business expertise, industry experience, networks, and rapport with the entrepreneurs. If these reasons allow the PII of angels to add value and improve the financial performance of ventures, then the returns that angels earn from their investments should also be positively affected. Thus, we examine the following research questions:

Research question 1: Do the PII activities of angels improve the returns they earn on their venture investments?

Research question 2: Do the non-monitoring related PII activities of angels improve the returns they earn on their venture investments?

Monitoring in the agency theoretic sense is about protecting the interests of the investors. Since it incurs costs, monitoring through management control system, more frequent and detailed reporting, etc. should by itself decrease the value of the venture. But installation of formal management control and reporting, as long as they are not excessive, may also improve the efficiency of the operations, especially for early stage ventures that still do not have such control systems or where the entrepreneurs have no experience with setting up such systems. Thus, if one assumes a level of rationality on the part of the angels ensuring that the benefits exceed the costs, then even monitoring related PII activities may be value adding. If so, then, in combination with protecting the interests of the angels, the monitoring related PII should increase the returns angels earn on their investments. Therefore, we investigate a third research question:

Research question 3: Do the monitoring related PII activities of angels improve the returns they earn on their venture investments?

4 Data

The data came from a survey entitled "The Performance Project: Group Angel Investor". The data set was released in May 2007 and has been available on the webpage of the Kauffman Foundation since January 2008. According to the report of the Angel Investor Performance Project (AIPP), 539 angel investors were included in the data set, and they belonged to 86 angel investor groups in North America and "experienced 1,137 exits from their angel investments" (Wiltbank and Boeker, 2007a, page 1). The response rate of the surveys was 31% out of 276 of the angel investor groups, and 13% of the members in these 86 groups participated (Wiltbank and Boeker, 2007a; Wiltbank, Read, Dew and Sarasvathy, 2009). The survey attempted to collect a rich array of information on both investment behavior and return on investment. However, observations based on the data may be limited in terms of their generalizability. First, there are many missing values. Since the missing values do not overlap completely in terms of the survey questions respondents chose not to answer, the set of responses with complete information is very small (<20). Thus, any multivariate analysis that includes a reasonable number of control variables quickly renders the degree of freedom insufficient. The problem is worst in the overlap of available observations between strategy, venture team characteristics, and risk perceptions. Second, extensive number of missing values always introduces the doubt that there may be selection bias. Third, the information collected is from angel investors belonging to groups. Therefore, results and conclusions made may not apply to non-group angel investors. This has also been pointed out by Wiltbank and Boeker (2007b). Fourth, multiple angels in the groups are very likely to invest in the same ventures. As a result, the information supplied by agents in the same group could have been related to the same venture. If this is the case, then observations would not be independent. This problem could be made even more serious if groups have different confidentiality agreements; so the responses with more complete data could selectively come from those groups whose confidentiality agreements allow them to answer more questions. Despite these problems, we believe that scarcity of data on angel investments demand that

whatever is available be analyzed to the maximum extent possible.

There is not enough information to do the usual tests for how representative the data may be of the larger population. For example, it is not possible to compare early and late respondents. Since the survey asked for mainly objective data instead of data for latent constructs, there is not likely to be common method bias. As discussed, multivariate analysis including all relevant variables is impossible. But principal component analysis with separate subgroups of variables showed multiple components with eigenvalues above one or explained variances above five percent. At least, the subsample tests suggest that concern for any common method bias is not serious.

5 Sample Angel Attributes and Investment Behavior

Table 1 presents the descriptive statistics for selected variables. The angels in the sample have an average age of 50 years, have been investing for 10.5 years, have around 15 years of entrepreneurial experience, have founded 2.9 ventures themselves, worked in large companies for 13 years, and had experience in the focal industry of more than 6 years. More than 96% of them graduated from university with a bachelor (27.5%), masters (53.3%), JD (6.1%), or PhD (9.8%). So this is a very highly educated group of individuals. The educational attainment of the angels in this particular sample appears to be higher than the data presented by Morissette (2007) who consolidated data previously presented by other researchers. Morisette's (2007) consolidated data show that 60%-80% of angels have a college degree and 28%-42% have graduate degrees. The majority of their investments originated from the group to which they belong after initial screening by the group. Next to that are ventures of personal friends or of individuals with whom they had previously worked. As observed by previous researchers, the predominant majority of their investments were in the seed (31.9%) and startup (44.1%) stages. Surprisingly and seemingly contradicting themselves, however, they reported that the average initial revenues of the ventures was more than $1.8 million

with median at $125K. They intially invested an average of $119K and median of $40K and had 5 co-investors. These amounts are within the ranges reported by Morissette (2007). The average total investment ($161.9K) was not much more than the average initial investment, suggesting that the angels in the sample did not participate very much in further rounds of financing. Before investing, they devoted an average of more than 60 hours to due diligence.

The level of post-investment interactions was reported in ordinal terms (1=rarely; 2=annually; 3=quarterly; 4=monthly; 5=weekly; 6=daily). We created a second set of values by assigning to each ordinal ranking the number of times per year indicated (1=0, 2=1 time/year; 3=4 times/year; 4=12 times/year; 5=52 times/year; 6=365 times/year) and called this PII(times/year) as opposed to the original set which we call PII(Ordinal). The two sets of PII values have a correlation of 0.716 ($p<0.01$). The average level of PII activity was 60.77 times a year but the median was 4 or quarterly. The data show clear positive skewness in both amount of investment and PII. The angels exited through acquisition by other operating companies in 46.9% of the cases, by ceasing operation 32.1%, through IPO 13.5%, and by investors purchasing the business 5.1% of the time.

The survey also asked the angels to pick the top three from a list of sources of risk when making the initial investments. The list included technology, operation, customer base concentration, fragmented market, marketing channel, competition, financing difficulty, management team, and regulation. As shown in Table 1, 54 percent selected technology as one of top three sources; 46.5 percent selected market channel; 33.5 percent selected competition; 29.3 percent management risk; 28.4 percent operation; 23.3 percent financing difficulty. The other sources of risk were selected as the top three by less than twenty percent of the respondents.

