Angel Finance:
The Other Venture Capital

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Abstract

Angel financing is one of the most common, but least studied methods, to finance new ventures. In this paper, I propose a model to explain angel behavior. I use a unique dataset of angel-backed firms to test the predictions of the model and examine the characteristics of angel financing. Although they are exposed to greater uncertainty by investing earlier in the life of a firm compared to venture capital, angel investors do not rely on traditional control mechanisms such as board control, staging, or contractual provisions to protect against expropriation. Instead, angels reduce expected agency costs by forcing entrepreneurs to hold a larger stake in the firm, thereby aligning the interests of the entrepreneur with the outcome of the firm. In addition, angels use more informal methods such as investing in close geographic proximity and syndicating investments with other angels to mitigate risks.

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1 Introduction

With the recent rise (and fall) in the returns and prominence of new entrepreneurial ventures, much attention has focused on the genesis of new firms. One of the most important considerations these new entities face in the transformation from entrepreneurial ideas to revenue generating companies is the procurement of capital. Because traditional avenues of finance such as debt are often not available, entrepreneurs must seek risk capital by offering equity. While some companies may be able to generate capital by forming alliances[1], most new ventures must rely on two sources of outside equity: venture capital and angel financing.

Institutional venture capital has been glamorized in the press and academic research as the primary source of outside equity finance. However, many studies estimate institutional venture capital contributes less than half of the total equity financing for new firms. The less-scrutinized, yet equally important, source of start-up capital is the informal venture capital market, known as angel financing. While it is difficult to precisely quantify the size of the angel market due to its informal nature, some studies estimate the size of the angel investments to be twice that of the institutional venture capital market.[2] The National Venture Capital Association assesses the size of the angel market to be $100 billion in the United States while the institutional venture capital market is less than half this size at $48.3 billion.[3] The Small Business Association estimates that 250,000 angels commit $20 billion each year to over 30,000 private companies.[4] Freear et al. (1992) suggest angels provide the largest amount of capital among early stage financiers and fund

[1] See Robinson(2001) for a detailed examination on alliances

[2] Many people refer to angels as informal venture capital. Unless otherwise specified, I use the term venture capital to refer to institutional venture capital partnerships.

[3] Venture Economics press release, January 2000, *www.ventureeconomics.com*

[4] U.S. Small Business Association release *http://www.sba.gov/opc/pubs/fs83.html*

more than ten times the number of firms as venture capitalists. In the United Kingdom, Mason and Harrison (1990) find angel investors finance at least five times as many small firms as venture capitalists.

Despite the importance of angel funding, much of what is known about angels is incomplete and not well understood. Very few academic studies have examined angels, in part because data on angel investment is difficult to obtain. The lack of research leaves many questions unanswered. Specifically, why do two types of equity based start-up financing exist and do these investors operate in the same manner with respect to control? Asymmetric information and uncertainty problems in new firms makes corporate governance very important. If angel financiers are similar to institutional venture capital, they should maintain a comparable degree of control over their investments. Previous research has found the implementation of control mechanisms with venture capital investments to be more important as expected agency costs or uncertainty increase. Alternatively, if angels do not behave similarly to venture capitalists with regard to the use of traditional control rights, what mechanisms (if any) do angels use to protect themselves from expropriation?

Using a unique dataset of angel financed firms, I examine the role of angels in funding, monitoring and providing assistance to their investments. While many of my results are different from conclusions that other researchers have found with institutional venture capital, some similarities exist. Many of the findings are consistent with the model that I propose in the appendix. Angel financed firms typically receive their first outside funding when the firm is less than a year old, suggesting the degree of uncertainty is great and the need for control important. However, angel investors do not employ the same control mechanism as venture capitalists. For example, I find that angels seldom receive board seats in the firm the invest in. When board seats are allocated, the founders usually retain board control, indicating board control is not the primary control mecha-

nism utilized by angels. The allocation of board seats is not sensitive to measures of agency costs or greater uncertainty. Gompers(1995) finds venture capitalist use staged capital infusions as a mechanism to control agency costs. In contrast, I find little support for the use of staging in angel investments. While some investors follow-on their initial investments, the majority of angels do not stage their investments. The use of staging does not increase in response to higher degrees of uncertainty or expected agency costs in the firm. Lastly, Kaplan and Strömberg(2001) report venture capitalists employ many contractual clauses as protection. Unlike venture capitalists, I find angels do not appear to use contractual design to safeguard their investment. Angels usually take common equity claims, which do not afford them a higher degree of protection in the event of bankruptcy or liquidation. The majority of contracts between firms and angels also do not contain clauses for anti-dilution or contingent equity claims.

Angels may use alternative mechanisms of control. On average, less than a quarter of the firm is sold to outsiders in each round. Potential moral hazard problems are mitigated because the entrepreneur retains a large share of the equity. While their funding levels are not sensitive to measures of investment uncertainty or expected agency costs, angels receive a higher level of equity ownership to compensate for investing in earlier rounds. The average contribution per angel decreases as the amount of uncertainty increases. Additionally, many investors syndicate risky investments to share the risk and minimize the losses for any single investor. However, venture capitalists also use syndication and incentive alignment in their investments, yet they maintain strong traditional control rights as well.

An important facet of angel investing materializes by investigating the geographical proximity of the investors. Geographic proximity is a substitute for many of the formal control mechanisms and a compliment to other mechanisms such as syndication. Taken together, these results suggest

that the entrepreneur appeals to sociological networks and uses local ties to generate initial funding for the venture. The angels rely on trust in lieu of formal control. As the need for more capital arises, the entrepreneur exhausts local funding sources. The entrepreneur must appeal to more professional and remote funders, such as venture capitalists, for assistance. Because the new funders are not as familiar with the entrepreneur as the local investors, more formal control mechanisms need to be implemented to protect their investment. This finding provides some insight into the extensive control mechanisms used by institutional venture capital and the relative lack of formal control with angels.

While much empirical and theoretical research has been conducted on venture capital, there are few empirical studies of angel investing. Much of what is known is based on anecdotal evidence or small, regional surveys of angel investors (see Van Osnabrugge and Robinson(2000) for an overview of survey results). These papers tend to focus mainly on descriptive statistics of investment size while my paper focuses on the control aspects of angel investment. Wetzel(1983) provides one of the earliest profiles of angel investment in his survey of New England area angels. Lerner(1998) analyzes the plausibility of public efforts to fund new firms via angels. Prowse(1998) describes the characteristics of angel investors in the Dallas area. Ehrlich et al. (1994) publish survey results comparing the level of investor involvement of venture capitals and angels. Freear and Wetzel (1990), Freear et al. (1992), and Sohl, Van Osnabrugge, and Robinson(2000) provide survey evidence on the investment behavior of angels within certain industries.

The study that is most similar to this is Kaplan and Strömberg(2001), one of the first papers to formally study the details of venture capital contracting. In their paper, Kaplan and Strömberg provide detailed empirical evidence on the degree of board control, cash flow, liquidation and voting rights in venture capital financings. They find that the control rights are held mostly by the

venture capitalists, particularly when the performance of the firm is poor.

Casamatta(2000) develops a model that captures some of the differences between angel investment and venture capital. She finds the optimal choice of security is a function of the size of investment. She finds that smaller investments (typically by angels) should use common equity and straight preferred while larger investments (typically by venture capitalists) should use more complicated securities. The empirical results from this paper support her predictions.

In additional to Kaplan and Strömberg(2001), a related line of literature examines investor control in venture capital literature. Sahlman(1990) and Gompers and Lerner(1996) examine venture capital contracts and reports some typical stipulations in the contracts. Gompers(1995) finds staged capital infusions to be more prevalent in situations of higher agency costs. Lerner(1995) and Baker and Gompers(2000) investigate the degree of board control of venture capitalists in their investments. Both papers find venture capitalists maintain active board participation.

Many theoretical papers examine the control aspects of venture capital. Berglöf(1994), Cornelli and Yosha(2001), Repullo and Suarez(1999), and Hellmann(2001) investigate the role of convertible debt in venture financings. Admati and Pfleiderer(1994) and Garmaise(2000) investigate how venture capital investors contract in asymmetric information environments. Hellmann(1998) looks at how the allocation of control rights is affected by quality of replacement help. Kirilenko(2001) argues that venture capitalists should get more control rights to compensate for information problems. Papers such as Hart and Moore(1994), Bergemann and Hege(1998), and Neher(1999) stress the role of staging in their theoretical models.

My results are at odds with some theoretical findings, in large part because much of this research does not explicitly distinguish between angel investors and venture capital. As is the case with much of the literature, it is possible the authors did not consider angel finance as a viable

source of start-up capital since very little is known about angels. For example, Admati and Pfleiderer(1994) argue investors should hold a fixed fraction of equity through each investment stages. However, my results show angels do not follow-on, meaning the the fraction of equity held by angels decreases. Trester(1998) suggests investors should only use common equity in later stages; I find common equity is most frequently used in the earliest stages of investment. Gompers(1997) argues control rights should be assigned to investors in periods of highest asymmetric information, such as the early in the life of the project. I find that control rights are actually retained by entrepreneurs even though investment occurs when the firms are young. My results also do not support the results of Neher(1999), Bergemann and Hege(1998), and Cornelli and Yosha(2001) who advocate the staging of capital and the optimality of convertible securities. The results of many of these models rely on assumptions based on the stylized facts of venture capital investing and did not consider angel investors as a financing alternative.

This paper proceeds as follows. Section 2 is a brief background on angels and angel investments. Section 3 details the sample and the data collection process. A brief summary of the model is described in section 4. The empirical tests and results are described section 5. Section 6 concludes. In the appendix, details of the model are provided.

2 Angel background

The term 'angel investor' originates from funders for Broadway shows. Today, an angel investor refers to a high-net worth individual who typically invests in small, private firms on their own account. Formally, angel investors are 'accredited investors' according to the SEC. SEC Rule 501 of Regulation D states an accredited investor is an individual who has a net worth of more than $1

million or an expected individual (household) yearly income of more than $200,000 ($300,000). While the Federal Reserve's Survey of Consumer Finances estimates that over 6 million household qualify to be accredited investors, many studies estimate of the number of active angel investors in the United States to be between 250,000 to 400,000.[5]

Sohl (1999) reports that angels are usually cashed-out entrepreneurs who continue to yearn for the next high-growth venture. Because angels have to perform their own due diligence, they typically invest in ventures in the familiar industries. Prowse (1998) reports that angels are diverse in background, with some being financially sophisticated and others relatively inexperienced. In addition to making a financial investment, some angels actively participate in the firm's operations; however, such participation varies by angel. He reports that angels usually invest close to home. Using information collected from interviews with angels, Linde and Prasad(1999) finds the average angel has a total of $335,000 invested in 4 different companies. As individual investors, angels exhibit great heterogeneity in personal characteristics such as age, experience, and investment preferences.

3 Sample Description

3.1 Data Gathering

To investigate the hypotheses of the model, I need a sample of angel-backed firms. The task is complicated by the fact that no commercial database exists that systematically records angel transactions. The angel market involves private transactions which are not subject to public disclosure

[5] *Forbes* November 2, 1998 and *Individual Investor* July 2000.

with very little institutional infrastructure supporting the market. Additionally, much of the market is fragmented and unorganized. These factors make data difficult to obtain.

To conduct this study, I collect data through surveys and interviews with entrepreneurial firms. Over 800 angel-backed firms were identified via newswires, periodicals (such as *Angel Investor*, press releases, angel networks, and websites (such as *Red Herring's* Herringtown and Localbusiness.com). Firms were asked if they had received any outside funding. Angel backed firms were contacted for information regarding all financing received since firm initiation. In addition to financial information, the firms were asked to provide descriptive information on their firm such as the number of employees, revenues (if any), and background information on the founders. Due to issues of confidentiality and competition, some respondents only provided partial responses. Whenever possible, a founder or person responsible for investor relations was contacted for information. The final sample consists of 215 investment rounds made by angel investors in 143 companies from 1994 to 2001.

All funding rounds consisted of some financial participation by angels, whether it was angels only or co-investing with venture capitalists, strategic investors, or other investors such as friends and family. For my purposes, any funding conducted by 'angel venture' funds or limited-liability organizations acting as 'early-stage-angel' funds are considered venture capital funds because I only wanted investments by individuals. For example, entities such as Angel Investors LLP and the Band of Angels Fund are considered a venture fund. However, investments from individual Band of Angels members are classified as angel investments.

The sample of firms has many advantages. Since entrepreneurial firms were asked for information (instead of angels), the sample is free from the bias caused by investors only reporting information from only the successful ventures. Although surveys are imperfect for the usual rea-

sons, the approach allowed for subjective answers from entrepreneurs on questions such as the quality of help from outside investors. While it is impossible to obtain information on every completed angel financing due to the very nature of the transactions, every effort has been made to make the sample as unbiased and representative as possible. The 215 financings are a large enough sample to draw representative conclusions.

3.2 Sample Selection Issues

In this section, I discuss potential selection issues concerning my sample. The financings are not a completely random sample in that the data is from firms that were willing to respond to inquiries and provide confidential information.

I contacted 801 companies for information and received information from 143 companies. Of the 143 companies in the sample, 56 companies are identified via newswires, 48 companies from *Red Herring's* Herringtown website,[6] 33 from angels or angel networks and 6 from other miscellaneous sources.[7] It is possible that the companies surveyed were more successful, having released some information publicly. However, many of the companies surveyed have since been acquired, ceased operations, or continued to operate successfully. As of November 2001, 102 of the companies are still operating, 9 have been acquired, 22 have ceased operations. No companies have gone public in the time. I am not able to verify the status of 10 companies.

The average age of the companies when surveyed is 24.5 months (with a median of 19 months), relatively close to the age of the companies at funding in table 1. The proximity between the survey age and the funding age should reduce selection bias problems.

[6] Herringtown was a database of young start up companies maintained by the publishers of *Red Herring*.
[7] These include companies personally referred by angels.

Despite the possibilities of modest selection bias existing in the sample, the biases should not be of great concern since I am not attempting to measure performance. Instead, I am trying to detail the specifics of angel investments and the role of angel investors. In this respect, the sample is likely to be similar to typical angel investments.

3.3 Summary Statistics

Table 1 presents summary information for the sample. Panel A of table 1 reports the geographical distribution of the dataset.[8] In comparison to venture capital investments, the dataset has fewer observations in California and New England, although the sample remains heavily weighted toward California. For the time period of 1995-2000, Venture Economics reports slightly more than 22% of venture-capital-backed companies are located in California. A major difference between Venture Economics and my data is the high representation of firms in the southeast and an underrepresentation of firms from New England. Venture Economics reports between 12% of venture backed companies are located in New England whereas less than six percent of my sample comes from New England. If angel activity is concentrated in the highest areas of venture capital activity, then the sample has minor geographical differences. However, the data geographic breakdown falls roughly in line with AngelSociety's Survey of angel group activity.[9]

Panel B shows the date of company formation. Most of the companies are founded between 1998 and 2000. While it is easy to state the founding date of the company as the date of legal incorporation, many firms had other significant events occur, such as the hiring an employee or the beginning of business operations, before legal incorporation. I take the founding date as the

[8] A superconductor firm refused to give its geographical location for confidentiality purposes.
[9] *Angel Society*, January 2001

earliest date that I have for any significant firm activity. Most of the angel rounds were completed in 1998-2000, with over half of my sample financing rounds from 2000. While the young age of the companies does not allow for long term panel studies, the relative youth of our companies and the freshness of the funding is positive for many aspects. First, the findings in this paper will not suffer from survivorship bias caused by analyzing data from older companies. Secondly, the companies reflect the current state and trends in angel financing.

Panel C divides the sample into different industries as defined by Venture Economics. Most of the sample are from the 'Computer Related' industry, reflecting the technology boom in the late 1990s. 'Computer Related' firms include are internet services, internet content and design firms, and business-to-business/consumer companies. This may be oversampling of one industry, or it may represent the trend in the late 1990s to invest heavily in computer related companies, an industry which experienced rapid growth during this time. Data from venture capital disbursements seem to support this idea. Gompers and Lerner(2001) find 60% of all venture capital disbursements went to information technology industries.

As Panel D indicates, the majority of the rounds in my sample are pre-revenue. 69% (99 of 143 companies) of the firms are pre-revenue for all funding rounds. This is significantly different than the sample of firms in most venture capital research. For example, less than 40% of the firms in Kaplan and Strömberg's (2001) sample are pre-revenue firms. If revenue generation is an indicator of development, my analysis focuses on firms who are earlier in their life-cycle than analysis on venture capital financed firms. Panel E indicates the age of the firms in the sample at first funding. The average age of first funding is 10.5 months. Most firms that receive funding are less than 12 months old. In comparison, the average age at first funding for venture-backed firms is greater than one year (Gompers (1995)). If information quality is linked to age, then the uncertainty should be

much greater in angel-financed than in venture capital financed firms. Panel D and E of table 1 support the idea that angels typically finance earlier stage companies.

Panel A of Table 2 shows that most of my sample (157 rounds) is financed entirely by angels. Co-investment by angels and venture capitalists accounts for less than twenty percent of all funding rounds. This indicates that angels are a different type of venture investor, not merely co-investors with institutional venture capital.

Panel B of Table 2 describes the funding amounts for the financing rounds. The median investment per investment round is $1 million. Not surprisingly, firms with positive revenue or are in later stages of financing receive greater amounts financing, suggesting as asymmetric information decreases in later rounds or with observable revenue streams, financing increases. In rounds having only angel participation, the mean investment is 1.28M (median of 850,000). Compared to the results in Kaplan and Strömberg(2001), the average amount of financing provided by venture capitalists is twice the size of amount of financing provided by angels only for companies at comparable stages.

Comparing the results from table 2 with data from institutional venture capital data from Venture Economics yields many differences between angels and venture capital. In rounds closed between 1998 and 2000, the average round of venture capital investment is 17.95M per round. Considering only venture capital funded seed and start-up rounds, the size of average venture capital investment remains larger than angel contributions. From 1998 to 2000, an average of 4.77M was received from venture capitalists by companies in these startup/seed stages. The average angel funding is 2.17M across all rounds. Panel D and E of table 2 reports angel financing is smaller than venture capital fundings in comparable industries.

The difference in funding size provides some evidence that angels play a complementary role

to venture capital. Instead of competing with venture capitalists for firms at similar stages of development, angels provide a smaller amount of funding to younger firms.

4 Model Implications

The model in the appendix predicts entrepreneurs will retain control rights in their investments even with the ability to renegotiate contracts. However, certain investments may not be feasible if the entrepreneur does not relinquish control to the outside investor. In particular, if a project requires a large investment, the only way that the investor will fund a project is if he receives control. Additionally, control rights shift to the outside investor as the value of liquidation increases. Moreover, if the entrepreneur retains controls rights (as is the case with smaller investments), straight equity will be the preferred security. Larger investments which require the ceding of control rights will use a more complicated security similar to convertible debt.

Within the context of angel investors, the model predicts that smaller investments will use straight equity. As long as the outside investors only own a small fraction of the firm, the entrepreneur will retain the control rights. As the ownership of the angels increase, more control will be ceded.

The model has predictions regarding the variation in contracts between angel and venture capital investments. As the information in the summary statistics indicate, angel investors typically provide small amounts of capital,[10] typically with less than 20% of the equity exchanged for investment, while venture capitalists typically provide larger amounts of capital for larger ownership shares.[11] According to the model, venture capitalists should receive more control provisions in

[10] See table 1

[11] See Kaplan and Strömberg(2001) for details on venture capital ownership levels.

their deals. Additionally, venture capitalists often have a better ability to liquidate the firm because of their larger network of contacts compared to angel investors. Because of this, control rights are more likely to be held by venture capitalists rather than angels. Lastly, the model predicts a more complicated security with larger investment; therefore, venture capitalists should use a convertible claim, while angels should use an equity-like claim.

5 Empirical Tests and Results

In this section, I use my sample to provide detailed evidence on the predictions of the model. Inferences regarding the differences in the allocation of control rights between venture capital and angel investors are drawn by comparing existing results on venture capital to my findings. Subsequently, I investigate the variation of the distribution of control rights within angel investments. In addition to the model's predictions, I test for other determinants that may determine distribution of control rights. These factors are culled from existing literature on venture capital. In addition to funding, venture capitalists often provide professionalization assistance. I examine whether angels can provide the same non-monetary benefits to the new enterprise.

5.1 Control Rights

Many investors seek to protect their investment from expropriation through the use of control rights. I consider three common controls mechanisms used by institutional venture capital. The first measure is representation on the board of directors. Receiving board rights is an indication that investors maintain a degree of authority over the manager. Secondly, the control of investments through staging has been documented in the venture capital literature (see Gompers(1995)) as a

control mechanism. Staging an investment can effectively halt the progress of a wayward venture as capital is no longer available for the new firm. Lastly, as Kaplan and Strömberg(2001) demonstrate in venture capital contracts, contracting mechanisms such as security choice and contractual provisions can be effective methods of control. If angels are identical to venture capitalists, they should maintain similar protections, particularly in ventures where the threat of expropriation is the highest.

Many theories emphasize the role that capital providers such as venture capital provide after the investment is made. Lerner(1995) finds venture capitalists exercise control through board representation and the active recruitment and dismissal CEOs. Kaplan and Strömberg(2000) find many venture capitalists anticipate having an active role in management and the hiring of new management. If angel investors are similar to venture capital organizations, angels should actively participate in the lives of the firms.

5.1.1 Board Rights

Board seats give outside investors the ability to affect corporate decisions. Board rights are particularly important in environments with greater uncertainty since it is not feasible to specify all possible contingencies in the *ex ante* contract. Sahlman(1990) finds board seats are typically allocated to venture capitalists as part of a financing rounds. Panel A of table 3 shows this is not the case with angel investments. Board seats are granted only in 42.5% of all funding rounds. The likelihood of providing a board seat does not change much when considering pre- and post-revenue funding rounds. The initial round of angel financing tends to have a slightly higher (though not statistically significant) probability of board seat allocation, although fewer than half of all first rounds relinquish board seats to outside investors.

Lerner(1995) reports an average of 1.12 board seats are added in each venture capital round. In panel C of table 3, an average of only 0.59 board seats are added to the board of directors in a typical angel financed investment round. The board size in the angel-financed ventures are much smaller than public companies[12] or venture-backed firms.[13] Panel C shows that the average board size of the firms is 3.71 members with a median of 4 members. Panel D reports, on average, angels only represent 18% of the board of directors. Kaplan and Strömberg(2001) find venture capitalists control between 37 to 47 % of the board seats in the firms they invest in. In my sample, insiders have the majority of board seats on 100 boards (out of 116 where I have information on board composition subsequent to funding) which is consistent with Kaplan and Strömberg's (2001) finding that outside board control is less common for early-stage companies. However, in venture capital funded firms, insiders comprise the majority in only 13.9% of the boards. From table 3, angels take a much smaller degree of control through board representation than venture capitalists.

The results on boards of directors are consistent with other theories which suggest a passive role for angels. Fama and Jensen(1983) hypothesize that the composition of board should be shaped by the need for monitoring. If the threat of managerial expropriation is high, then the board will bear a greater responsibility for oversight. Additionally, at the early age of the firm, much of the value of venture is embodied in the human capital of the entrepreneurs, so the replacement of the founders would not seem to increase the value of the company.

Similarly, the need for a board seat may be determined by the need for oversight within each company. Larger investments (and equity stakes) by outsiders will increase the need for oversight. Ventures with larger potential agency costs should be monitored more often. Firms in industries

[12] See Denis and Sarin(1999), Yermack(1996) or Gertner and Kaplan(1996) for evidence on public companies.