Table 2 shows the list of variables with which initial investment, total investment, due diligence, and PII showed significant correlations ($p<0.05$ or $p<0.01$ only). For initial investment and due diligence, we considered only variables whose values would be available pre-investment while, for total investment and PII, we considered both ex ante and ex post

variables. The amounts of initial investment and total investment exhibited generally similar patterns. They are positively correlated with whether the entrepreneur has previously worked with the angel and with referral by a friend. On the other hand, they are negatively correlated with group screening for initial investment and with group presentation. This corroborates observations by previous researchers (Fiet, 1995a; Prowse, 1998) that previous knowledge about or relationship with the entrepreneur are the most important determinants of angel investments. So, although the ventures are predominantly sourced from the group, whether and how much angels invest appears to depend on their trust in the entrepreneur. In addition to the source of investment opportunities, angel investments appear to be affected by the angel's personal attributes. The more ventures the angel has helped establish, the larger the amount of both initial and total investment. This could also be a function of wealth. Assuming that the angel who has helped found a large number of ventures has had the average proportionate number of successes, the angel should be wealthier and able to invest a larger amount in a single venture. Finally, angel investments are positively affected by the venture's stage of development in terms of whether it is a later growth stage venture. This is understandable because at the later growth stage, the investment needed for expansion should be larger than that required at the seed stage and the angel should have more confidence in making the investment.

There are some differences between the behaviors of initial and total investment. Total investment is positively correlated with referral by professional contact suggesting that further round investments are affected by professional opinions. It is positively correlated with PII and with the mode of exit - positively with exit through cessation of operation and negative with exit through IPO. The causality relationship with PII could go in either direction. PII could increase because the angel spends more time on the larger investment or total investment could increase because the angel is more willing to make further investments when they have more information gathered through PII. The negative correlation with IPO may be explained by further needs of capital being met from the public market. The positive

correlation with cessation of operation is intriguing because it may indicate commitment escalation - that angels throw good money after bad.

On the other hand, initial investment is different in two aspects. It is negatively affected by the angel's age. This would fit with the life-cycle portfolio theory recommendation that as the individual gets older, investments should shift from high risk to lower risk instruments. Initial investment also increases with the number of co-investors. This must be due to the size of the financing. Keeping the size of financing constant, the more co-investors involved, the smaller should be the amount of investment. But if co-investors are involved mainly because the size of financing is large, then the amount of investment for each co-investor could be larger.

Time spent on due diligence appears to be mainly a function of angel investment style. It is positively correlated with the angel's years of investing in ventures and years of entrepreneurship. Maybe, having learned from past mistakes, they have compiled a longer list of things to check before making any investment. Having a PhD is also positively correlated with time spent on due diligence. Angels with PhD may be more used to analyzing issues in detail than other angels. It was not surprising to find that due diligence is not affected by the size of the investment because the decision about how much to invest may come after due diligence. But it was surprising to find due diligence unaffected by risk perceptions except VC team sales experience. We have no explanation for why the more sales experience the VC team has, the more time angels spend investigating and checking the venture. The response rate on the risk perception questions was the lowest.

PII, the focus of this study, increases with the size of the investment; this is understandable because angels' exposure would be higher. It increases with due diligence suggesting that angels who spend more time analyzing ventures also spend more time with the ventures after investing. PII also increases with management risk. It cannot be ascertained from the survey question whether the perceived management-related risks are due to agency or competence problems. The increase in PII will be for monitoring if it is the former and for

value-adding activities if the latter. Angel PII also increases with experience in investment and entrepreneurship being positively correlated with angel years of investing in ventures, years in entrepreneurship, number of ventures founded, and years of experience in the focal industry. Angels appear to delegate or "free ride" when convenient. We arrive at this conjecture based on the negative correlations with: having co-investors, having outside board members, sourcing from group screening, and sourcing from group presentations. These negative correlations suggest that angels shift some of the burden of PII to co-investors, outside board members, and other members of the investment groups. Investments made through a friend's referral gets more attention post investment than pre-investment. The angel and the entrepreneur may enjoy working together more than when they are strangers. But it could also be a case of mislaid trust leading to problematic situations that demand more angel attention. The results seem to confirm a "homerun" effect (Sapienza et al., 1996). PII increases with the firm being bought out by other operating firms and decreases with cessation of operation. Finally, age appears to have a negative effect on PII. The older angels may not have as much energy or motivation.

6 Examining the Research Questions

To repeat, our three research questions are:

Research question 1: Do the PII activities of angels improve the returns they earn on their venture investments?

Research question 2: Do the non-monitoring related PII activities of angels improve the returns they earn on their venture investments?

Research question 3: Do the monitoring related PII activities of angels improve the returns they earn on their venture investments?

6.1 Dependent Variables

Data was available for total investment, total cash-out received, time of initial investment, and time of final cash out. Some observations also provide information about initial and following investments, respectively, and the time points they occurred. For those angel investments that had only one investment, the initial investment, we combined the following variables to calculate an approximate internal rate of return using the following formula:

$$IRR = \left(\frac{Total\ Cashout}{Total\ Investment} \right)^{\left(\frac{1}{Duration\ of\ Investment} \right)} - 1 \tag{1}$$

where

$$Duration\ of\ Investment\ = Time\ of\ final\ cashout\ -\ Time\ of\ initial\ investment.$$

For those with multiple rounds of investments, on the other hand, we use the "irr" function in Microsoft Excel to estimate the internal rate of return (IRR).

6.2 Independent Variables

6.2.1 Total Post-Investment Involvement (PII)

For Research Question #1, we needed a variable measuring the total amount of time spent interacting with the venture post-investment. For this, we used the two PII variables: PII(Ordinal) and PII(times/yr) in separate tests.