[13] See Barry, Muscarella, Peavy III, and Vetsuypens(1990), Lerner(1995), Baker and Gompers(2000), and Kaplan and Strömberg(2001) for evidence on board seats and board size in venture-backed firms

with higher market-to-book ratios may need more monitoring as agency costs are often associated with growth options. Tangible assets lower expected the agency costs in inefficient continuation, decreasing the need for board seats. Industry volatility should increase the need for a board seat if the volatility is a measure of the uncertainty in the project. Firms with intensive R&D may need more oversight since it is likely that these firms will have more specific assets that can be expropriated. Entrepreneurs with previous entrepreneurial history may not need as much oversight because their reputations have already been established. Finally, early rounds, when uncertainty is the highest, should have more board seats allocated.

Table 4 reports results from the probit regressions on the factors determining the allocation of board seats. Panel A examines the results for all funding rounds and panel B only considers funding rounds composed entirely of angel funders. The coefficient on industry volatility has the opposite sign as predicted and different from Kaplan and Strömberg's (2001) finding that outsider board control is positively related to industry volatility. Though the coefficients on R&D are economically large, they are not always statistically significant. However, the coefficient on the ratio of fixed assets has the opposite sign from expectation. In total, the regression provides mixed results on the predictions of the models and other theories. It appears that angels do not increase the use of board representation as a control mechanism in projects with higher agency costs or uncertainty.

5.1.2 Staging

Empirical and theoretical works have emphasized the importance of staging as a control mechanism for venture capitalists. Instead of providing all the needed capital in a lump sum, the investment is provided in stages, preserving the investor's option to abandon. Models such as Hart and

Moore(1994), Bergemann and Hege(1998), and Neher(1999) stress the importance of staging as a control mechanism. Gompers(1995) finds that venture capitalists use staging as an important method to control agency costs.

Panel A of table 5 provides mixed results for the use of staging. Consecutive rounds funded by angels only do tend to have follow on investors. However, if the subsequent financing round involves venture capital participation, angels do not follow on. This finding supports the complementary nature of angel and venture capital investment. Once the firm has been nurtured to success, with success being venture capital investment, the angels step aside to more professional investors.[14] Panel B shows that even when angels follow on, only an average of 40% of investors from previous rounds participate in the subsequent rounds.

I investigate the factors that affect the probability of staging investment in the probit regressions in panels C and D of table 5. Similar to the predictions on board seats, investors in ventures with high degrees of agency costs and uncertainty should have a higher probability of staging their investments. The predictions for the coefficients of the independent variables are similar to the predictions for board rights. However, the results indicate that many of the variables do not significantly affect whether angels stage investment. Most of the variables are not statistically significant. Investigating only angel financed rounds, none of the independent variables are statistically significant although the coefficient on research and development is economically large. Angels may want to wait for the product to be closer to development before committing additional funds. In summary, staging is not a frequently used control mechanism by angels. Staging does not appear to be used to control agency costs or relieve uncertainty in investment decisions.

[14] Alternatively, venture capitalists may not want to co-invest with angels, thereby forcing angels aside. Evidence for this idea is provided in panel C of table 11. The number of angels is significantly lower in rounds with venture capital co-investment.

5.1.3 Contractual Provisions

Angel investors may use contractual provisions as protection from expropriation. More complex securities may provide investors stronger protections in the event of liquidation. Contractual clauses may give the investor additional protection from expropriation. Common protections in venture contracts include ratcheting and anti-dilution agreements.

Panel A of table 6 reports the types of security used in each round. Common equity is the most prevalent security, used in 34% of all rounds and 39.5% of angel-only rounds. In contrast, Sahlman(1990), Gompers(1998) and Kaplan and Strömberg(2001) report that convertible preferred is the dominant security in venture capital financing. The high usage of preferred and common equity is consistent with the theoretical predictions of Casamatta (2000). In her model, Casamatta finds common equity is better suited to smaller investments (such as those made by angels) while larger investments should use preferred or convertible preferred securities. Equity may be used more often with angel investments because of the higher costs of writing a complex securities with a small investment outweigh the benefits.

Panels B and C of table 6 reports regression results from probit regressions where the dependent variable is equal to one if the security used is equity and 0 otherwise. Smaller investments may not justify the use of complex securities because of the higher costs of implementing a more complex security. Complex securities should be used the threat of expropriation is greater. Thus, a negative coefficient is expected for the market-to-book ratio, R & D and industry volatility. Firms that have an identifiable revenue stream and entrepreneur with prior entrepreneurial experience may not need as strong a security than other firms.

The results in table 6 support the relation between funding and security choice. Large invest-

ment rounds use more complex securities, providing some support for the model. However, if the size of the investment is measured by equity stake, the coefficient is not statistically significant, lending support to the fixed costs of security choice. The other independent variables do not affect the choice of security, indicating that the cross sectional variation in security choice is not influenced by concerns with reducing agency costs or expropriation.

In addition to security choice, many investment contracts have provisions that protect and empower the investor. Panel D contains information on many of these contractual clauses. Many contracts contain a follow-on right of first refusal provision that allows angels to participate in future rounds to capture the potential upside in successful ventures. However, as table 5 shows, many angels do not exercise this right. 26% of financing rounds contain weighted ratchet closes for protection against future rounds at decreased valuations. Full ratcheting protection was not given in any investment round. In comparison, Kaplan and Strömberg(2001) find 21.9% of their sample use full-ratcheting and 78.1% of their sample use weighted-ratcheting. Kaplan and Strömberg(2001) find contingent equity ownership prevalent in venture capital contracts. However, very few angel contracts contain provisions for contingent equity stakes.

Contractual protection from expropriation is not one-sided. Panel E indicates 38 financing rounds contain provisions that allow the firm to repurchase the stake of the angel, similar to the call provisions explained in Sahlman(1990). Many entrepreneurs cite this clause as a way to rid themselves of 'bad apples' or investors whose vision does not coincide with that of the founders.

5.2 Alternative Mechanisms

In contrast to previous results on the control mechanisms adopted by venture capitalists, I find angels do not implement the same methods of managerial oversight. In particular, angels typically do not receive board seats, stage investments, or use particularly strong contractual claims to protect their claims. The use of the conventional control mechanisms is not very sensitive to commonly used measures of agency costs and uncertainty. Little support is found that increases in potential agency costs and uncertainty lead to increased use of protections. The puzzle remains: how do angel investors mitigate the increased risks of investing at early stages?

5.2.1 Funding

This section investigates the factors affecting the amount of funding. If investors are concerned with large degrees of uncertainty, then the average contribution per investor, total funding amounts, and number of investors will be sensitive to industry proxies for uncertainty, characteristics of the entrepreneur and management team, and the presence of a revenue stream. Intangibles factors such as entrepreneur's prior experience may provide signals to alleviate investor uncertainty. Funders may feel more secure investing with entrepreneurs who have a previous track record. More mature firms and larger firms also should have more existing information, decreasing the uncertainty with investment. Having a management team or a revenue stream signals to investors that the firm has completed the initial research and development phases. Hellmann and Puri(2000) find the hiring of a marketing and sales vice president to be an indicator for product development. Another method to protect against large potential losses it to invest smaller amounts in greater uncertainty and to syndicate riskier investments. Lerner(1994) finds venture capitalists syndicate early rounds as a

method to verify their decision making processes.

Table 7 provides evidence on the factors influence the amount of funding in a round. The results on the total funds raised in the round are displayed in panel A, and the funds in angel-only investment rounds are shown panel B. Focusing on the angels-only results in panel B, post-revenue firms actually receive less funding. High growth firms, as measured by the industry market-to-book ratio, receive more funding in each round. However, there is little support that any other measures of uncertainty strongly influence the amount of funding as most of the coefficients are not statistically significant.

As evidenced by the statistics on cash flow rights in table 8, the majority of residual claims belong to management. Outside investors typically own less than a quarter of the new firm. Angels may not need a high degree of control because the threat of expropriation is minimized by the large residual claim held by the founders. The incentives of the founders are aligned with the prospects of the firm. In comparison, Kaplan and Strömberg(2001) find venture capitalists hold a slightly larger proportion of cash flow rights (on average 40%) in the investments that they make. Because the incentives of the entrepreneur are not as strongly aligned with the outside investors, the need for formal control may be greater. However, it is questionable whether such a small decrease in managerial ownership drastically increases the need for formal controls.

Table 9 presents estimates from two stage least squares regressions where the dependent variable is the equity ownership allocated to the outside investors in each round. Angels receive a higher equity stake to compensate for the extra risk of investing under greater uncertainty. The statistically significant and positive coefficient on the first round dummy indicates angels receive a premium for investing early. Having a management team in place, an indication that the firm has progressed passed the initial development stages, decreases the equity ownership purchased

by outsiders. Investors in firms with more uncertainty, as measured by industry volatility, receive more cash flow rights. Greater research and development intensity leads to a decreased equity stake for angels. These results agree with the results from Kaplan and Strömberg(2001).

5.2.2 Syndication

Another method of reducing risk is to syndicate investment with other investors. By syndicating investments, the investors may be able to share the risks and share in the monitoring of the firm. Additionally, more angels investing may signify that firm has passed the evaluations of more screeners. Syndication may act as a verification mechanism, thus it is expected that earlier funding rounds will have more investors.

Table 10 shows the average number of angels participating in each round. On average, twelve angels co-invest in a round. In comparison, Kaplan and Strömberg(2001) find venture rounds are normally syndicated with two to nine funds co-investing. While the increase in syndication may increase the monitoring capacities of the angel investment group,[15] venture capitalists also syndicate their investments while maintaining more formal control mechanisms.

Panel A of table 10 shows that the number of angels in each round is higher in earlier rounds. As firms develop, later rounds and post-revenue firms receive larger average contributions per angel. On average each angel owns between three to five percent of the firm.

I run regressions to further examine the factors that influence the variation of contribution amounts. Panels A and B of table 11 shows the average contribution per angel is only affected by early rounds, although the coefficient is not statistically significant in panel B. In panel B, angels have a higher average contribution when a management team is in place at the firm.

[15]The increased syndication may lead to free-rider problems as well

Panel C and D of table 11 provides results on the factors that determine the number of angels investing in a round. The model is an instrumental variables estimate of a poisson model, following the 2SQML method detailed in Mullahy(1997). Using this procedure, the estimates are consistent, but the standard errors may be positively biased using this procedure. The results in panel D for angels-only rounds indicate more investors in firms in higher market-to-book industries, suggesting that more investors want to invest in ventures with the higher growth. Entrepreneurial experience seems to attract more investors.

5.3 Geographic Proximity

The results on geographical proximity deserve further elaboration and may provide insight into the investing behavior of angels. Entrepreneurs may begin their search for capital by exploring local resources. A localized bond of trust may exist between the entrepreneur and investor, making formal control mechanisms unnecessary. Because of the strong trust and familiarity many local investors may have with each other, syndication is greater among local investors. Subsequent larger fundings may exhaust the resources of the local investors and need to be funded by more professional investors. Additionally, as a firm progresses, the need to professionalization services is greater, leading the entrepreneur to turn to more professional investors who require more formal control because of their lack of familiarity with the founders.

If investment size is related to the degree of uncertainty and the cost of information dissemination is related to geography, the amount of investment should increase as the angels are closer. Alternatively, investments made by investors at a distance can be most costly (either to monitor, to negotiate, etc.). The results in table 7 show the total funding and the angels' contribution to the

round decrease when the nearest angel is less than fifty miles away, supporting the second idea.

Panel B of table 11 shows the average contribution per angel also decreases as the angels are closer, suggesting that local investors may not be as wealthy as more professional investors. However, this is offset by the increase in the number of angels who invest if they are located closer to the entrepreneur. Lastly, from table 12 local investors provide more help given their local proximity. However, geographical proximity may delay venture capital investment. A possible explanation is local angels do not have as large as a contact network as more professional investors.