6.2.2 Monitoring Related PII (PII-M)

For Research Questions #2 and #3, we needed to separate monitoring related PII from PII for other purposes. To do this, we regressed PII against variables that we believe are determinants of the need for monitoring. We then used the predicted values from the regression model as measures of monitoring related PII or PII-M. The logic is as follows. Total PII

consists of angel post-investment activities for both monitoring and value-adding purposes. As a result, total PII should be related to both factors that generate monitoring and those that generate value-adding activities. If we regress total PII against those factors that generate monitoring activities, then the predicted value would measure the component of total PII generated by monitoring activities.

The two main variables we used to help separate PII-Monitoring from other post-investment activities are time spent on due diligence and source of investment opportunity. As discussed previously, time spent to analyze the venture pre-investment appears to be mainly one of investment style. Therefore, we argue that the more time an angel spends on due diligence, the more time that the angel would spend on monitoring post-investment. The correlation between PII and time spent on due diligence pre-investment is around 0.2 ($p<.05$). On the other hand, as also discussed previously, the source of the investment opportunity may determine whether the angel is able to delegate monitoring responsibilities, observing that having co-investors allows the angel to "free ride" and decrease involvement in monitoring. Finally, we added two risk proxies for which there were sufficient number of observations. One is the angel's percentage wealth invested in the venture and the other is the venture's revenue at the time of investment. The argument here is that the riskier the venture in terms of the angel's personal wealth exposure and the venture's ability to generate revenues, the more the angel would monitor it post-investment. Consequently, the regression model we used to separate PII-M from other post-investment activities is the following:

$$\begin{aligned} PII &= \gamma_0 + \gamma_1 \cdot DueDiligence \\ &\quad + \gamma_2 \cdot \ Source\ of\ Angel\ Investments \\ &\quad + \gamma_3 \cdot \ CoInvestors + \gamma_4 \cdot \%Wealth \\ &\quad + \gamma_5 \cdot Initial\ revenues + \varepsilon_1 \end{aligned} \tag{2}$$

The predicted values generated by this regression model comprise the values for PII-M.

6.2.3 Value Adding PII (PII-V)

Using the same logic, we separate the value-adding related PII by regressing total PII against variables that we believe are determinants of value that the angels can potentially add to the venture. The main variables used are: angel's work, entrepreneurial, and investsment experiences; angel's age; and venture revenues at time of investment. De Clercq and Sapienza (2005) find that venture capital firms learn from their past and current investments through experience. Extrapolating their findings to angels**, w**e argue that the angel's entrepreneurial and work experience, shown in Table 2 to be correlated with PII, are important factors determining whether the angle's business advice and network resources are able to add value to the venture. Then, assuming that the angel is rational and would not be engaged in value adding PII if the angel has no ability to add value leads to the argument that, the more experienced the angel, the more time the angel will spend mentoring the entrepreneur. Age is included because, as shown in Table 2, although experience may increase with age, age itself decreases PII. Finally, venture revenues at time of investment was again included as a measure of risk. The argument is again that the farther away the venture is from profitability, the more help the entrepreneur may need, the more value the angel may be able to add, and the more time the angel may spend mentoring the entrepreneur. We did not include percent of the angel's wealth as a risk measure because protecting the angel's interest is more related to monitoring.

$$\begin{aligned} PII &= \eta_0 + \eta_1 \cdot Angel\ Work\ Experience + \eta_2 \cdot Angel\ Entrepreneurial\ Experience \\ &\quad + \eta_3 \cdot Angel\ Investment\ Experience + \eta_4 \cdot Age \\ &\quad + \eta_5 \cdot Initial\ revenues + \varepsilon_2 \end{aligned} \tag{3}$$

The predicted values from this regression model formed the values for PII-V.

6.2.4 Other PII (PII-O)

To test for the possibility that other PII activities, unrelated to either PII-M or PII-V, is responsible for any value added by angel total PII, we generated a measure of other PII activities as the residuals from the following regression:

$$PII = \delta_0 + \delta_1 \cdot (PII - M) + \delta_2 \cdot (PII - V) + \varepsilon_3, \tag{4}$$

and assigned the residuals from this regression as values for PII-Others (PII-O).

$$PII - O = \varepsilon_3. \tag{5}$$

6.3 Control variables

As mentioned previously, the low response rate for many variables made it necessary to be parsimonious in terms of the control variables included. We accomplished this by including only the variables correlated with angel investment activities but not yet used in any of the preliminary regressions. As a result, for testing the three research questions, the control variables included were type of exit (*Cease*, *BoughtOut*, *BoughtInv*, and *IPO*), *BoardOutsider*, and industry sector (*Service* and *HighTech*). With the independent and these control variables, the number of observations was reduced to 57. Therefore, it was not advisable to add any more variables.

6.4 Testing the Relationships between PII and Angel IRR

We tested Research Question #1 with the following regression model:

$$\begin{aligned} IRR \;=\; & \beta_0 + \beta_1 \cdot PII \\ & + \beta_2 \cdot \; Exit\ Variables + \beta_3 \cdot \; Board\ Outsiders \\ & + \beta_4 \cdot Industry\ Variables + \varepsilon_4, \end{aligned} \tag{6}$$

where types of exits are the binary variables $Cease$, $BoughtOut$, $BoughtInv$, IPO, and industry variables are the binary variables $Service$ and $HighTech$. The statistical significance of $\beta_1$was used to answer the question of whether PII improves angels' return on venture investment.

We tested Research Questions #2 and #3 jointly using the following regression model:

$$\begin{aligned} IRR &= \xi_0 + \xi_1 \cdot (PII - Monitoring) + \xi_2 \cdot (PII - Value\ Adding) \\ &\quad + \xi_3 \cdot \ (PII - Others) + \xi_4 \cdot Control\ Variables + \varepsilon_5. \end{aligned} \tag{7}$$

Answer to Research Question #2 is based on the statistical significance of ξ_2 while that for Research Question #3 is based on ξ_1.