Some additional validation for this idea is provided by examining the results on the formal control mechanisms: board seats, staging and security choice. In contrast to Lerner's (1995) finding that close geographical proximity increases the likelihood of board representation, I find geographical proximity has a negative effect on the probability of board representation in angel funded rounds (table 4), albeit the results not highly significant. The need for contractual monitoring (via a board seat) may be reduced because of the geographic proximity of investors. Although not statistically significant, geographic proximity also decreases the use of staging and increases the use of equity, consistent with the localized investor hypothesis.

Taken together, these results suggest many entrepreneurs begin their search for capital with local resources, relying on local ties to encourage investment. Local angel investors may not be as sophisticated as more professional investors, but may be more trusting.

5.4 Other Post-Investment Activities

In this section, I consider the role angels have in the success of the firm. Gorman and Sahlman(1989), Sahlman(1990), and Ehrlich et al. find that venture capitalist actively participate in their invest-

ments after funding. In addition to funding, angel investors may play an active role in professionalizing the firm or bringing a product to market, similar to some activities that venture capitalists provide (Hellmann and Puri(2001)). Since many angels are former entrepreneurs or industry executives, many angels may derive some private benefits from assisting in the development of a new firm.

Building the management team is an important responsibility of the founders. In table 7, a complete management team leads to larger funding amounts. Hellmann and Puri(2001) find that venture capitalists help form the management team. In panel A of table 12, 23.5% of respondents said that angel investors assisted in identifying and recruiting members of the management team. Kaplan and Strömberg(2000) find that 50% of venture capitalists expect to replace the CEO or help recruit the management team. I find that angels tend to provide less assistance than venture capitalist in recruiting top management.

Angels can provide assistance in another important area, helping to locate and secure subsequent financing from venture capital. Gorman and Sahlman(1989) report venture capitalists consider raising additional funds the most important activity. If angels are helpful in securing additional funding from venture capital, the time until venture funding should decrease as the number of angels increases because of a larger network of contacts. Panel B of table 12 presents hazard rate duration regressions on the time until venture capital financing assuming that the hazard rate follows the Weibull distribution. There are 57 financing rounds where the subsequent round is financed by venture capital. I find that more angel investors leads to a faster time to venture financing. This is evidence that angels can play a networking role; a larger number of angels leads to a larger network of contacts and faster venture capital financing.

Panel C of table 12 presents results from ordered logit regressions where the dependent variable

is the amount of help that angel investors provided the firm. The amount of help is a subjective response from the founders, so it is tainted by the usual problems with subjective responses. The variable is separated into 5 categories with the lowest category representing 'little or no help' and the highest category corresponding to 'a lot of beneficial help from angel investors.' In all the regressions, geography is statistically significant at the 5% level. Angels who are in closer proximity tend to provide better assistance. Familiarity with issues confronting new ventures may require more interaction, therefore geographical proximity may encourage more assistance. Other variables do not appear to affect the degree of assistance.

6 Conclusion

This paper presents an examination of angel investing. Using a hand-collected dataset, I detail the characteristics of angel finance, from the implemented control mechanisms to the determinants of funding levels. I find that angels are not given the traditional control rights that venture capitalists typically use. Rather, one of the primary mechanisms to control agency costs is the alignment of the entrepreneur's interests with those of the firm through the large ownership positions. Additionally, angels make smaller investments and increase syndication when investing in the riskier ventures.

The results suggest a difference between venture capital investors and angel investors. The summary statistics show angels fund smaller amounts than venture capital. Firms that require larger amounts will seek venture capital investment, while angels may be preferred for small capital. Closer examination reveals that venture capitals may not like to co-invest with angels. Angel investors appear to nurture younger firms until the company is established enough for venture capital consideration.

A puzzle still remains as to why angels provide capital in highly uncertain operations without much formal protection from expropriation. I suggest a geographic based explanation. Geographical proximity plays a large role in determining the funding amount, control, and degree of post-investment assistance from angels. These results are similar to the networking effects for venture capital found by Sorenson and Stuart(forthcoming). Sorenson and Stuart find close geographic proximity increases the likelihood of funding and the ease of monitoring. Additionally, some support is found that investors may receive private benefits from investing. O

ther theories cannot be excluded. It is entirely possible that the returns from investing at early stages may be commensurate to the risk involved. Table 9 shows first round investments receive a significantly higher equity claim, enhancing the possible return for early investors. To address this hypothesis, reliable estimates on private equity returns need to be obtained. As Cochrane(2001) shows, private equity returns are problematic to measure.

Another explanation may be that angels have specialized information and have a high ability to screen for higher quality projects. Many investors have made their fortunes in the same industries that they subsequently invest in. Industry knowledge is difficult to measure and examine since the identities of the investors need to be known. In such a confidential environment, the screening ability of angels would be difficult to examine.

Lastly, issues of liquidity and exit strategy are not addressed. Since the investor seeks to make a high return from his investment, the time to and method of exit may affect the funding and contractual status between parties. These issues are left for future work.

Appendix: Model

A Model

A wealth constrained entrepreneur has a project with a payoff $\widetilde{M}$ with support $[\underline{M}, \overline{M}]$. The entrepreneur can exert effort at a cost, k, which will improve the project's payoff by a factor of $\overline{\theta}$, making the final payoff $\overline{\theta}\widetilde{M}$. Not exerting effort results in an expected payoff of $\underline{\theta}\widetilde{M}$.

The entrepreneur has the exclusive rights (monopoly rights or specific human capital) to develop this project, but is wealth constrained, and needs to raise funds from outside resources. The entrepreneur is risk-neutral; her utility is only affected by her final wealth. Risk-neutral financiers have funds to finance the project. In exchange for the the investment, the financier receives a share of the project's outcome, α.

Assumption 1 *Equity is the only security in this economy.*

The financier and entrepreneur share the same beliefs regarding the probabilities, payoffs, and cost of effort in this economy. There are three dates in the model. At the initial date 0, the entrepreneur negotiates with outside investors and the investment is made if the contracting is successful. At date 1, a liquidation opportunity, L is available. The party that holds the control rights makes the liquidation decision. At date 2, the project is revealed a success or failure and the payoffs are distributed to the contracting parties. All payoffs are in date 0 present values.

In addition to the payoffs from the project, the entrepreneur enjoys private benefits from managing the project. The private benefits accumulate to the entrepreneur only if the project is not liquidated. Private benefits may be on-the-job consumption, recognition for leading an entrepreneurial

venture or any other similar benefit. B denotes the monetary equivalent of the entrepreneur's private benefits.

The contract agreed upon at date zero specifies the allocation of control rights, γ, the share of the liquidation value, β, and the share of the final payoff, given to the investors in exchange for the required investment I. Let α_γ denote the share retained by the entrepreneur and $1-\alpha_\gamma$ equal the share given to the outside financier. If the project is liquidated, the entrepreneur will receive βL and the financier will receive $(1-\beta)L$. The contract cannot be made contingent on the effort of the entrepreneur. Denote entrepreneurial control of liquidation by $\gamma = 0$, and outsider control by $\gamma = 1$.

In the first best scenario, effort is provided by the entrepreneur if

$$\left(\overline{\theta} - \underline{\theta}\right) \widetilde{M} \geq k \tag{A-1}$$

If the entrepreneur must go to the outside financier for capital, she must decide the share to offer and whether or not to allocate the control rights to the outsiders. In this section, the initial contract agreed upon at date zero cannot be renegotiated at intermediate dates. Later sections will investigate the ramifications of renegotiation.

Consider the regime where $\gamma = 0$. With control rights, the entrepreneur will not liquidate the firm if the private benefits are large enough. The entrepreneur will exert effort if

$$\alpha_0 \left(\overline{\theta} - \underline{\theta}\right) \widetilde{M} \geq k \tag{A-2}$$

The investor will contribute to the new venture if his rationality constraint is not violated:

$$(1-\alpha_0)\,\overline{\theta}\widetilde{M} \geq I \quad \text{if effort is provided}$$

$$(1-\alpha_0)\,\underline{\theta}\widetilde{M} \geq I \quad \text{if effort is not provided}$$

Without loss of generality, assume effort is provided. Assuming a competitive market for investors, the rationality constraint will bind with equality. Solving for the share,

$$\alpha_0 = 1 - \frac{I}{\theta\widetilde{M}} \tag{A-3}$$

Comparing equation A-2 with equation A-1, it is apparent that the entrepreneur will not work the optimal amount as she must share part of the surplus from effort with the investor.

Suppose the outside investor has control, so $\gamma = 1$. Without renegotiation, there is inefficient liquidation when $\overline{\theta}\widetilde{M} > L > (1-\alpha_1)\overline{\theta}\widetilde{M}$. [16] The entrepreneur will exert effort if

$$\begin{aligned} &Pr\left((1-\alpha_1)\overline{\theta}\widetilde{M} \geq (1-\beta)L\right)(\alpha_1\overline{\theta}\widetilde{M}+B) + Pr\left((1-\alpha_1)\overline{\theta}\widetilde{M} < (1-\beta)L\right)\beta L \qquad \text{(A-4)} \\ \geq\ &Pr\left((1-\alpha_1)\underline{\theta}\widetilde{M} \geq (1-\beta)L\right)(\alpha_1\underline{\theta}\widetilde{M}+B) + Pr\left((1-\alpha_1)\underline{\theta}\widetilde{M} < (1-\beta)L\right)\beta L + k \end{aligned}$$

The rationality constraint for the investor is

$$Pr\left((1-\alpha_1)\overline{\theta}\widetilde{M} \geq (1-\beta)L\right)((1-\alpha_1)\overline{\theta}\widetilde{M}) + Pr\left((1-\alpha_1)\overline{\theta}\widetilde{M} < (1-\beta)L\right)(1-\beta)L \geq I \tag{A-5}$$

If equation A-5 holds, then the investor will provide beneficial effort.

Notationally, let

$$Pr(C|E) = Pr\left((1-\alpha_1)\overline{\theta}\widetilde{M} \geq (1-\beta)L\right)$$

[16] Or if the entrepreneur does not exert effort: $\underline{\theta}\widetilde{M} > L > (1-\alpha_1)\underline{\theta}\widetilde{M}$

and

$$Pr(C|NE) = Pr\left((1-\alpha_1)\underline{\theta}\widetilde{M} \geq (1-\beta)L\right)$$

$Pr(C|E)$ denotes the probability of continuation with effort and $Pr(C|NE)$ denotes the probability of continuation without effort provision.

Assumption 2 *$\widetilde{M}$ has a convex cdf*

With this assumption, effort is more likely to be provided if $\beta = 0$.

Lemma 1 *If $\beta = 0$, the entrepreneur is more likely to exert effort.*

Proof.

Consider the IC constraint of the entrepreneur. If the IC constraint is more likely to hold if $\beta = 0$, then the lemma is true.

Equation A-5 can be rewritten as:

$$Pr(C|E)(\alpha_1\overline{\theta}\widetilde{M} - \beta L) - Pr(C|NE)(\alpha_1\underline{\theta}\widetilde{M} - \beta L) - k$$

Since $Pr(C|E) \geq Pr(C|NE)$ and $\widetilde{M}$ has a convex cdf, the expression is decreasing in beta. Hence, the expression is maximized with $\beta = 0$. ■

β may be considered the bargaining power of the investor in liquidation. The lemma shows that effort is provided more often if the investor retains all the payoff in liquidation, making the entrepreneur work harder to avoid liquidation. From a security design standpoint, the claim that the investor holds is no longer a straight equity claim, but it resembles a convertible security that is fixed in low states and converted to equity in high states.

In a competitive equilibrium,

$$\alpha_1 = 1 - \frac{I - (1 - Pr(C|E))L}{Pr(C|E)\bar{\theta}\widetilde{M}} \tag{A-6}$$

If $L < I$, $\alpha_0 \geq \alpha_1$ since $\alpha_1 - \alpha_0 = \frac{(1-p)(L-I)}{P(C|E)\bar{\theta}\widetilde{M}}$. If $\gamma = 1$ and $L > I$, the investor recoups extra rents in the low state, thus he only needs a smaller share in the high state for compensation.