7 Results and Discussion

The regression results for testing the research questions are presented in Table 3. They are organized into two sets because, as discussed previously, data on PII was collected in ordinal terms and we created a separate series based on times of interaction per year.

The first column of both sets of results show that a significant positive relationship was found between angel IRR and total PII at the 5% level. This suggests that the PII activities carried out by angels may have stronger impacts on venture financial performance than those of VCs. Based on the observations of Ehrlich et al. (1994), one of our conjectures was that the entrepreneurs who sought angel investment may have been more receptive to advice given by angels. Based on the observations of researchers (e.g., Wetzel, 1983; Mason and Harrison, 1995; Prowse, 1998) and the data used in this study showing that angels involve themselves in the ventures at earlier stages of development, we argue that their advice may have had more positive impact when the uncertainty, legitimacy, strategy, and organizational problems faced by the ventures were more acute.

The second column for both sets of results show that IRR is significantly affected by PII-V (value-adding PII activities, $p<0.05$) but not by PII-M (monitoring related PII activities).

This suggests that enlarging the pie is more important than protecting one's slice of the pie. It recommends what Timmons and Spinelli (2006) suggested: that the best arrangement between investors and entrepreneur is one that maximizes the venture's probability of success.

We argued that, aside from protecting the angel's interests, monitoring related PII activities may help improve the venture's operating efficiency through the implementation of management control and reporting systems. But the results indicate otherwise. Since neither was there a significant negative effect, one explanation is that the benefits roughly equal the costs of angels' monitoring related PII activities.

Two of the control variables (Cease and Bought Out) exhibited VIF values greater than 10 in the regression model with PII-M and PII-V separated, indicating serious multicollinearity problems. Therefore, we re-estimated the regression model without these two control variables. The results are qualitatively similar and do not warrant different answers to our research questions. The re-estimated regression model based on PII(Ordinal) data shows a marginally significant positive relationship between IRR and PII-Other. But the one based on PII(times/year) shows no significant relationship. Thus, the combined results suggest the following:

· Angel PII activities add value to ventures**,** and

· Angel PII increase return to investors by enlarging the pie rather than protecting the investors' slice of the pie.

7.1 Robustness Tests

Realized IRR is known only after exit while PII is conducted before exit. Therefore, it can be argued that causality should flow from what happens before to what happens after. But, as Sapienza et al. (1996) explained, investors may pursue a "homerun" strategy in their PII; they may abandon the failing investments and devote more of their time to successful ones. This means that the causality in the relationship we found between IRR and PII may be reversed if early inklings about a venture's return are highly correlated with eventual

realized returns. We tested for endogeneity with the Hausman specification test and did not find any statistically significant bias. The tests for Research Questions 2 and 3 were already two-stage least squares estimates because the regression models used to estimate PII-M and PII-V contained variables correlated with PII but not with IRR. Therefore, we only retested Research Question 1 using two-stage least squares with total investment as instruments for PII and PII-V. Total investments is a reasonable instrument because the more the angel invests in a venture, the more time the angel is likely to devote to the venture post-investment. On the other hand, the size of the investment is not a reliable predictor of performance. The results were not qualitatively different, but the coefficients increased in size and the significance levels of the coefficients on PII (times/year) rose to 1%.

The control variables indicating type of exit could have a reverse causality with IRR; negative IRR leading to the business ceasing, high IRR leading to IPO, etc. Although this is not central to our research questions, we used instrumental variables and the Heckman two-step method to examine whether this possibility of reverse causality in control variables could affect our findings. The results also show no qualitative change in the relationships between IRR and PII or PII-V.

Finally, we also performed the tests with different sets of control variables, and applied the Tobit model by taking into account truncation of the internal rate of return at -100%. The results were also not qualitatively different.

7.2 Limitations

The data used for the tests conducted in this study came from a survey with low response rate for many questions and especially the ones related to venture risk, venture strategy, and venture team attributes. As a result, many variables could not be included in the regression model because including them would have quickly depleted the degrees of freedom. As a result, the observations made here must be deemed very preliminary. Furthermore, the data may not be representative of angels in general for several reasons. First, only angels who

belong to groups were surveyed. Angels who do not belong to groups may be quite different in their investment behavior and abilities to add value to the ventures in which they invest. Second, the respondents appear to be more highly educated than those reported by other researchers. Third, as discussed previously, we cannot ascertain that the observations are independent because the respondents from the same group may have supplied data on the same venture.

The survey did not collect data on mentoring and value adding PII activities. So the analysis separated PII into monitoring related PII and value adding PII by regressing total PII against factors that we argued to be determinants of monitoring or value adding activities. Since research on these factors with respect to angels has not been conducted, the arguments we made are not based on the literature. Therefore, the variables chosen may not be the appropriate proxies for the determinants of PII-M and PII-V. As a result, the predicted values of the regression models may have measured other aspects of PII.

All the information is self reported and there is no independent corroboration of the data gathered. Therefore, if there is any bias in the self reported information, especially in terms of PII and financial performance, then the results obtained and the conclusions based on them would be unreliable. But, as we argued previously, the paucity of data on angels demand that what is available be analyzed to the maximum extent possible. These data-related issues have also been summarized in a recent study by Farrell, Howorth, and Wright (2008).

8 Implication for Angel Ownership Share

If angels contribute more than just financial capital to ventures and, in fact, create additional values, this has very important implications for the ownership shares that angels deserve and the shares that entrepreneurs deserve to retain. It requires rethinking about how the ownership of a venture should be split between the entrepreneur and the investors. Although

analysts and VCs typically talk about valuation, the negotiation between the entrepreneur and investors is ultimately about ownership shares. Indeed, Prowse (1998) found that ownership share is one of the two main financing issues for angels, the other being the type of financing.