Proposition 1 *if $\gamma = 0$ is feasible, the entrepreneur prefers to retain the control rights.*

Proof.

Consider the difference in the entrepreneur's utility between the control regimes:

$$\begin{aligned} U_{\gamma=0} - U_{\gamma=1} &= && \text{(A-7)} \\ &= \theta\widetilde{M}(\alpha_0 - P(C|E)\alpha_1) + (1 - P(C|E))B \\ &\geq \theta\widetilde{M}\left(\frac{\theta\widetilde{M} - I - (P(C|E)\theta\widetilde{M} - I + (1 - P(C|E))L)}{\theta\widetilde{M}}\right) \\ &= (1 - P(C|E))(\theta\widetilde{M} - L) > 0 \end{aligned}$$

(A-8)

The proof is analogous if the entrepreneur decides to expend no effort. Clearly, if the entrepreneur expends effort with $\gamma = 1$, then she will also expend effort with $\gamma = 0$. If expending effort with $\gamma = 0$ is rational, this will dominate any choice with $\gamma = 1$. ■

Without renegotiation of the contract, the entrepreneur is better off by retaining the control rights. If $\gamma = 0$, the entrepreneur will work more often, but many projects are not feasible if $\gamma = 0$. If the project requires a large investment, retaining control may require that $\alpha \geq 1$. The set of feasible projects with $\gamma = 1$ is larger (although not as large as the first best) since the outside

investor does not require as large of a share. In the next section, I outline the characteristics of project feasibility.

A.1 Project Feasibility

More projects will be contracted under the first best optimum than if the entrepreneur is forced to seek outside investment. If effort is required for the project to be successful, many projects are not completed because the required effort is not provided as the entrepreneur bears the cost of this effort while receiving only part of the gains.

If $\gamma = 0$, the feasibility of the project depends on the NPV. Denote

$$NPV_{\text{effort}} = \quad \bar{\theta}\widetilde{M} - I \tag{A-9a}$$

$$NPV_{\text{no effort}} = \quad \underline{\theta}\widetilde{M} - I \tag{A-9b}$$

If $NPV_{\text{no effort}} \geq 0$ then any project that is funded in the first best will also be funded. If $NPV_{\text{effort}} > 0$ then the project will be funded only if equation A-2 is satisfied. However, consider a project where

$$NPV_{\text{effort}} \geq 0 > NPV_{\text{no effort}}$$

but equation A-2 is not satisfied. These projects will not be funded, despite being positive net present value.

From proposition 1, the entrepreneur will prefer to retain control rights whenever it is feasible. However, some projects are only feasible by ceding the control rights to the outside investor. Projects that require more capital are more likely to be feasible with outside control because the in-

vestor benefits from the downside protection of liquidation. In these situations, $\alpha_0 < 0$ but $\alpha_1 > 0$.

Another situation where project feasibility matters involves the costs of effort. Consider a project where equation A-2 is violated:

$$\alpha_0 \left(\overline{\theta} - \underline{\theta}\right) < k$$

but $NPV_{\text{no effort}} < 0$. With entrepreneurial control, this project is not feasible. However if $L > I$, the project is able to be financed if

$$\frac{\alpha_1}{\alpha_0} > \frac{\overline{\theta} - \underline{\theta}}{P(C|E)\overline{\theta} - P(C|NE)\underline{\theta}} \tag{A-10}$$

The ratio $\frac{\alpha_1}{\alpha_0}$ is affected by the liquidation value. Larger values of liquidation and lower probabilities of continuation, $P(C|E)$, increase the ratio $\frac{\alpha_1}{\alpha_0}$, enhancing the likelihood of equation A-10 being satisfied. There is a tradeoff with the increase in effort provision when control rights are retained and the decrease in effort because a larger share needs to be given to the outside investors.

A.2 With Renegotiation

If the entrepreneur and investor can renegotiate the contract when the liquidation opportunity arises at at date 1, the contractual decision may change. Renegotiation will eliminate some situations of inefficient continuation or liquidation.

If $\gamma = 0$, renegotiation will only occur if $\overline{\theta}\widetilde{M} + B < L$ (or $\underline{\theta}\widetilde{M} + B < L$ if effort is not provided) since $\beta = 0$ and the entrepreneur does not receive any payoff in liquidation. The case where the liquidation value is greater than the total value of the project is uninteresting and will not be

considered here. If $\gamma = 0$, the payoffs will be the same as above.

Renegotiation with $\gamma = 1$ is more interesting. Renegotiation occurs if $\overline{\theta}\widetilde{M} > L > (1-\alpha_1)\overline{\theta}\widetilde{M}$. While it is efficient to continue the project, the investor, who has the control rights, would like to liquidate the project and obtain the higher payoff, L. To avoid liquidation, the entrepreneur must bribe the investor to continue. Without loss of generality, I assume a take-it-or-leave it bargaining game where the outside investor has all the bargaining power, allowing him to usurp all the surplus. Therefore, in the bargaining state, the investor actually has a higher payoff.

With renegotiation, the entrepreneur's utility with effort is:

$$Pr((1-\alpha_1)\overline{\theta}\widetilde{M} \geq L)(\alpha_1\overline{\theta}\widetilde{M} + B) + Pr(\overline{\theta}\widetilde{M} > L > (1-\alpha_1)\overline{\theta}\widetilde{M})B - k \qquad \text{(A-11)}$$

Let $Pr(C|E) = Pr((1-\alpha)\overline{\theta}\widetilde{M} \geq L)$ and $Pr(B|E) = Pr(\overline{\theta}\widetilde{M} > L > (1-\alpha_1)\overline{\theta}\widetilde{M})$. $Pr(C|NE)$ and $Pr(B|NE)$ are defined similarly. The entrepreneur will exert effort if

$$\alpha_1 M(Pr(C|E)\overline{\theta} - Pr(C|NE)\underline{\theta}) + B(Pr(B|E) - Pr(B|NE)) \geq k$$

If $\gamma = 1$ the entrepreneur will be more likely to exert effort because of the potential gain in the bargaining state, $B(Pr(B|E) - Pr(B|NE))$ since the cdf of $\widetilde{M}$ is convex.

Proposition 2 *With bargaining, the entrepreneur still prefers to retain control if* $\gamma = 0$ *is feasible.*

Proof. *Consider the entrepreneur's utility under the two regimes,* $\gamma = 0$ *and* $\gamma = 1$

$$
\begin{aligned}
U_{\gamma=0} - U_{\gamma=1} &= && \text{(A-12)} \\
&= \theta\widetilde{M}(\alpha_0 - P(C|E)\alpha_1) + (1 - P(C|E) - P(B|E))B \\
&\geq \theta\widetilde{M} - I - ((\theta\widetilde{M}(P(C|E) + P(B|E)) - I + (1 - P(B|E) - P(C|E))L + P(B|E)B) \\
&\geq (1 - P(B|E) - P(C|E))(\theta\widetilde{M} - L) > 0 \\
& && \text{(A-13)}
\end{aligned}
$$

■

Although the entrepreneur prefers to retain control, many projects may not be feasible with $\gamma = 0$. With renegotiation, the same problems with project feasibility under the $\gamma = 0$ regime still exist. However, renegotiation allows for greater efficiency as more projects are funded with renegotiation.

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Table 1: **Sample Description**

Summary information for 215 investments in 143 angel financed companies. Investments were made between January 1994 and March 2001. Panel A specifies the location of the financed firm into their respective regions. The regions are specified by Venture Economics. Panel B provides founding dates for the companies in the sample. The column labelled First Fund denotes the year which the firm first received angel financing. Panel C provides information on the number of angel-financed rounds in each year, and the years that a company has first received angel-financing. Panel D provides the industry decomposition of angel investments. Industry classifications are the same as reported by Venture Economics. Panel E reports the type of investor per funding round. Other investors include strategic alliances and corporate venture capital.

Panel A: Geographic Location

Region	Companies	Percent	Funding Rounds	Percent
Great Lakes	11	7.8	19	8.9
Great Plains	6	4.2	11	5.1
New York	11	7.8	15	7.0
MidAtlantic	10	7.0	16	7.5
California	31	21.8	46	21.5
New England	8	5.6	10	4.7
Northwest	13	9.2	24	11.2
Ohio Valley	7	4.9	9	4.2
Rocky Mountains	6	4.2	9	4.2
South	3	2.1	4	1.9
Southeast	20	14.1	25	11.7
Southwest	16	11.3	26	12.15
Total	142	100.0	214	100.0

Panel B: Date Founded and Rounds Financed

Year	Companies Founded	Percent	Rounds Completed	First Fund
1991	1	0.7	0	0
1992	0	0.0	0	0
1993	2	1.4	0	0
1994	2	1.4	1	1
1995	4	2.8	0	0
1996	6	4.2	1	1
1997	10	6.9	5	5
1998	18	12.5	18	13
1999	65	45.1	51	38
2000	35	25.0	130	80
2001	0	0.0	7	5
Total	143	100.0	213	143

Table 1: Sample Description, continued

Panel C: Industry Distribution of Companies and Rounds

Industry	Companies	Percent	Rounds	Percent
Communications	4	2.8	7	3.3
Computers	0	0.0	0	0.0
Computers Related	78	54.6	117	54.4
Computer Software	33	23.1	49	22.8
Electronic Components	7	4.9	11	5.12
Other Electronics	5	3.5	7	3.3
Biotechnology	3	2.1	5	2.3
Medical/Health	3	2.1	5	2.3
Energy	0	0.0	0	0.0
Consumer Products	3	2.1	6	2.8
Industrial Products	1	0.7	1	0.5
Transportation	3	2.1	3	1.4
Other Industries	3	2.1	4	1.9
Total	143	100.0	215	100.0

Panel D: Pre-revenue and Post-Revenue Funding Rounds

	Number of rounds
Pre-Revenue Rounds	151
Post-Revenue Rounds	59
First Funding Round	137
Later Rounds	78

Panel E: Age at First Funding

	Months
1st Quartile	2
Median	7
3rd Quartile	12
Mean	10.5

Panel F: Number of Employees

Employees	First Funding	All
1	12	13
2	20	20
3	14	17
4	21	24
5	24	30
6-10	26	34
11-20	17	37
21 and higher	7	27

Table 2: **Firm Funding Information**

This table reports funding information in funding rounds. Panel A reports the number of rounds funded by financier type. Panel B reports the Total Funding amount in each round. Panel C reports the funding amounts in selected industries for seed and start-up rounds. Panel D reports funding information for all rounds in the selected industries. Venture capital funding information is from Venture Economics. The Total columns denote the entire funding or equity stake in the round. Total Funding in Co-invested rounds denotes the total funding in rounds where angels and venture capital, angels and other, or angels, venture capital and others. Angel Funding in Co-invested Rounds refers to the angel contributed amounts in rounds whose investors are angels and venture capital, angels and other, and angels, venture capital and others. Angels Only refers to rounds where only angel investment was made.[17] In Panel B, the number beneath the means is the t-statistic for differences in means assuming unequal variances. The number beneath the median column is the z-score for Mann-Whitney test for differences in percentages in ownership.