Models in the literature about splitting the ownership between the entrepreneur and investors (e.g., Chua and Woodward, 1993; Timmons and Spinelli, 2006) implicitly assume that investors do not create value because the model is borrowed from the theory of financing in public markets where investors are not involved in governing or managing the business. The theory of financing in the public market predicts that competition would lead to an equilibrium where new shareholders (investors) earn the cost of capital on their investments while the old shareholders (entrepreneur) get to keep the residual or net present value (NPV). This is the basis for prescribing that firms should invest in all projects with positive NPV because any positive NPV would belong to the existing shareholders for whom managers work, at least until the new investors become shareholders. But if angels create additional value, the creation of value must be explicitly taken into account. Below we point out the adjustment needed to do this. In the following discussion, we assume that the reader has a certain level of familiarity with the basic financial concepts of investment such as cost of capital, net present value, value, and discounting.

Let INV be the amount that the angel is investing in the venture and let V_0 be the value of the venture if the angel's role is solely to supply the financial capital and has no value creating component. V_0 is also commonly called the post-money value of the venture. By commonly accepted financial theory, V_0 is the present value of future cash flows from the venture discounted at the cost of capital reflecting the riskiness of the venture and transaction costs. Therefore,

$$V_0 = INV + NPV_0$$

or

$$V_0 - INV = NPV_0,$$

by the definition of net present value which is commonly called the pre-money value. This residual value or NPV_0 is the residual value before the angel adds value to the venture.

If angels do not create value, then the angel's ownership share is currently recommended (e.g., Chua and Woodward, 1993; Timmons and Spinelli, 2006, p. 503, p. 506) to be:

$$Angel's\ Ownership\ Share = \frac{INV}{V_0}$$

while that of the entrepreneur is the rest which is equal to the NPV_0/V_0. This clearly assumes that the entrepreneur created all of the NPV_0; otherwise, the entrepreneur should not deserve all of it.

Let the angel create value through PII activities equal to V_A. This means that the total value of the venture becomes $(V_0 + V_A)$ after the angel provides both financial capital and the value creating PII to the venture. In this case, the angel's ownership share, assuming that whoever creates the value gets to keep all of it, must be updated and increased to:

$$Angel's\ \ Ownership\ \ Share = \frac{INV\ +\ V_A}{V_0 + V_A}$$

and that of the entrepreneur updated and decreased to:

$$Entrepreneur's\ \ Ownership\ \ Share = \frac{NPV_0}{V_0 + V_A}$$

To gain an appreciation for the change in ownership share, we derive below the formula for the critical V_A needed for the angel or any investor who creates additional value through PII to deserve majority ownership. This is important because losing control over the venture is a great concern for the entrepreneur. For the investor to deserve more than 50% of the ownership share, the entrepreneur must also deserve 50%. Therefore, the following relationship must hold:

$$\frac{NPV_0}{V_0 + V_A} < 0.5$$

Substituting $V_0 = INV + NPV_0$ into the relationship above and taking the reciprocal of both sides yields:

$$\frac{NPV_0 + INV + V_A}{NPV_0} > 2$$

Dividing the numerator and denominator on the left side of the equation by INV and solving for $\frac{V_A}{V_0}$ yields:

$$\frac{V_A}{V_0} > \frac{\frac{NPV_0}{INV} - 1}{\frac{NPV_0}{INV} + 1}$$

Figure 1 shows the above relationship in a graph with V_A as a percentage of V_0 on the vertical axis and NPV_0/INV on the horizontal axis. For example, when $NPV_0/INV = 3$, then $NPV_0 = 3INV$ and $V_0 = 4INV$. This means that

$$\frac{NPV_0}{V_0} = \frac{3INV}{4INV} = 0.75$$

which leaves the angel with 25% ownership if the angel creates no additional value. If, however, the angel creates value equal to 50% of V_0, then the value of the venture would increase to $6INV$. This means that the entrepreneur would only deserve

$$\frac{NPV_0}{V_0 + V_A} = \frac{3INV}{6INV_A} = 0.5$$

of the venture and the angel would also get 50%. Any value creation above this level would make the angel deserving of majority ownership.

Numerically, the adjustment can be made by raising the cost of capital without taking the value created by the investors into account. For every level of angel value creation, there is a higher cost of capital that would give the angel the equivalent theoretical ownership share. This is because a higher discount rate would lower V_0 without decreasing INV and increase INV/V_0 which is the investor's share if no value is created by the investor. But approaching this issue by raising the cost of capital is conceptually inappropriate because cost of capital is related to the cost of the input. The relevant issue here is about the output of the angel's

PII activities. With the same input, the more productive angel who creates more additional value deserves a higher ownership share. By making explicit the additional value expected to be created by the angel, the negotiation can deal with it separately from the cost of capital. Combining the two considerations into one variable is confounding and more likely to lead to the impression that the required return is exorbitant or that the ownership share demanded by angels is excessive. Separating the cost of capital from the value created by the angel would also lead to negotiations about the angel's PII commitments.

9 Conclusions

Due to serious informational asymmetry between entrepreneurs starting a venture and capital suppliers, it is difficult to secure financial capital through lenders, the public market, or formal private equity financing entities such as venture capital firms. Thus, informal venture capital, such as angel investments, becomes the typical source of financing for early stage ventures once the entrepreneur exhausts the financial resources of friends and relatives and those available through bootstrapping. Empirical studies of angel investors are rare because of the scarcity of data. By analyzing data from the survey entitled "The Performance Project: Group Angel Investor" provided by the Kauffman Foundation and the Angel Capital Education Foundation, this study contributes to the literature on angels as informal private venture investors.