Panel A: Financiers

Financier	Number of Rounds
Angels only	157
Angels and Venture Capital	38
Angels and Other	12
Angels, Venture Capital, and Other	8

Panel B: Funding Amounts in each round (amounts in millions)

	Total			Total Funding in Co-invested Rounds		
	Mean	Median	N	Mean	Median	N
All Firms	2.16	1.00	212	4.80	2.20	57
Pre-Revenue	1.49	1.00	149	2.79	2.00	41
Post-Revenue	3.76	1.00	59	11.5	6.50	13
	(2.26)	(1.87)		(2.43)	(2.82)	
First Round	1.29	0.87	135	2.37	1.50	29
Later Rounds	3.69	1.50	77	7.33	3.15	28
	(3.02)	(3.03)		(2.51)	(3.18)	

	Angel Funding in Co-invested Rounds			Angels Only		
	Mean	Median	N	Mean	Median	N
All Firms	0.88	0.70	42	1.28	0.85	155
Pre-Revenue	0.79	0.60	35	1.01	0.72	108
Post-Revenue	1.41	1.04	6	1.85	1.00	46
	(1.51)	(1.98)		(1.67)	(1.50)	
First Round	0.60	0.50	23	1.00	0.63	106
Later Rounds	1.23	1.00	19	1.87	1.00	49
	(3.14)	(3.18)		(1.91)	(2.75)	

Table 2: Firm Funding Information

Panel C: Seed and Startup Rounds (amount in millions)

Industry	Angels & Co-invested Rounds	Angel Only	VC
Computer Related (internet)	1.40	0.94	4.8
Computer Software	1.05	0.64	3.34
Semiconductors and other	1.37	1.37	4.94

Panel D: All Rounds (amount in millions)

Industry	Angels & Co-invested Rounds	Angel Only	VC
Computer Related (internet)	2.47	1.38	20.03
Computer Software	1.31	0.90	13.31
Semiconductors and other	1.71	1.08	20.58

Table 3: **Board Rights**

This table details the security issued in exchange for investment and the composition of the board of directors. Panel A provides information on the board seats given to the group of investors in each round. The number in parentheses represent t-statistics for tests of equality of means under an unequal variance specification between consecutive rows. Panel B displays information on the number of board seats given in each round. Panel C provides post-investment board size. Panel D shows the angel composition of the board subsequent to investment. Pre-revenue refers to firms that do not have any revenue at the time of funding.

Panel A: Round with Granting of Board Seats

	Percentage	N	
All Rounds	0.425	193	
Angels Only	0.439	139	(0.63)
Angels with co-investment	0.389	54	
Pre-Revenue	0.439	132	(0.36)
Post-Revenue	0.411	56	
First Round	0.459	122	(1.26)
Later Rounds	0.366	71	

Panel B: Number of Board Seats Granted on Investment

	Mean	Median	N	Min	Max
Board Seats	0.59	0.00	193	0	6
Board Seats if granted	1.39	1.00	82	1	6
Pre Revenue	0.58	0.00	132	0	6
Post Revenue	0.64	0.00	56	0	3
First Round	0.45	0.00	71	0	3
Later Rounds	0.67	0.00	122	0	6

Table 3: Board Rights, continued

Panel C: Board Size

	Mean	Median	N	Min	Max
Board Size	3.71	4.00	116	1	9
Board Size if granted	4.29	5.00	63	1	9
Pre Revenue	3.65	3.00	80	1	9
Post Revenue	3.97	4.00	33	2	7
First Round	3.53	3.00	76	1	9
Later Round	4.05	4.00	40	1	7

Panel D: Angel Representation on Board

	Mean	Median	N	Min	Max
Angel Percentage	0.18	0.20	116	0	.80
Angel Percentage if granted	0.33	0.33	63	.17	.80
Pre Revenue	0.18	0.20	80	0	.80
Post Revenue	0.19	0.17	33	0	.67
First Round	0.22	0.23	76	0	.80
Later Round	0.11	0.00	40	0	.67

Table 4: **Determinants of Board Seats**

This table presents two stage instrumented probit regressions using the approach of Newey(1987). Panel A uses all funding rounds and panel B only examines rounds entirely funded by angels. The dependent variable is equal to 1 if a board seat was assigned to an angel investor in the financing round. The logarithm of funds is instrumented with the number of angels and the number of employees at funding. The percentage ownership is instrumented with the number of employees and the financing round. First round is equal to one if this is the firm's first round of outside financing. Round is the number of outside financing rounds. Age of firm at financing refers to the number of months since founding. Geography equals one if the closest angel investor is less than fifty miles away. Previous Entrepreneur equals one if the founders have been previous entrepreneurs. Industry $\frac{\text{Market}}{\text{Book}}$ is the mean 3-digit SIC market to book ratio. Industry $\frac{\text{R \& D}}{\text{Assets}}$ is the aggregate R & D expense to total assets for public firms in the company's 3-digit SIC industry according to COMPUSTAT. Industry $\frac{\text{Fixed Assets}}{\text{Total Assets}}$ is the median fixed total assets for all (public as well as closely held) firms with sales less than one million in the company's 4-digit SIC industry according to OneSource. Industry Volatility is the volatility of the value weighted industry portfolio return from months *t-61* to *t-1* where *t* is the date of funding, where industries are defined according to the Fama & French (1997) industry classification. Previous Entrepreneur equals one if the founders had previously started another venture. The absolute values of z-statistics are reported in parentheses beneath the coefficients.

Table 4: Determinants of Board Seats, continued

Panel A: All Rounds

	(1)	(2)	(3)	(4)	(5)	(6)
Log of Funds (instr.)	0.207		-0.092		0.195	
	(1.18)		(0.70)		(0.91)	
Pct. Owned (instr.)		3.037		5.446		3.105
		(0.82)		(1.64)		(0.87)
First Round	0.514	0.183			0.707	0.459
	(1.63)	(0.51)			(1.86)*	(1.23)
Geography	-0.316	-0.505			-0.209	-0.342
	(1.17)	(1.65)*			(0.66)	(0.98)
Previous Entrepreneur	-0.439	-0.504			-0.097	-0.224
	(1.58)	(1.63)			(0.30)	(0.62)
Industry $\frac{\text{Market}}{\text{Book}}$			0.025	0.032	0.005	0.023
			(1.22)	(1.37)	(0.16)	(0.65)
Industry Volatility			-0.225	-0.120	-0.383	-0.304
			(2.55)**	(1.12)	(3.15)***	(2.10)**
Industry $\frac{\text{R\&D}}{\text{Assets}}$			5.804	0.861	12.444	8.493
			(1.01)	(0.12)	(1.63)	(0.79)
Industry $\frac{\text{Fixed Assets}}{\text{Total Assets}}$			3.712	3.441	3.341	2.975
			(2.51)**	(2.14)**	(1.77)*	(1.39)
Constant	-2.852	-0.180	1.498	-1.276	-1.754	0.322
	(1.12)	(0.24)	(0.81)	(1.10)	(0.57)	(0.25)
Observations	108	98	156	142	94	84
Psuedo-R^2	0.05	0.06	0.07	0.09	0.17	0.18
χ^2	7.68	8.50	15.69	16.83	21.99	20.81

Absolute value of z statistics in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%

Table 4: Determinants of Board Seats, continued

Panel B: Angel Only Rounds

	(1)	(2)	(3)	(4)	(5)	(6)
Log of Funds (instr.)	0.175		-0.126		0.150	
	(0.87)		(0.67)		(0.58)	
Pct. Owned (instr.)		6.058		4.755		5.392
		(1.11)		(1.50)		(0.98)
First Round	0.583	-0.144			0.591	0.092
	(1.66)*	(0.22)			(1.38)	(0.14)
Geography	-0.295	-0.539			-0.259	-0.326
	(0.97)	(1.61)			(0.69)	(0.75)
Previous Entrepreneur	-0.318	-0.321			0.100	0.019
	(1.03)	(0.93)			(0.26)	(0.04)
Industry $\frac{\text{Market}}{\text{Book}}$			0.036	0.043	0.017	0.028
			(1.57)	(1.69)*	(0.48)	(0.62)
Industry Volatility			-0.282	-0.155	-0.381	-0.283
			(2.79)***	(1.26)	(2.79)***	(1.54)
Industry $\frac{\text{R\&D}}{\text{Assets}}$			4.575	2.386	14.722	8.583
			(0.63)	(0.29)	(1.44)	(0.58)
Industry $\frac{\text{Fixed Assets}}{\text{Total Assets}}$			3.260	3.779	2.606	2.289
			(1.80)*	(1.96)**	(1.15)	(0.89)
Constant	-2.603	-0.630	2.479	-0.968	-1.160	0.002
	(0.92)	(0.83)	(0.92)	(0.74)	(0.30)	(0.00)
Observations	83	74	112	103	71	62
Psuedo-R^2	0.05	0.07	0.09	0.10	0.18	0.19
χ^2	5.86	7.13	14.05	13.86	17.43	15.86

Absolute value of z statistics in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%

Table 5: **Follow On Investment**

This table presents results on the follow on investment behavior of angel investors. Panel A provides frequency data on the number of follow-on investments. Panel B provides information on the percentage of angels who have funded previous rounds. Panels C and D present probit regressions where the dependent variable is equal to 1 if a funding round contained investors from previous investment rounds. The independent variables are described in table 4. Industry dummies are included in columns 1-7. All financing rounds are included in the regressions in panel C. Panel D examines rounds funded by only angels. The absolute values of White (1980) t-statistics are reported in parentheses beneath the coefficients.

Panel A: Number of Follow On Investments

	All Rounds	Angel Only Rounds	VC investment
No follow-on	64	18	46
Follow-on	42	27	15

Panel B: Follow On Percentage	Mean	Median
Percentage of Investors from Previous Rounds	40.25%	25%

Panel C: All Rounds

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Log of Funds	-0.074							
	(0.80)							
Pct. Owned		0.424						
		(0.43)						
Board Seat			-0.170					
			(0.66)					
Previous Entrepreneur				0.460				
				(1.20)				
Number of Angels					-0.007			
					(0.64)			
Geography						-0.269		
						(0.81)		
Post Revenue							0.353	
							(1.18)	
Industry $\frac{\text{Market}}{\text{Book}}$								0.018
								(0.89)
Industry Volatility								0.022
								(0.17)
Industry $\frac{\text{R\&D}}{\text{Assets}}$								20.000
								(2.61)***
Industry $\frac{\text{Fixed Assets}}{\text{Total Assets}}$								0.558
								(0.31)
Constant	0.800	-0.151	-0.119	-0.489	-0.054	0.000	-0.298	-1.671
	(0.62)	(0.60)	(0.68)	(1.48)	(0.29)	(0.00)	(2.10)**	(1.54)
Observations	104	86	97	59	97	59	104	93
PsuedoR^2	0.00	0.00	0.00	0.02	0.00	0.01	0.01	0.07
χ^2	0.64	0.19	0.43	1.45	0.41	0.65	1.40	7.96

Table 5: Follow On Investment, continued

Panel D: Angel Rounds Only

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Log of Funds	0.071							
	(0.36)							
Pct. Owned		0.875						
		(0.51)						
Board Seat			0.072					
			(0.18)					
Previous Entrepreneur				-0.181				
				(0.31)				
Number of Angels					-0.010			
					(0.68)			
Geography						-0.619		
						(1.11)		
Post Revenue							0.220	
							(0.45)	
Industry $\frac{\text{Market}}{\text{Book}}$								-0.012
								(0.40)
Industry Volatility								0.295
								(1.47)
Industry $\frac{\text{R\&D}}{\text{Assets}}$								16.289
								(1.58)
Industry $\frac{\text{Fixed Assets}}{\text{Total Assets}}$								2.657
								(1.08)
Constant	-0.643	0.320	0.210	0.566	0.476	0.842	0.210	-3.033
	(0.25)	(0.86)	(0.81)	(1.11)	(1.80)*	(1.83)*	(0.99)	(1.86)*
Observations	44	38	42	27	42	27	45	39
PsuedoR^2	0.00	0.01	0.00	0.00	0.01	0.04	0.00	0.10
χ^2	0.13	0.26	0.03	0.09	0.46	1.24	0.21	4.74

Robust z statistics in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 6: **Security Issuance and Contractual Terms**

This table presents information on security issuance and other contractual terms. Panel A lists the type of security used in each round. Panel B reports regression results from probit regressions where the dependent variable equals 1 if equity is issued and 0 otherwise using all rounds of funding. Panel C reports results using only angel financed rounds. Columns 1 to 7 of panels B and C include industry dummy variables. Panel D presents the types of dilution protection for angel investors. The 'Other' category includes dilution protection such as verbal agreements in the event of a down round. Panel E provides data on the number of rounds where repurchase agreements are in the contract. A repurchase option gives the entrepreneur the right to repurchase an angel's stake in the firm.

Panel A: Security Issuance

Security	All Rounds	Angel Rounds Only
Common Equity	72	60
Preferred Equity	56	34
Convertible Note	14	12
Convertible Preferred	67	46

Panel B: Determinants of Security

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Log of Funds	-0.347							
	(4.09)***							
Pct. Owned		-0.640						
		(0.70)						
Board Seat			-0.129					
			(0.64)					
Previous Entrepreneur				-0.076				
				(0.27)				
Number of Angels					-0.007			
					(0.68)			
Geography						0.361		
						(1.36)		
Post Revenue							0.135	
							(0.65)	
Industry $\frac{\text{Market}}{\text{Book}}$								-0.002
								(0.48)
Industry Volatility								0.044
								(0.60)
Industry $\frac{\text{R\&D}}{\text{Assets}}$								1.948
								(0.40)
Industry $\frac{\text{Fixed Assets}}{\text{Total Assets}}$								-0.987
								(0.82)
Constant	5.116	6.076	6.045	6.052	6.052	5.691	0.617	-0.587
	(3.88)***	(9.68)***	(8.09)***	(7.52)***	(8.76)***	(7.57)***	(0.90)	(0.90)
Observations	208	166	187	112	189	112	206	191
Psuedo-R^2	0.14	0.07	0.07	0.08	0.07	0.10	0.06	0.01
χ^2	26.59	115.63	86.50	75.66	96.13	71.18	16.48	1.88

Table 6: Security Issuance and Contractual Terms, continued

Panel C: Determinants of Security - Angels Only

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Log of Funds	-0.400							
	(3.98)***							
Pct. Owned		-0.320						
		(0.31)						
Board Seat			-0.087					
			(0.37)					
Previous Entrepreneur				-0.040				
				(0.12)				
Number of Angels					-0.015			
					(1.17)			
Geography						0.282		
						(0.95)		
Post Revenue							0.102	
							(0.43)	
Industry $\frac{\text{Market}}{\text{Book}}$								0.013
								(0.76)
Industry Volatility								0.046
								(0.55)
Industry $\frac{\text{R\&D}}{\text{Assets}}$								9.475
								(1.54)
Industry $\frac{\text{Fixed Assets}}{\text{Total Assets}}$								-1.505
								(1.01)
Constant	5.789	6.067	6.055	6.056	6.068	5.775	0.631	-0.780
	(3.87)***	(6.34)***	(6.88)***	(8.29)***	(6.38)***	(6.48)***	(0.91)	(0.97)
Observations	151	123	134	86	137	86	151	137
Psuedo-R^2	0.13	0.05	0.06	0.07	0.07	0.07	0.05	0.03
χ^2	22.50	52.69	56.82	96.18	50.56	48.73	8.63	5.78

Absolute value of z statistics in parentheses

* significant at 10%; ** denotes significance at 5%; *** denotes significant at 1%

Panel D: Contractual Provisions

Type of Protection	N	Percent
Right to participate in future funding	27	24%
Weighted Ratchet	18	26%
Warrants at lower valuation	5	4%
Other ratcheting protection	3	11%
No reported ratcheting provision	66	55%
Right to force bankruptcy	3	4.6%
Contingent board or equity rights	2	1.7%
Veto Management Decision	6	5.1%

Panel E: Buyback Provision

	N
Repurchase Provision	38
No Repurchase Provision	80

Table 7: **Determinants of Round Funding**

This table presents ordinary least squares estimates of the size of funding in a round. The dependent variable is the logarithm of the total amount of funding received in a round of financing from all outside investors divided by the total number of employees in the round. Panel B presents regression results from rounds entirely funded by angels. Venture Capital is equal to one if the round includes investment from venture capitalists. The other independent variables are described in table 4. Regressions 1 through 5 in Panels A and B have industry dummies. The absolute values of White (1980) t-statistics are reported in parentheses beneath the coefficients.

Panel A: Total Investment in Round

	(1)	(2)	(3)	(4)	(5)	(6)
Venture Capital	0.937	0.906	0.970	1.042	1.114	0.860
	(5.91)***	(5.74)***	(4.85)***	(4.21)***	(4.35)***	(5.40)***
First Round	0.243					
	(1.67)*					
Post Revenue		-0.334				
		(2.30)**				
Mgmt. Team			0.084			
			(0.45)			
Geography				-0.305		
				(1.47)		
Previous Entrepreneur					-0.207	
					(0.82)	
Industry $\frac{\text{Market}}{\text{Book}}$						-0.001
						(0.08)
Industry Volatility						-0.054
						(0.94)
Industry $\frac{\text{R\&D}}{\text{Assets}}$						-1.457
						(0.39)
Industry $\frac{\text{Fixed Assets}}{\text{Total Assets}}$						-0.369
						(0.38)
Constant	10.821	11.170	11.726	12.074	11.768	12.217
	(20.53)***	(18.81)***	(15.84)***	(16.30)***	(16.56)***	(24.46)***
Observations	209	207	122	119	119	185
R^2	0.17	0.18	0.21	0.20	0.19	0.12
F-statistic	5.46	6.14	4.24	15.60	6.24	6.06

Absolute value of t statistics in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%

Table 7: Determinants of Funding, continued

Panel B: Angel Funding Only

	(1)	(2)	(3)	(4)	(5)	(6)
First Round	0.208					
	(1.13)					
Post Revenue		-0.334				
		(1.95)*				
Mgmt. Team			0.117			
			(0.52)			
Geography				-0.266		
				(1.11)		
Previous Entrepreneur					-0.043	
					(0.17)	
Industry $\frac{\text{Market}}{\text{Book}}$						0.033
						(2.73)***
Industry Volatility						-0.055
						(0.88)
Industry $\frac{\text{R\&D}}{\text{Assets}}$						-3.927
						(0.90)
Industry $\frac{\text{Fixed Assets}}{\text{Total Assets}}$						-0.908
						(0.80)
Constant	10.848	11.170	11.710	12.035	11.768	12.327
	(20.30)***	(18.65)***	(15.36)***	(15.88)***	(16.37)***	(21.98)***
Observations	154	153	92	93	93	134
R^2	0.12	0.13	0.19	0.17	0.16	0.07
F-statistic	3.11	4.41	7.19	18.80	9.69	3.55

Absolute value of t statistics in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%

Table 8: **Investor Ownership**

This table reports the total equity stake relinquished in each round. The Total columns denote the entire funding or equity stake in the round. Total Percentage Ownership in Co-invested rounds denotes the total percentage ownership in rounds where angels and venture capital, angels and other, or angels, venture capital and others. Angel Percentage Ownership in Co-invested Rounds refers to the ownership stake in rounds whose investors are angels and venture capital, angels and other, and angels, venture capital and others. Angels Only refers to rounds where only angel investment was made. The number beneath the means is the t-statistic for differences in means assuming unequal variances. The number beneath the median column is the z-score for Mann-Whitney test for differences in percentages in ownership. For firms that used convertible notes, the percentage ownership amount is adjusted for conversion.

	Total			Total Percentage Ownership in Co-invested Rounds		
	Mean	Median	N	Mean	Median	N
All Firms	0.20	0.18	173	0.24	0.21	44
Pre-Revenue	0.20	0.19	119	0.24	0.22	32
Post-Revenue	0.19	0.16	54	0.25	0.21	12
	(0.30)	(0.49)		(0.25)	(0.21)	
First Round	0.21	0.20	107	0.24	0.21	24
Later Rounds	0.18	0.15	66	0.24	0.28	20
	(1.53)	(1.89)		(0.96)	(0.30)	

	Angel Ownership in Co-invested Rounds			Angels Only		
	Mean	Median	N	Mean	Median	N
All Firms	0.10	0.08	35	0.18	0.15	129
Pre-Revenue	0.10	0.08	30	0.19	0.17	87
Post-Revenue	0.09	0.10	5	0.13	0.18	42
	(0.59)	(0.40)		(0.36)	(0.38)	
First Round	0.11	0.09	18	0.20	0.20	87
Later Rounds	0.09	0.07	17	0.14	0.10	42
	(0.74)	(0.48)		(2.61)	(2.77)	

Table 9: **Determinants of Cash Flow Rights**

This table presents two stage least squares estimates of the percentage of cash flow rights exchanged in a round. The dependent variable is the total percentage ownership given to investors in a round of financing from all outside investors. Log of Funds is instrumented by the number of employees and a venture capital dummy. Columns 1 through 4 have industry dummy variables as controls. Panel B uses only rounds entirely funded by angel investors. The other independent variables are described in table 4. The absolute values of White (1980) t-statistics are reported in parentheses beneath the coefficients.

Panel A: All Rounds

	(1)	(2)	(3)	(4)	(5)	(6)
Log of Funds (instr.)	0.041	0.046	0.072	0.070	0.050	0.103
	(2.73)***	(2.32)**	(3.26)***	(3.52)***	(3.11)***	(2.89)***
First Round	0.052	0.059	0.104	0.099	0.067	0.088
	(3.10)***	(2.79)***	(4.13)***	(4.43)***	(3.81)***	(2.57)**
Post Revenue	-0.027					-0.035
	(1.52)					(0.93)
Mgmt. Team		-0.036				-0.060
		(1.51)				(1.81)*
Geography			0.026			0.046
			(0.71)			(0.92)
Previous Entrepreneur				-0.031		-0.045
				(0.98)		(1.06)
Industry $\frac{\text{Market}}{\text{Book}}$					-0.001	0.000
					(2.73)***	(0.07)
Industry Volatility					1.359	2.186
					(3.17)***	(2.56)**
Industry $\frac{\text{R\&D}}{\text{Assets}}$					-0.023	-0.016
					(3.30)***	(1.26)
Industry $\frac{\text{Fixed Assets}}{\text{Total Assets}}$					-0.011	0.213
					(0.10)	(1.32)
Constant	-0.489	-0.569	-0.981	-0.922	-0.422	-1.247
	(2.44)**	(2.15)**	(3.06)***	(3.44)***	(1.98)*	(2.40)**
Observations	172	107	104	104	152	65
R^2	0.27	0.30	0.26	0.27	0.24	0.25
F-statistic	8.22	4.54	4.51	4.50	8.26	4.26

Absolute value of t-statistics in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 9: Determinants of Cash Flow Rights, continued

Panel B: Angel Rounds

	(1)	(2)	(3)	(4)	(5)	(6)
Log of Funds (instr.)	0.069	0.094	0.085	0.079	0.075	0.288
	(2.01)**	(2.80)***	(1.97)*	(2.01)**	(2.03)**	(2.84)***
First Round	0.078	0.097	0.129	0.114	0.073	0.156
	(4.06)***	(3.41)***	(4.05)***	(4.17)***	(3.26)***	(1.87)*
Post Revenue	-0.031					-0.214
	(1.48)					(1.43)
Mgmt. Team		-0.057				-0.102
		(2.11)**				(1.27)
Geography			0.067			0.187
			(1.44)			(1.41)
Previous Entrepreneur				-0.045		-0.212
				(1.10)		(1.76)*
Industry $\frac{\text{Market}}{\text{Book}}$					-0.001	-0.002
					(0.67)	(0.30)
Industry Volatility					1.594	3.354
					(2.90)***	(1.52)
Industry $\frac{\text{R\&D}}{\text{Assets}}$					-0.023	0.035
					(2.73)***	(0.93)
Industry $\frac{\text{Fixed Assets}}{\text{Total Assets}}$					-0.133	-0.008
					(0.91)	(0.02)
Constant	-0.871	-1.207	-1.208	-1.045	-0.741	-4.008
	(1.94)*	(2.68)***	(1.99)*	(2.01)**	(1.51)	(2.55)**
Observations	128	80	80	80	112	50
R^2	0.21	0.20	0.19	0.20	0.10	
F-statistic	3.97	2.74	2.26	7.73	5.41	2.37

Absolute value of t-statistics in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 10: **Angel Funding Information**

This table reports information on angel participation in financing rounds. Panel A reports the number of angels in each round. The columns titled Angels Only refers to deals which only angel investors participated in the round. Angels with Co-investment refers to rounds funded jointly by angels and a combination of venture capitalist or other miscellaneous investors. Panel B reports the average contribution per angel in each round. Panel C reports the equity ownership percentage for the average angel investor and the maximum angel ownership position.