The private venture investment process, as opposed to that in the public market, includes post-investment involvement. The results presented here suggest that angel post-investment involvement (PII) has a significant positive effect on the returns earned by angels on their venture investments. We extrapolate from this to mean that angels create additional value through PII since the alternative explanation, by simple subtraction, is that they expropriate value from the entrepreneurs, post investment. Further analysis suggests that the additional value created by angels is not from their monitoring related PII. Instead, it is more likely

from activities that researchers have classified as value adding. According to the literature, these include: serving as sounding board for management, helping management develop strategy, helping secure additional financing, mentoring management, serving as managers' confidant, supplying contacts with suppliers and customers.

If angels create value through their PII, then they deserve an ownership share higher than what is justified by the financial cost of capital alone. Thus, we also explored the implications of angel value creation through their PII for the ownership shares that angels deserve theoretically. The framework for determining the ownership share of angels, as currently discussed in the literature and in entrepreneurship textbooks, implicitly assumes that investors create no value. It needs to be adjusted if angels create value for ventures. To do this, we propose an adjustment that can be used to guide the negotiation between entrepreneur and venture investor regarding ownership shares.

Considering the limitations of the data used and the consequent analysis performed, the tests conducted here should be repeated using a more extensive set of data. Efforts should be directed at measuring directly the level of PII that angels devote separately to monitoring and to the value adding activities listed by researchers. The tests should also be conducted using data from other countries, especially since researchers (e.g., Sapienza et al., 1996) have observed significant differences in VC behaviors and impact across countries.

There is no shortage of other ideas for future research on angel PII; the research on VC PII should be a very useful guide for other important topics for research. However, a very important agenda is the documentation of differences in the behaviors of the two groups of private venture investors. For example, the way entrepreneurs interact with an individual who is the owner of the capital may be very different from the way they interact with the professional manager of the institutional suppliers of capital. Since the social process of PII has been found to be important to the effectiveness of PII (Ehrlich et al., 1994), the differences in dynamics may be crucial to understanding any variation in thejob and wealth creation role of new ventures in the economy.

Finally, our adjustment of the theoretical framework for splitting the venture between the entrepreneur and the investor does not take into account differences between the parties' perceptions about the venture's prospects, or what Chua and Woodward (1993) call the "expectation gap". It also does not address the moral hazard problem related to diluting the entrepreneur's ownership share. These are interesting topics for future researchers to pursue.

References

[1] Ardichvili, A., Cardozo, R. N., Tune, K., & J. Reinach. (2002). The role of angel investors in the assembly of non-financial resources of new ventures: Conceptual framework and empirical evidence. *Journal of Enterprising Culture,* 10, 39-65.

[2] Barney, J., Busenitz, L., Fiet, J., & Moesel, D. (1996). New venture teams' assessment of learning assistance from venture capital firms. *Journal of Business Venturing,* 11, 257-272.

[3] Baum, J.A.C., & Silverman, B.S. (2004). Picking winners or building them? Alliance, intellectual, and human capital as selection criteria in venture financing and Performance of biotechnology startups. *Journal of Business Venturing*, 19, 411-436.

[4] Bottazzi, L., Da Rin, M., & Hellmann, T. (2008). Who are the active investors? Evidence from venture capital. *Journal of Financial Economics*, 89, 488-512.

[5] Brau, J.C., Brown, R.A., & Osteryoung, J.S. (2004). Do venture capitalists add value to small manufacturing firms? An empirical analysis of venture and nonventure capital-backed. *Journal Of Small Business Management*, 42, 78-92.

[6] Busenitz, L., Fiet, J., & Moesel, D. (2004). Reconsidering venture capitalists 'value added' proposition: An interorganizational learning perspective. *Journal of Business Venturing*, 19, 787-807.

[7] Bygrave, W.D., & Timmons, J.A. (1992). *Venture Capital at the Crossroads*. Boston, MA: Harvard Business School Press.

[8] Chahine, S., Filatotchev, I., & Wright, M. (2007). Venture capitalists, business angels, and performance of entrepreneurial IPOs in the UK and France. *Journal of Business Finance & Accounting*, 34, 505-528.

[9] Chua, J.H., & Woodward, R.S. (1993). Splitting the firm between the entrepreneur and the venture capitalist with the help of stock options. *Journal of Business Venturing*, 8, 43-58.

[10] De Clercq, D., & Dimov, D. (2008). Internal knowledge development and external knowledge access in venture capital investment performance. *Journal of Management Studies*, 45, 585-612.

[11] De Clerq, D., & Sapienza, H.J. (2005). When do venture capital firms learn from their portfolio companies? *Entrepreneurship Theory & Practice*, 29, 517-535.

[12] Dimov, D. & De Clerq, D. (2006). Venture capital investment strategy and portfolio failure rate: A longitudinal study. *Entrepreneurship Theory & Practice*, 30, 207-223.

[13] Ehrlich, S.B., De Noble, A.F., Moore, T., & Weaver, R.R. (1994). After the cash arrives: A comparative study of venture capital and private investor involvement in entrepreneurial firms. *Journal of Business Venturing*, 9, 67-82.

[14] Elitzur, R., & Gavious, A. (2003). Contracting, signaling, and moral hazard: A model of entrepreneurs, 'angels,' and venture capitalists. *Journal of Business Venturing*, 18, 709-725.

[15] Farrell, E., Howorth, C., & Wright, M. (2008). A review of sampling and definitional issues in informal venture capital research. *Venture Capital*, 10, 331-353.

[16] Fiet, J.O. (1995a). Reliance upon informants in the venture capital industry. *Journal of Business Venturing*, 10, 195-223.

[17] Fiet, J.O. (1995b). Risk avoidance strategies in venture capital markets. *Journal of Management Studies*, 32, 551-574.

[18] Florin, J. (2005). Is venture capital worth it? Effects on firm performance and founder returns. *Journal of Business Venturing*, 20, 113-135.

[19] Gomez-Mejia, L., Balkin, D., & Welbourne, T. (1990). Influence of venture capitalists on high tech management. *Journal of High Technology Management Research*, 1, 103-188.