Panel A: Number of Angels per Deal

	Total			Angel Funding with Co-Investment			Angels Only				
	Mean	Median	N	Mean	Median	N	Mean	Median	N	t-test	MW
All Fundings	11.8	8.0	193	10.9	8.0	52	12.2	8	141	(0.61)	(0.46)
Pre-Revenue	10.8	6.0	133	9.7	4.0	38	11.2	7	95	(0.66)	(1.22)
Post-Revenue	14.5	11.5	58	14.9	15.0	13	14.4	11	45	(0.14)	(1.34)
	(1.23)	(2.00)		(1.77)	(2.70)		(1.04)	(0.79)			
First Round	12.4	8.0	125	12.5	9.0	26	12.4	8	99	(0.05)	(0.08)
Later Rounds	10.7	7.5	68	9.2	7.5	26	11.6	7.5	42	(1.05)	(0.58)
	(0.85)	(0.05)		(1.05)	(0.17)		(0.24)	(0.32)			

Panel B: Average Contribution per Angel (numbers in thousands)

	Total			Angel Funding with Co-Investment			Angels Only				
	Mean	Median	N	Mean	Median	N	Mean	Median	N	t-test	MW
All Fundings	222.0	91.1	178	225.0	100.0	39	221.1	87.5	139	(0.06)	(0.58)
Pre-Revenue	179.3	92.0	127	252.2	116.7	33	153.7	86.6	94	(1.42)	(1.14)
Post-Revenue	328.3	88.0	51	75.9	77.0	6	362.0	88.0	45	(2.44)	(0.75)
	(1.40)	(0.30)		(2.65)	(1.25)		(2.35)	(0.19)			
First Round	145.2	75.0	119	113.2	50.0	21	152.1	78.5	98	(0.92)	(1.13)
Later Rounds	376.8	120.0	59	355.5	144.2	18	386.2	100.0	41	(0.19)	(1.38)
	(2.43)	(3.09)		(2.17)	(2.75)		(2.59)	(1.74)			

Panel C: Ownership Percentage per Angel

	Total			Angel Funding with Co-Investment			Angels Only		
	Mean	Median	N	Mean	Median	N	Mean	Median	N
All Fundings	4.2	1.6	158	3.0	1.2	34	4.5	1.7	124
Pre-Revenue	4.6	1.7	111	5.1	1.7	29	5.1	1.7	82
Post-Revenue	3.2	1.3	47	3.5	1.6	5	3.5	1.4	42
First Round	4.8	1.7	102	2.6	0.8	17	5.3	1.8	85
Later Rounds	3.1	1.4	56	3.5	1.6	17	2.6	1.3	39

Table 11: **Syndication and Average Contribution**

Panels A and B presents estimates from OLS regressions on average angel contribution. In panel A, the dependent variable is the logarithm of the average contribution per angel in all financing rounds. Panel B reports results for only angel financed rounds. Panel C and D reports the results from a instrumental variable regression Poisson regression as specified in Mullahy(1997). The dependent variable is the number of angel investors. Panel D only uses rounds entirely financed by angels. The natural logarithm of funds is instrumented by the number of employees and the presence of venture capital. The other independent variables are defined in table 4. The regressions in columns 1-6 of panels A and B and columns 1-6 of panel C and D have industry dummy variables. The absolute values of White (1980) t-statistics are reported in parentheses below the coefficients in panels A and B.

Panel A: Average Contribution per Angel

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Venture Capital	0.237							0.336
	(1.04)							(0.78)
Post Revenue		0.077						0.353
		(0.37)						(1.05)
First Round			-0.559					-0.745
			(2.89)***					(2.33)**
Mgmt. Team				0.391				0.445
				(1.58)				(1.53)
Geography					-0.811			-0.528
					(3.13)***			(1.55)
Previous Entrepreneur						0.442		0.352
						(1.52)		(0.96)
Industry $\frac{\text{Market}}{\text{Book}}$							-0.007	0.028
							(2.91)***	(0.87)
Industry Volatility							0.021	-0.123
							(0.29)	(0.98)
Industry $\frac{\text{R\&D}}{\text{Assets}}$							-5.148	-4.091
							(1.07)	(0.49)
Industry $\frac{\text{Fixed Assets}}{\text{Total Assets}}$							3.630	2.723
							(2.76)***	(1.42)
Constant	13.214	13.136	13.493	13.018	14.024	13.214	10.834	12.210
	(29.98)***	(26.85)***	(20.68)***	(21.56)***	(26.98)***	(29.32)***	(15.31)***	(10.68)***
Observations	178	178	178	111	111	111	158	70
R^2	0.09	0.08	0.14	0.11	0.21	0.15	0.09	0.30
F-statistic	3.39	6.81	9.55	9.14	7.13	4.48	3.77	2.97

Table 11: Syndication and Average Contribution, continued

Panel B: Average Contribution per Angel - Angels Only

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Post Revenue	0.221						0.286
	(0.92)						(0.83)
First Round		-0.395					-0.387
		(1.65)					(1.01)
Mgmt. Team			0.679				0.630
			(2.42)**				(1.97)*
Geography				-0.568			-0.179
				(1.86)*			(0.48)
Previous Entrepreneur					0.358		0.131
					(1.08)		(0.31)
Industry $\frac{\text{Market}}{\text{Book}}$						0.002	0.011
						(0.11)	(0.32)
Industry Volatility						-9.750	-14.026
						(1.76)*	(1.46)
Industry $\frac{\text{R\&D}}{\text{Assets}}$						3.679	1.300
						(2.40)**	(0.49)
Industry $\frac{\text{Fixed Assets}}{\text{Total Assets}}$						-0.018	-0.182
						(0.21)	(1.22)
Constant	12.992	13.411	12.874	13.782	13.214	11.235	13.027
	(25.67)***	(22.22)***	(17.84)***	(25.06)***	(28.87)***	(13.03)***	(8.18)***
Observations	139	139	87	89	89	122	54
R^2	0.09	0.10	0.18	0.18	0.15	0.12	0.31
F-statistic	8.39	9.07	3.36	5.62	7.62	2.85	2.34

Table 11: Syndication and Average Contribution, continued

Panel C: Number of Angel Investors per Round

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Log of Funds (instr.)	0.139	0.011	-0.071	0.057	0.073	0.008	0.035	0.178
	(4.68)***	(0.46)	(2.12)**	(2.21)**	(1.67)*	(0.19)	(1.45)	(2.13)**
Venture Capital	-0.335							0.071
	(4.48)***							(0.47)
Post Revenue		0.177						0.221
		(3.71)***						(2.03)**
Mgmt. Team			0.255					0.230
			(4.15)***					(2.54)**
First Round				0.056				0.639
				(1.09)				(5.91)***
Geography					0.488			0.111
					(6.88)***			(1.12)
Previous Entrepneur						-0.115		-0.078
						(1.61)		(0.79)
Industry $\frac{\text{Market}}{\text{Book}}$							0.001	0.010
							(1.13)	(1.16)
Industry Volatility							-0.044	0.021
							(2.50)**	(0.62)
Industry $\frac{\text{R\&D}}{\text{Assets}}$							-1.698	-3.024
							(1.52)	(1.39)
Industry $\frac{\text{Fixed Assets}}{\text{Total Assets}}$							-0.635	-1.003
							(2.15)**	(1.82)*
Constant	-1.838	-0.328	0.803	-0.782	-1.456	-0.107	2.556	-0.738
	(2.27)**	(0.42)	(0.97)	(0.99)	(1.57)	(0.12)	(7.26)***	(0.62)
Observations	191	190	118	191	114	114	170	70
χ^2	581.03	573.82	127.94	561.95	152.36	105.56	17.49	56.81

Panel D: Number of Angel Investors per Round - Angels Only

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Log of Funds (instr.)	0.197	0.138	0.217	0.093	0.066	0.274	0.029
	(5.87)***	(3.34)***	(6.52)***	(1.99)**	(1.42)	(8.57)***	(0.38)
Post Revenue	0.041						0.275
	(0.71)						(2.42)**
Mgmt. Team		0.131					0.089
		(1.72)*					(0.88)
First Round			0.025				0.202
			(0.41)				(1.58)
Geography				0.273			-0.187
				(3.56)***			(1.69)*
Previous Entrepneur					-0.022		0.241
					(0.27)		(2.09)**
Industry $\frac{\text{Market}}{\text{Book}}$						0.013	0.025
						(2.80)***	(2.80)***
Industry Volatility						-0.038	-0.007
						(1.87)*	(0.17)
Industry $\frac{\text{R\&D}}{\text{Assets}}$						0.036	2.653
						(0.03)	(1.04)
Industry $\frac{\text{Fixed Assets}}{\text{Total Assets}}$						-1.130	0.399
						(3.15)***	(0.61)
Constant	-2.643	-1.889	-2.874	-1.496	-0.868	-0.668	1.235
	(3.21)***	(2.13)**	(3.42)***	(1.57)	(0.93)	(1.44)	(1.07)
Observations	139	89	140	89	89	123	54
χ^2	592.30	163.50	594.54	109.07	96.15	75.74	29.00

Absolute value of z statistics in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%

Table 12: **Post-Investment Assistance**

This table presents evidence on the amount of assistance angel financiers provide. Panel A gives the number of rounds where the angel investors helped form the management team. Panel B presents results on the determinants of funding duration leading up to venture capital financing. The dependent variable is the number of months from completion of one funding round until the completion of the next funding round from venture capital. The distribution of the hazard duration is assumed to be Weibull. Panel C presents results from ordered logit regressions where the dependent variable is the amount of help that angel investors provide. Responses are 1 (for very little or no help) to 5 (the angel provided a great deal of help). The other independent variables are defined in table 4.

Panel A: Management Team Assistance

Do the angels help form the management team (N=119)?	23.5%

Panel B: Time until Venture Capital Financing

	(1)	(2)	(3)	(4)
Post Revenue	0.224	0.207	0.024	0.183
	(0.79)	(0.79)	(0.17)	(1.58)
Log of Funds	0.035		0.029	
	(0.40)		(0.56)	
Number of Angels	-0.018	-0.012		
	(1.70)*	(1.46)		
First Round	-0.007	-0.211		
	(0.02)	(0.78)		
Geography	0.254	0.535		
	(1.06)	(2.59)***		
Pct. Owned		1.489		0.390
		(1.32)		(0.82)
Industry $\frac{\text{Market}}{\text{Book}}$			-0.006	-0.008
			(0.69)	(0.78)
Industry Volatility			-0.158	-0.087
			(2.94)***	(1.51)
Industry $\frac{\text{R\&D}}{\text{Assets}}$			6.559	6.699
			(3.39)***	(3.46)***
Industry $\frac{\text{Fixed Assets}}{\text{Total Assets}}$			2.010	1.208
			(3.12)***	(1.23)
Constant	1.856	1.855	2.071	2.024
	(1.41)	(4.99)***	(3.52)***	(5.09)***
Observations	28	26	47	38
χ^2	4.23	14.28	40.39	37.54

Table 12: Post-Investment Assistance, continued

Panel C: Amount of help

	(1)	(2)	(3)
Number of Angels	-0.003	-0.001	-0.001
	(0.12)	(0.03)	(0.05)
Geography	1.149	1.105	1.105
	(3.00)***	(2.85)***	(2.88)***
Log of Funds		-0.021	-0.013
		(0.18)	(0.11)
Previous Entrepreneur			-0.231
			(0.49)
Observations	97	96	96
Psuedo-R^2	0.03	0.03	0.03
χ^2	9.16	8.68	8.95

Robust z statistics in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%