[20] Gorman, M., & Sahlman, W.A. (1989). What do venture capitalists do? *Journal of Business Venturing*, 4, 231-248.

[21] Keuschnigg, C., & Nielsen, S.B. (2000). Tax policy, venture capital, and entrepreneurship. NBER Working Paper 7976.

[22] Lee, P.M., & Wahal, S. (2004). Grandstanding, certification and the underpricing of venture capital backed IPOs. *Journal of Financial Economics*, 73, 375-407.

[23] MacMillan, I.C., Kulow, D.M., & Khoylian, R. (1989). Venture capitalists' involvement in their investments: Extent and performance. *Journal of Business Venturing*, 4, 27-47.

[24] Mason, C.M., & Harrison, R.T. (1995). Closing the regional equity gap: the role of informal venture capital. *Small Business Economics*, 7, 153-172.

[25] Morrissette, S.G. (2007). A Profile of Angel Investors. *Journal of Private Equity*, 10, 52-66.

[26] Prowse, S. (1998). Angel investors and the market for angel investments. *Journal of Banking & Finance*, 22. 785-792.

[27] Sapienza, H.J., & Timmons, J.A. (1989). The roles of venture capitalists in new ventures: What determines their importance? *Academy of Management Best Papers Proceedings*, 74-78.

[28] Sapienza, H.J., & Gupta, A.K. (1994). Impact of agency risks and task uncertainty on venture capitalist - CEO interaction. *Academy of Management Journal*, 37, 1618-1632.

[29] Sapienza, H.J., Manigart, S., & Vermeir, W. (1996). Venture capital governance and value added in four countries. *Journal of Business Venturing*, 11, 439-469.

[30] Schwienbacher, A. (2007). A theoretical analysis of optimal financing strategies for different types of capital-constrained entrepreneurs. *Journal of Business Venturing*, 22, 753-781.

[31] Timmons, J.A., & Bygrave, W.D. (1986). Venture capital's role in financing innovation for economic growth. *Journal of Business Venturing*, 1, 161-176.

[32] Timmons, J.A., & Spinelli, S. (2006). *New Venture Creation: Entrepreneurship for the 21st Century*. McGraw-Hill/Irwin, 6th edition.

[33] Tyebjee, T.T., & Bruno, A.V. (1984). A model of venture capitalist investment activity. *Management Science*, 30, 1051-1066.

[34] Wetzel, W. (1983). Angels and informal risk capital. *Sloan Management Review*, 24, 23-34.

[35] Wiltbank, R., & Boeker, W. (2007a). Angel investor performance project: Data overview. Social Science Research Network (SSRN) #1024714. http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1024714.

[36] Wiltbank, R., & Boeker, W. (2007b). Returns to angel investors in groups. Social Science Research Network (SSRN) #1028592. http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1028592.

[37] Wiltbank, R., Read, S., Dew, N., & Sarasvathy, S.D. (2009). Prediction and control under uncertainty: Outcomes in Angel Investing. *Journal of Business Venturing*, 24, 116-133.

[38] Yitshaki, R. (2007). Confidence in cooperative relationships between entrepreneurs and VCs: The role of social and formal control mechanisms. Presented at the Babson College Entrepreneurship Research Conference 2007. Social Science Research Network (SSRN) #1059921. http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1059921.

Table 1. Descriptive statistics

Variable	Mean	Median	Standard Deviation	N	Variable	Mean	Median	Standard Deviation	N
Personal Attributes of Angel									
Age	50.00	50	10.990	322	Bachelor	0.275	Not Meaningful (NM)	0.447	775
Years inv	10.484	0	9.381	814	JD	0.061		0.239	775
Year entre	15.293	14	11.028	769	Master	0.533		0.499	775
# founded	2.860	2	3.388	769	Ph.D.	0.098		0.298	775
Year in large Co	13.346	10	11.507	767	%wealth	13.901	10	15.781	716
Industry Exp	6.134	0	9.929	322					
Source of Investment Opportunity									
Gp Screening	0.646	NM	0.479	531	Work Relation	0.156	NM	0.363	391
Gp Presentation	0.095		0.293	391	Referral Friend	0.119		0.324	531
Personal friend	0.175		0.380	531	Referral Prof	0.110		0.313	391
Focal Industry of Venture									
Service	0.230	NM	0.421	448	HighTech	0.353	NM	0.478	448
Stage of Venture Development at Investment									
Seed	0.319	NM	0.467	392	EarlyGrowth	0.181	NM	0.386	392
Startup	0.441		0.497	392	LateGrowth	0.031		0.172	392
Amount of Investment Made									
Initial Invest	119,363	40,000	270,139	662	Total Invest	161,884	50,000	409,451	662
Interactions with Venture Pre- and Post Investment Involvement (PII)									
Due Diligence	60.625	15	317.696	277	PII - Ordinal	3.41	3	1.622	289
					PII – times/yr	60.77	4	123.232	289
Type of Exit									
Cease	0.321	NM	0.467	452	Bought by invstrs	0.051	NM	0.220	452
Bought by others	0.469		0.500	452	IPO	0.135		0.342	452
Other Characteristics of Venture									
Initial Rev	1,801,967	125,000	7,461,491	211	Co Investors	5.204	5	4.431	334
Perceived Risk									
TechRisk	0.540	NM	0.500	215	MarketRisk2	0.335	NM	0.473	215
OperRisk	0.284		0.452	215	FnceRisk	0.233		0.423	215
CustRisk1	0.102		0.304	215	MgmtRisk	0.293		0.456	215
CustRisk2	0.177		0.382	215	ReguRisk	0.153		0.361	215
MarketRisk1	0.465		0.500	215					

Table 2. Significant Correlations for Angel Investment Behavior

	Initial Investment	Total Investment	Due Diligence	PII (Ordinal)	PII (Times/yr)
Initial investment		0.838***			
Total investment				0.161***	0.124**
Gp screening	-0.102**	-0.136***		-0.327***	-0.349***
Gp presentation	-0.129**	-0.189**		-0.243***	-0.339***
Work relation	0.143***	0.189***			
Referral - friend	0.091**	0.119***		0.171***	
Referral - prof		0.139***			
Management risk				0.164**	0.203**
VC team sales exp			0.250***		
Due Diligence				0.206***	0.284***
PII (category)		0.161***			0.716***
PII (times/yr)		0.124**			
Industry exp				0.221***	0.219***
Angel age	-0.144**			-0.146**	
Angel yrs inv			0.223***	0.317***	0.306***
Angel yrs entrp			0.162***	0.205***	0.226***
Angel #founded	0.120**	0.382***		0.147**	0.174***
PhD			0.172***		
Co-investors	0.151**			-0.293***	-0.237***
Board outsider				-0.254***	
Late growth	0.311***	0.218***			
Cease		0.100**		-0.184**	-0.210***
Bought out				0.174**	0.228***
IPO		-0.105**			

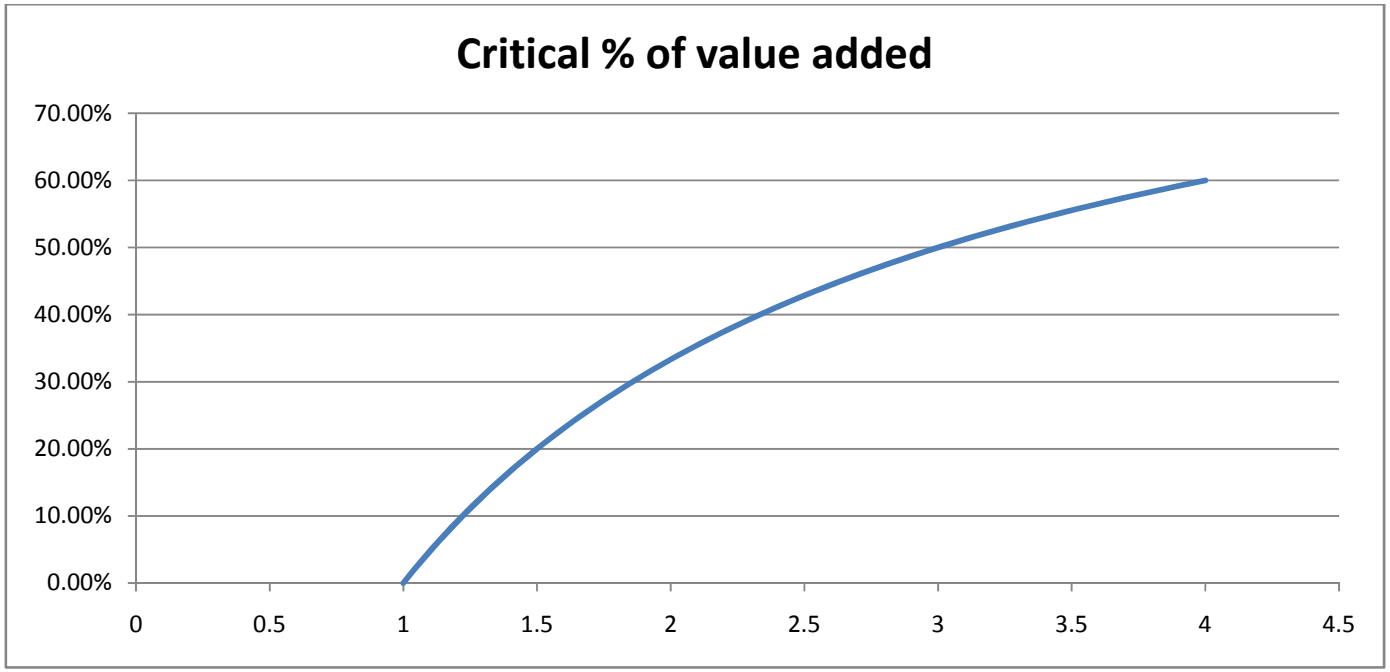
***Significant at 1%; **Significant at 5%

Table 3. Tests for Value Added by Angels

Dependent Variable: IRR						
Variables	Using PII (Ordinal)			Using PII (Times/Year)		
PII	0.659**			0.006**		
PII-Monitoring		0.504	0.550		0.010	0.010
PII-Value Adding		2.485**	2.568**		0.032**	0.034**
PII-Others		0.800	0.923*		0.003	0.005
Cease	-1.048	-0.063		-1.400	-0.045	
Bought out	0.549	1.447		0.228	1.690	
Bought by Inv	-0.224	-0.033	-0.887	-0.415	-0.676	-1.644
IPO	0.707	0.428	-0.454	0.327	-0.007	-1.051
Board Outsider	0.704**	0.886***	0.966***	0.624**	0.650**	0.730**
Service	0.398	0.904	0.781	0.223	0.510	0.279
High Tech	-1.212	-1.674	-1.691	-1.205	-1.328	-1.374
Constant	-3.684	-13.110**	-12.963***	-1.085	-4.923	-4.276***
N	90	57	57	90	57	57
F Value	3.02**	2.17**	2.64**	2.73**	2.43**	2.92***
Prob > F	0.005	0.037	0.017	0.010	0.021	0.0098
Adj. R-Square	0.154	0.173	0.190	0.134	0.203	0.215

***Significant at 1%; **Significant at 5%; *Significant at 10%

Figure 1. Angel Value Creation Needed for Majority Ownership



Note: The vertical axis is V_A/V_0, and the horizontal axis is NPV_0/INV. V_A is the value created by the angel through PII activities, and V_0 is the post-money value of the venture. NPV_0 is the residual value before the angel adds value to the venture, and INV is the amount that the angel is investing in the venture.